APPENDIX 2

DEVELOPMENT MANAGEMENT REVIEW COMMITTEE

APPLICATION FOR REVIEW – LAND NORTH EAST OF DUNTRUNE HOUSE, DUNTRUNE

APPLICATION NO 20/00830/FULL

APPLICANT'S SUBMISSION

Angus House Orchardbank Business Park Forfar DD8 1AN Tel: 01307 473360 Fax: 01307 461 895 Email: plnprocessing@angus.gov.uk

Applications cannot be validated until all the necessary documentation has been submitted and the required fee has been paid.

Thank you for completing this application form:

ONLINE REFERENCE 100531124-001

The online reference is the unique reference for your online form only. The Planning Authority will allocate an Application Number when your form is validated. Please quote this reference if you need to contact the planning Authority about this application.

Applicant or Agent Details

Are you an applicant or an agent? * (An agent is an architect, consultant or someone else acting on behalf of the applicant in connection with this application) ☐ Applicant ☒ Agent

Agent Details

Please enter Agent details

Company/Organisation:	Brodies LLP		
Ref. Number:		You must enter a Building Name or Number, or both: *	
First Name: *	Elaine	Building Name:	Brodies House
Last Name: *	Farquharson-Black	Building Number:	31-33
Telephone Number: *	01224 392251	Address 1 (Street): *	Union Grove
Extension Number:		Address 2:	
Mobile Number:		Town/City: *	Aberdeen
Fax Number:		Country: *	United Kingdom
		Postcode: *	AB10 6SD
Email Address: *	planning@brodies.com		

Is the applicant an individual or an organisation/corporate entity? *

☐ Individual ☒ Organisation/Corporate entity

Applicant Details

Please enter Applicant details

Title:		You must enter a Building Name or Number, or both: *	
Other Title:		Building Name:	
First Name: *		Building Number:	15
Last Name: *		Address 1 (Street): *	@rchitects Scotland Ltd
Company/Organisation	Duntrune Ltd	Address 2:	West High Street
Telephone Number: *		Town/City: *	Forfar
Extension Number:		Country: *	United Kingdom
Mobile Number:	[redacted]	Postcode: *	DD8 1BE
Fax Number:			
Email Address: *	planning@brodies.com		

Site Address Details

Planning Authority:	Angus Council

Full postal address of the site (including postcode where available):

Address 1:	
Address 2:	
Address 3:	
Address 4:	
Address 5:	
Town/City/Settlement:	
Post Code:	

Please identify/describe the location of the site or sites

Northing	735536	Easting	344875

Description of Proposal

Please provide a description of your proposal to which your review relates. The description should be the same as given in the application form, or as amended with the agreement of the planning authority: *
(Max 500 characters)

Erection of Crematorium Building and associated Parking, Access, Turning Space, Landscaping and Boundary Enclosures at Land North East Of Duntrune House Duntrune.

Type of Application

What type of application did you submit to the planning authority? *

☒ Application for planning permission (including householder application but excluding application to work minerals).

☐ Application for planning permission in principle.

☐ Further application.

☐ Application for approval of matters specified in conditions.

What does your review relate to? *

☒ Refusal Notice.

☐ Grant of permission with Conditions imposed.

☐ No decision reached within the prescribed period (two months after validation date or any agreed extension) – deemed refusal.

Statement of reasons for seeking review

You must state in full, why you are a seeking a review of the planning authority's decision (or failure to make a decision). Your statement must set out all matters you consider require to be taken into account in determining your review. If necessary this can be provided as a separate document in the 'Supporting Documents' section: * (Max 500 characters)

Note: you are unlikely to have a further opportunity to add to your statement of appeal at a later date, so it is essential that you produce all of the information you want the decision-maker to take into account.

You should not however raise any new matter which was not before the planning authority at the time it decided your application (or at the time expiry of the period of determination), unless you can demonstrate that the new matter could not have been raised before that time or that it not being raised before that time is a consequence of exceptional circumstances.

See separate Application for Review Statement.

Have you raised any matters which were not before the appointed officer at the time the Determination on your application was made? * ☐ Yes ☒ No

If yes, you should explain in the box below, why you are raising the new matter, why it was not raised with the appointed officer before your application was determined and why you consider it should be considered in your review: * (Max 500 characters)

Please provide a list of all supporting documents, materials and evidence which you wish to submit with your notice of review and intend to rely on in support of your review. You can attach these documents electronically later in the process: * (Max 500 characters)

See separate Application for Review statement and related documents.

Application Details

Please provide the application reference no. given to you by your planning authority for your previous application.	20/00830/FULL
What date was the application submitted to the planning authority? *	26/11/2020
What date was the decision issued by the planning authority? *	24/01/2022

Review Procedure

The Local Review Body will decide on the procedure to be used to determine your review and may at any time during the review process require that further information or representations be made to enable them to determine the review. Further information may be required by one or a combination of procedures, such as: written submissions; the holding of one or more hearing sessions and/or inspecting the land which is the subject of the review case.

Can this review continue to a conclusion, in your opinion, based on a review of the relevant information provided by yourself and other parties only, without any further procedures? For example, written submission, hearing session, site inspection. *

☒ Yes ☐ No

In the event that the Local Review Body appointed to consider your application decides to inspect the site, in your opinion:

Can the site be clearly seen from a road or public land? *	☒ Yes ☐ No
Is it possible for the site to be accessed safely and without barriers to entry? *	☒ Yes ☐ No

Checklist – Application for Notice of Review

Please complete the following checklist to make sure you have provided all the necessary information in support of your appeal. Failure to submit all this information may result in your appeal being deemed invalid.

Have you provided the name and address of the applicant?. *	☒ Yes ☐ No
Have you provided the date and reference number of the application which is the subject of this review? *	☒ Yes ☐ No
If you are the agent, acting on behalf of the applicant, have you provided details of your name and address and indicated whether any notice or correspondence required in connection with the review should be sent to you or the applicant? *	☒ Yes ☐ No ☐ N/A
Have you provided a statement setting out your reasons for requiring a review and by what procedure (or combination of procedures) you wish the review to be conducted? *	☒ Yes ☐ No

Note: You must state, in full, why you are seeking a review on your application. Your statement must set out all matters you consider require to be taken into account in determining your review. You may not have a further opportunity to add to your statement of review at a later date. It is therefore essential that you submit with your notice of review, all necessary information and evidence that you rely on and wish the Local Review Body to consider as part of your review.

Please attach a copy of all documents, material and evidence which you intend to rely on (e.g. plans and Drawings) which are now the subject of this review *	☒ Yes ☐ No

Note: Where the review relates to a further application e.g. renewal of planning permission or modification, variation or removal of a planning condition or where it relates to an application for approval of matters specified in conditions, it is advisable to provide the application reference number, approved plans and decision notice (if any) from the earlier consent.

Declare – Notice of Review

I/We the applicant/agent certify that this is an application for review on the grounds stated.

Declaration Name: Mrs Elaine Farquharson-Black

Declaration Date: 28/02/2022

APPLICATION FOR REVIEW

On behalf of

DUNTRUNE LTD

Relative to the delegated refusal of Planning Permission by Angus Council of

Planning Application Ref: 20/00830/FULL

Erection of Crematorium Building and associated Parking, Access, Turning Space, Landscaping and Boundary Enclosures at Land North East of Duntrune House, Duntrune

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1 EXECUTIVE SUMMARY

1.1 Duntrune Ltd (“the Applicant”) seeks a review of Angus Council's delegated refusal of planning application reference 20/00830/FULL for the erection of a Crematorium Building and associated Parking, Access, Turning Space, Landscaping and Boundary Enclosures at Land North-East of Duntrune House Duntrune (“Application Site”) on the grounds that the application conforms with relevant planning policies and that material considerations also support the grant of consent. There is therefore a legal presumption in favour of the development and the Council's decision requires to be overturned.

1.2 Planning decisions always involve the balance of competing policies and competing interests. The Review Committee sits as a quasi-judicial body and requires to determine the application as if it had been made to it in the first instance. They need not follow the officer's recommendation and cannot be swayed by external pressures or the volume of apparent objections to the development. The Applicant welcomes the Committee's independent and rigorous review of the determination of the application.

1.3 There are no specific development plan policies governing the location of crematoria in Angus. It goes without saying that families and mourners seek an attractive, restful and comforting environment in which to gather and grieve the loss of loved ones.

1.4 Guidance issued by relevant cremation governing bodies suggests that sites should avoid close proximity to housing and highways and that given the sensitivity of the use, existing landscaping requires to be in place. When assessing a site's suitability, it is submitted that the sensitivity of the use and the users should carry considerable weight, as should the limited numbers of traffic movements associated with the development.

1.5 At £1,100 per cremation, the cost of cremation in Angus (Friockheim) is higher than anywhere else in the UK. Dundee, the next nearest cremation location for Angus residents, is 3rd equal highest in the UK at £1,070. Both of which are considerably more expensive than the national average of £815. The lack of choice of cremation facilities is prejudicing Angus residents. This is a material consideration for the determination of this application.

1.6 The Report of Handling accepts that the type of use is unlikely to come forward in a town centre or edge of centre location and acknowledges that the proposed development accords with relevant design and environmental policies and that there are no technical reasons for refusing the application. Further, the Report confirms that the development will not result in any significant direct or indirect impacts on natural, built or cultural heritage interests and that there will be no impact on neighbouring properties.

1.7 Despite these findings, the application has been refused on the grounds that given its location outwith a settlement boundary, the site is not considered to be accessible by a choice of transport modes particularly for pedestrians, cyclists and public transport. The Applicant disputes this for the reasons outlined in this Statement. This Supporting Statement demonstrates:

1.7.1 that there is a need for the proposed development which will have economic benefits for the Angus community;

1.7.2 that the use is not suitable for a town or edge of centre location;

1.7.3 that there are no sequentially preferable sites available;

1.7.4 that the application site is accessible by public transport; a new bus stop could be provided at the entrance to the application site; and a private electric vehicle collection service will also be available for mourners;

1.7.5 that the development will have no detrimental impacts on the natural, built or cultural environment nor or residential amenity; and

1.7.6 as such, the proposal accords with all relevant development plan policies and therefore benefits from a legal presumption in favour of granting consent for the development.

2 THE APPLICANT

2.1 The Applicant is a local family business which has been farming in Angus/Tayside for 8 generations. The Applicant farms 90 acres at Duntrune and 730 acres at Kinnell. The business currently rears beef cattle and grows potatoes and cereals. Historically the business also reared pigs, but that ceased recently due to the current disaster facing the UK pig industry. There are three people employed full time on the farm, and family members work part-time as required.

2.2 The family also owns Fleming Butchers (Arbroath) which has 15 employees.

2.3 Like many farming businesses, the Applicant requires to diversify to remain viable.

2.4 The Applicant contributes to the local community through such projects as supporting the Friockheim Christmas lights; providing dung every year to HOPE Organic Garden (Hospitalfield House); donating the turkey to the Cafe Project Christmas Lunch every year and sponsoring Arbroath Cricket Club, Webster Theatre Group Club, Arbroath Male Voice Choir over the years.

2.5 Since the inception of the proposals the Applicant has been in discussions with an established crematoria operator which will run the facility. The crematorium would employ 4 full time members of staff

3 SITE AND SURROUNDING AREA

3.1 The Burial and Cremation (Scotland) Act 2016 repealed the Cremation Act 1902 with effect from 4 April 2019. The minimum distance requirement for a crematorium from residential housing no longer applies in Scotland, however guidance issued by the Federation of Burial and Cremation Authorities on identifying sensitive and suitable sites for crematoria is still relevant (Document D49).

3.2 It goes without saying that a crematorium needs an appropriate and sensitive setting having regard to its use and its users. The Report of Handling acknowledges that the type of use is unlikely to come forward in a town centre or edge of centre location.

3.3 The application site extends to 1.98 hectares. The majority of the application site is Class 3:2 with a small area of Class 3:1 and is therefore not classed as prime agricultural ground. The field is difficult to combine/plough due to the slope and has been in set aside for approximately 4 years.

3.4 The site is strategically located in south Angus, north of Dundee, in relation to the surrounding settlements. It has good transport links to the surrounding area and beyond via both the A90 to the west, and the B978 (Kellas Road) to the south and east. The A90 provides trunk road links to the north through Angus and beyond. To the south it connects to Dundee, Perth and the M90. The application site also readily connects to the A92 providing links up the east coast of Angus and beyond.

3.5 There are only three dwellings within 300m of the proposed crematorium building. The nearest dwelling is some 183m away and the intervening mature woodland means that the application site will not be directly visible from any dwelling houses or from the surrounding areas. The Report of Handling confirms that given the existing and proposed landscaping, there will be no detrimental impact on these dwellings.

4 THE PROPOSED DEVELOPMENT

4.1 The Planning Design & Access Statement (Document D28) describes the proposed development and as such it is not proposed to rehearse all the details in this Statement at length.

4.2 While the size and general arrangement of the crematorium building are dictated by its function, the Applicant has sought to provide a well-designed building within a calm, contemplative, beautiful environment which is respectful of the solemnity of the occasion. This would be hard to do in a town centre or edge of centre location.

4.3 The main concept is to create a modern crematorium which reflects the traditional simple agricultural forms that are typical of this area of Angus. The form will be softened in the landscape through the use of form, large overhanging roof and the use of traditionally referenced and high quality materials.

4.4 The position of the crematorium building within the site has been carefully chosen, so that it nestles within a natural landscape. This combined with the existing trees mean that the proposals will be

completely screened from the west round to the east. Viewing from the adjacent road is screened by a new dry-stone wall and hedge / tree planting. The site is further screened by the mature trees to the south of the road. Additional native tree planting is incorporated into the proposals particularly to the east, screening the proposals further from this angle and further enhancing the sense of peace and enclosure. A planted garden and memorial garden will be located to the front and south of the crematorium building incorporating grassed areas, memorials and flower/shrub beds where people can linger in peace.

4.5 The principal view into the site will be when passing on the adjacent road along the south side of the site. These will be glimpsed views through the proposed planting and screened by a new drystone wall and hedging.

4.6 The site will incorporate an internal one-way road. As required by the Council's Roads Service, there will be 127 car parking spaces provided, 7 of which will be for disabled drivers, and there will be space for coaches to pull up and wait. Staff car parking, including electric vehicle charging, will be located to the rear of the crematorium building and accessed along with the service area to the north of the building.

5 DETERMINATION OF THE APPLICATION

5.1 There is a legal presumption in favour of granting consent for development which complies with the development plan. The Review Committee must therefore consider the extent to which the proposals comply with the relevant planning policy. All planning decisions involve balancing competing policies and priorities in the plan and as such, the plan must be looked at in the round. There may be some points in the plan which support a proposal, but there may be some considerations pointing in the opposite direction. The decision maker must assess all of these and then decide whether in light of the whole plan the proposal does or does not accord with it. (*City of Edinburgh Council v Secretary of State for Scotland 1998 SLT 120* (Document D52). The Committee is required to follow the correct legal approach in determining this review.

5.2 The Report of Handling sets out the officer's consideration of the application. It notes that the proposal is compatible with "*some aspects*" of the development plan and SPP. This summary downplays the extensive compliance with planning policy and the lack of objections on any technical grounds. It also glosses over the officer's own conclusions on many of the critical determining factors for the application.

5.3 Reading through the Report, it should be noted that the officer concluded that:

5.3.1 there are no significant amenity issues in respect of air quality, noise, light pollution, odour or loss of privacy to residential property that could not be mitigated by planning conditions. The development therefore complies with LDP Policy DS4. SEPA has no objection to the

proposals and will be responsible for granting a licence for the operation of the facility which will control emissions;

5.3.2 since the development would have its own dedicated access onto the public road and there would be reasonable separation between activities within the site and those that reside closest to the development there will be no detrimental impact on neighbouring properties and any such impact could be further reduced if additional planting was provided between the houses and the development. This is also consistent with LDP Policy DS 4;

5.3.3 all technical assessments relating to noise, air quality and odour control have been reviewed by the Council's Environmental Health Service and found to be acceptable, in line with LDP Policy DS4 regarding amenity noted above;

5.3.4 the siting and design of the proposed development would not give rise to any significant design or landscape issues and planning conditions could be attached to secure appropriate external finishes on the building and appropriate new landscaping. The development proposal therefore complies with LDP Policy DS3 regarding design quality and placemaking, as well as LDP Policy PV6 Development in the Landscape;

5.3.5 the proposal has been designed to minimise the loss of agricultural land and there is no evidence to demonstrate that the loss of a comparatively small area of non-prime land would affect the viability of the farm unit, ensuring compliance with LDP Policy PV20 which indicates that "*design and layout should minimise land required for development proposals on agricultural land and should not render any farm unit unavailable"*;

5.3.6 there are no protected species or habitats present on the site and it is not the subject of any natural heritage designation in line with LDP Policy PV5 on Protected Species;

5.3.7 the woodland to the north and west of the site which is subject to a Tree Preservation Order would not be directly affected by the development and the development would include new planting which may enhance the biodiversity contained within the site in the longer term complying with LDP Policy PV7 on Woodland, Trees and Hedges which states that development and planting proposals should "*protect and retain woodland*" and "*ensure new planting enhances biodiversity"*;

5.3.8 the site is not subject to any built or cultural heritage designation and is sufficiently remote and discrete from listed buildings in the surrounding that it would not impact on their setting, and thus complies with LDP PV8 Built and Cultural Heritage;

5.3.9 no archaeological mitigation is required and the proposal would not result in any significant direct or indirect impacts on natural, built or cultural heritage interest, again in compliance with LDP Policy PV8;

5.3.10 the Council's Road Service is satisfied that the traffic from the development can be accommodated within the local road network, complying with LDP Policy DS4 which requires Angus Council to consider the effect of timing of traffic movements to and from the site. Further details on this aspect are provided below;

5.3.11 the site is not at risk of flooding and the proposal can be connected to the public water supply and would be served by a private treatment system for foul drainage which is acceptable in line with LDP Policies PV12 Managing Flood Risk and PV15 Drainage Infrastructure. SEPA has no objection to the proposals; and

5.3.12 there are no objections from any statutory consultee, other than the Community Council;

5.4 It can be seen, therefore that the proposals comply with an extensive number of relevant development plan policies and as such this Statement does not examine these policies further. In fact, there is no dispute between the Council and the Applicant on the proposal's conformity with development plan policies other than with those the officer described as "*policies designed to ensure that development is directed to locations which are accessible by a choice of transport modes and avoids increasing reliance on the private car in situations where access to walking, cycling and public transport is poor".*

5.5 It is these policies which form the basis of the refusal of permission and are at the crux of this application to the Review Committee.

5.6 The application was refused on the following grounds:

"*1. The development will result in an unsustainable pattern of travel and development and would not be accessible by a choice of transport modes, increasing reliance on the private car in a situation where access to walking, cycling and public transport is poor. The proposal is therefore contrary to TAYplan policies 1 and 2, Angus Local Development Plan policies DS2, DS3 and TC8, and Scottish Planning Policy in so far it relates to locating development in accessible locations.*

2. The application is contrary to Policy DS1 of the Angus Local Development Plan 2016 because the scale and nature of the development is not appropriate for its location because it does not enjoy good accessibility, particularly for pedestrians, cyclists and public transport; and because the proposal is not in accordance with other relevant policies, namely polices DS2, DS3 and TC8."

5.7 Although on the face of it, the application has been refused for breaching 6 policies, they all relate to accessibility by a choice of modes of transport.

5.8 As highlighted above, weight also requires to be given to the numerous policies with which the proposal conforms and the application considered in the round.

5.9 The policies mentioned in the refusal notice are considered below. The following sections demonstrate that in fact the proposals also comply with the stated policies.

6 TAYPLAN POLICIES 1 and 2

6.1 The Report of Handling sets out the terms of TAYPlan policies 1 and 2.

6.2 The Applicant accepts that Policy 1 sets out the spatial strategy which is to direct development to the region's settlements in accordance with a tiered hierarchy. It is also accepted that the application site is not within a settlement. However, Policy 1 also permits development in the countryside where it meets specific local needs or does not undermine regeneration of the cities or respective settlements. Such proposals are to be assessed against the need to avoid suburbanisation of the countryside and unsustainable patterns of development.

6.3 As confirmed by the officer's assessment of the siting and design of the development, it will not lead to suburbanisation.

6.4 It is submitted that the proposal will meet local needs.

6.5 The Report of Handling suggests that the proposed crematorium would encourage competition and result in reduced prices, but then dismisses this, claiming that it cannot be controlled through the planning system. It is submitted that the officer has failed to have regard to the economic and societal benefits of granting consent for the application and give due weight to the benefit which the development will bring to the area.

6.6 The Review Committee should have regard to, and place weight on, the following information which demonstrates a need and demand for the proposed development in this location:

6.6.1 The Planning Design & Access Statement provided details on the Pharos Statistics 2020 Cremation Fee League Table dated 1 January 2020 which showed that Dundee and Friockheim were, at that time, the most expensive crematoria in Scotland at £1050 per cremation and the joint highest in the UK out of 291 locations. Crathes, as the next nearest crematorium to the north of Angus charged only £795.00 and Perth only £788.00. These facilities are, however, approximately 50 miles away from the south Angus area.

6.6.2 Since the application was submitted, an updated League Table dated January 2021 has been issued (Document D48). This now shows Friockheim on its own as the most expensive crematorium in the whole of the UK with its price per cremation increased to £1,100. Dundee has also increased its prices and now ranks 3rd equal highest. Prices at Crathes and Perth have remained static and are some £300 cheaper than in Angus and Dundee. These facilities rank 190th and 200th respectively in the table.

6.6.3 The Planning Design & Access Statement highlights the investigation which Competition and Markets Authority (CMA) conducted in 2019 with regard to low numbers of crematoria

providers in local areas, and difficulty for new companies to enter the market due to the planning regime and high fixed costs. Since the application was submitted, an updated CMA report has been published (Document D47).

6.6.4 The CMA found that demand for cremation is local and that a 30 minute cortege drive time from the family's house is generally considered an appropriate measure of local geographic market. A hearse drives at approximately 60% of normal road speeds, partly as a mark of respect, but also to keep the cortege vehicles together so that they arrive at the crematorium together. All else equal, the larger number of crematoria in a local area, the stronger the competitive market and thus the lower the prices. It is accepted that in rural areas, drive time may require to be slightly longer, but having to drive in a funeral cortege to Crathes or Perth to secure more competitive cremation rates is detrimentally impacting on Angus residents.

6.6.5 The report also highlights that a quantitative need for additional cremation facilities can be established if there are 136,000 to 171,000 people for whom the facility will be their closest crematorium. A quantitative need can be established if 59,000-95,000 people will, through the construction of a new crematorium, have such a facility within a 30 minute drive.

6.6.6 In Angus there is a population of approximately115,820 people and a further 148,820 in Dundee. 20% of the combined population is aged 65 or over. It can be seen that the population can support and has need of an additional cremation facility in Angus.

6.6.7 In July 2019 the report ‘Funeral Poverty in Dundee’ concluded that to improve choice for the consumer, Dundee City Council could actively consider the addition of another cremation facility. There has been no additional cremation facility constructed in Dundee or Angus since the publication of either of these reports.

6.7 The Report of Handling references a new crematorium 6 miles south of St Andrews. This is outwith a 30 minute cortege drive time from Angus and indeed from most of Dundee. As such, it will not compete with either the Friockheim or Dundee facility for business, nor would it impact on the viability of the appeal proposals.

6.8 It is submitted that this information demonstrates a specific local need for another crematorium in Angus and the officer has failed to apply sufficient weight to the ability of the proposed development to prevent "leakage" of business outwith Angus to Dundee and for it to provide fiscal and societal benefits to Angus residents by providing customer choice which will inevitably lower prices, as the CMA report concluded.

6.9 A quantitative and qualitative need has been established. This part of TAYPlan Policy 1 is therefore met. Travel patterns are addressed below, which highlights that the average cremation will only produce 24 car trips.

6.10 TAYPlan Policy 2 relates to delivering better quality development. There is a number of criteria under this policy with which the Council has found no fault. It is only one part of the requirements under designing an active and healthy development that are claimed to be breached and that relates to reducing the need to travel and improve accessibility by foot, cycle and public transport.

6.11 Again, this is addressed below.

7 LDP POLICY DS1

7.1 Like the TAYPlan Policy 1, LDP Policy DS1 directs development towards settlements, but permits development outwith settlement boundaries where they are of a scale and nature appropriate to their location and where they are in accordance with relevant policies of the plan. Development of greenfield sites will be supported where there are no suitable and available brownfield sites capable of accommodating the development. The development must not result in adverse impacts on designated sites.

7.2 As highlighted earlier, the Council accepts that the design of the building is of a scale and nature appropriate to the location and that there will be no adverse impacts on the natural, built or cultural environment.

7.3 The officer accepts that it is unlikely that there will be sites in a town centre or edge of centre location for the proposed use, but then rejects the Applicant's sequential assessment and conclusion that there are no other suitable and available sites which should be preferred to the application site. This rejection is firstly based on the fact that the Applicant has only considered sites in Angus and not Dundee. This approach fails to recognise that the proposal is to serve a local need for a crematorium in Angus, having regard to the location of existing facilities in Dundee and Friockheim. Locating another crematorium in Dundee would not address the need for a facility for the people of Angus.

7.4 The Planning Design & Access statement considered available land in South Angus and found that there are no suitable available brownfield sites or land within existing settlement boundaries. The planning officer did not identify any sites which the Applicant failed to consider, nor did he find that any of the sites which the Applicant discounted were suitable and available. As confirmed by the Supreme Court in Tesco Stores v Dundee City Council [2012] UKSC 13 (Document D53) the test is whether an alternative site is suitable for the proposed development, not whether the proposed development can be altered or reduced so that it can be made to fit an alternative site. In these circumstances, the Applicant's findings on the lack of available and suitable alternative sites should be preferred.

7.5 The proposals therefore comply with LDP Policy DS1.

8 LDP POLICY DS2

8.1 Under Policy DS2, developments require to demonstrate, according to their scale, type and location, that they meet specified criteria. These are dealt with in turn below, however, the Review Committee

needs to have regard, as the policy requires, to the fact that this is an application for a crematorium which, for the reasons already outlined, and accepted by the officer, is a type of use unsuitable for a town centre or edge of centre location.

8.2 This is not a large scale development which will generate significant traffic movements. The building only seats 120 people, with an average of 3 cremations per day. Based on established traffic movements for this type of development (which have been accepted by the Council) it is estimated that each service may generate on average 24 cars. It is submitted that the generation of 24 cars 3 times a day, outwith peak periods, cannot be considered to be a significant traffic generating development. It is submitted that the officer has failed to have regard to the scale and type of development and its need for a countryside location in South Angus when applying the rest of the DS2 policy criteria. These are assessed below:

8.2.1 **Are or can be made accessible to existing or proposed public transport networks;**

In considering the accessibility to public transport, it is important to remember that very few people travel to cremation services via public transport due to the solemnity and sometimes distressing nature of the event. Most people arrange to travel together by car or taxi, usually in family groups for comfort and support. The traffic counts, which have been accepted by the Council, assume everyone travels by car, via carshare. This only produces an average of 24 cars for each service. The services will be outwith peak periods.

Paragraph 276 of Scottish Planning Policy (Document D55) states that "*In rural areas the plan should be realistic about the likely viability of public transport services and innovative solutions such as demand-responsive public transport and small-scale park and ride facilities at nodes on rural bus corridors should be considered*."

The transport information submitted in support of the application confirms that there are two school bus services which pass the site frontage (the A17 and A38) and that these can be accessed on a hail and ride basis. There are a further 2 services (the 22 and 139) currently passing 450m to the west of the site. The bus companies have confirmed to the Council (Document D45) that if a bus stop is installed at the entrance to the application site, then they would be prepared to divert the services to stop at the application site. The Applicant has also confirmed that the crematorium will provide private electric transportation which can be booked by those attending a cremation. If the nos 22 and 139 services did not reroute past the application site, the crematorium's transport could collect mourners from the existing bus routes to the west or east as required. This is in line with SPP's recommended approach to rural bus provision and seeking innovative solutions.

Having regard to the nature and scale of the proposed development and the availability of existing public transport as well as additional private "green" transport provision, it is

submitted that the development can be considered to be or made to be accessible for the proposed use which is of small scale and requires a secluded, peaceful location.

8.2.2 **Make provision for suitably located public transport infrastructure such as bus stops, shelters, lay-bys, turning areas which minimise walking distances;**

8.2.3 As noted above, a bus stop can be provided at the entrance to the site as an alternative to the green transport provision. The walk from the entrance to the site to front door of the crematorium will be circa 100 metres. Alternatively, the crematorium's private electric vehicle will take passengers to the door of the building from bus stops at a greater distance as required.

8.2.4 **Allow easy access for people with restricted mobility;**

There will be 7 spaces for disabled drivers which are located within 20 metres of the door to the crematorium. The building itself has easy access for those with restricted mobility.

8.2.5 **Provide and/or enhance safe and pleasant paths for walking and cycling which are suitable for use by all, and link existing and proposed path networks:**

It is accepted that no pedestrian or cycle paths are being provided as part of the development, but given the nature of the development, few people are expected to wish to walk to the facility. Those wishing to cycle can cycle on the existing road network.

8.2.6 **Are located where there is adequate local road network capacity or where capacity can be made available.**

The scope of the Transport Assessment was agreed with the Roads Service and provides a robust assessment of the surrounding road network.

The Applicant will provide 5No new passing places on the Kellas Road, which will benefit existing road users. The road will be widened over the site frontage to the width agreed with the Roads Service, thus improving the road for all users over that which is currently in place.

Due to repeated objections, the Roads Service has been requested to provide 4 consultation responses on the application. This is extremely unusual.

The original response from the Roads Service, dated 19 January 2021 (Document D35), confirms that "*As a result of the low traffic impact on the surrounding road network and the proposed mitigating improvements to existing roads and visibility splays, I am minded that there is no significant cause to object to the planning application by reason of traffic impacts.*"

The Roads Service agreed with the Applicant's proposed visibility sightlines at the site access and the junction of the U315/B978, highlighting that "*it will improve the existing visibility at the [U315] junction which will provide a benefit to the wider community*." Conditions were recommended to secure the sightlines.

The Roads Service was asked to provide further information on the sightlines in response to third party objections and on 21 June 2021 (Document D37), the Service maintained their position on the proposed sightlines, highlighting that while the existing junctions may be below required standard, but the junctions operate in an acceptable manner with no accidents being reported within the latest 3 year reporting. The Roads Service specifically indicated that they did not want to impose a sightline condition which might not be able to be achieved.

In response to yet further objections from the same objector, the Roads Service defended their position in a response dated 13 August 2021 (Document D38). They explained that the relaxation which they are proposing is well within the relaxations which the Authority can permit having regard to the local roads circumstances.

Unhappy with the Roads Service' position, the third party objector submitted further objections on transport grounds and on 14 December 2021 (Document D39) some 11 months after their original consultation response, the Roads Service changed its position on the visibility splays required, but still does not object to the application.

No explanation is given for this *volte face* and it can only be assumed that the Roads Service has been unduly influenced by the repeated pressure from third parties to change its position. This is a breach of their statutory duty to act independently as a roads authority. There has been no change in circumstances which would justify the Roads Service departing from their position on the splays, as outlined in 3 previous responses.

The Applicant's primary position is that the revised sightlines are not required as a result of this development. This was the Roads Service's initial position. Their position only changed under repeated external pressure. Further, if there are deficiencies at the junctions, these are existing deficiencies in the road network and are not caused by the development, which will add very little traffic to these junctions. It is noted that none of the recently highlighted accidents by the objectors relate to the use of these junctions.

If these junctions are an existing problem, the Council as Roads Authority with responsibility for road safety should be carrying out the required improvements to the sightlines irrespective of whether this development is approved.

The visibility splays which the Roads Service now say are required are based on the Kellas Road having a 60mph speed limit. The 60mph speed limit is only over a short stretch before

it drops to 40mph in one direction and 30mph to the other, as shown on Document D50. If the speed limit was reduced to 40mph or 30mph, the visibility splays which are required would also reduce and the reduction in speed would be of benefit to the existing users of the road network, which the third parties would presumably welcome.

If the Review Committee considers that requiring the Applicant to extend the visibility splays meets the tests for a valid condition or a planning obligation, then the Applicant submits that its preference would be for payment of a monetary contribution to the Council.

8.3 It is submitted that the development conforms to the criteria in Policy DS2.

9 LDP POLICY DS3

9.1 Policy DS3 requires developments to deliver a high design standard and draw upon those aspects of the landscape that contribute positively to the character of the area and sense of place. The Planning Design & Access Statement demonstrates how that has been achieved. The planning officer finds no fault with the design and does not consider that there will be any detrimental landscape impacts.

9.2 One of the criteria requires that where development connects pedestrians, cyclists and vehicles with the surrounding area and public transport, the access and parking requirements of the Roads Authority must be met. The development includes the required number of parking spaces and access will be provided in accordance with relevant standards.

9.3 Refusing the application on the grounds of a breach of LDP Policy DS3 is therefore entirely unjustified.

10 LDP POLICY TC8

10.1 Policy TC8 requires new community facilities to be accessible and of an appropriate scale and nature for the location. The officer has no issue with the scale or design of the development having regard to its location. Accessibility has been addressed above.

10.2 It is submitted that the terms of Policy TC8 are met.

11 MATERIAL CONSIDERATIONS

11.1 The Review Committee must have regard to any material considerations which may impact on its conclusions in respect of the development's conformity with the development plan. Relevant material considerations are addressed below.

Need and economic benefits

11.2 This Statement sets out at section 6 why there is a need for a new crematorium. It is submitted that this is relevant to Policy TAYPlan 1. If that is not accepted by the Review Committee, then it should

be considered to be a material consideration, having regard to the terms of Scottish Planning Policy (Document D55).

11.3 It is also submitted that the Review Committee requires to give weight to the economic benefits of the construction of the facility. As the CMA report highlights, the construction cost of a new crematorium can vary from £3.4M to £8.5M. This is a considerable investment in the area and will bring construction jobs and spend in the local area during construction.

11.4 These benefits support a grant of consent for the development.

SPP

11.5 Paragraph 276 of Scottish Planning Policy (Document D55) states that "*In rural areas the plan should be realistic about the likely viability of public transport services and innovative solutions such as demand-responsive public transport and small-scale park and ride facilities at nodes on rural bus corridors should be considered*."

11.6 As outlined above, the bus companies have indicated that they will divert the existing hail and ride bus service and/or the Applicant will provide an electric vehicle which can collect mourners either from their homes or from the existing bus route 450m to the west.

Statutory Consultations

11.7 As noted above, there are no objections to the development from any of the statutory consultees responsible for the technical aspects of the development, including the Roads Service which has confirmed that the traffic from the development can be accommodated within the existing road network.

11.8 The Community Council objected to the application. The policies which they cite in support of their objection have either been addressed in the Report of Handling as not being breached or have been addressed in this Statement and also shown not to be breached.

11.9 It is disappointing that the Community Council does not address the societal and economic impacts on Angus residents who have to pay more for cremations than anyone else in the UK given the lack of competition. Nor do they address the fact that local residents require to travel many miles to the nearest crematorium, which is outwith the recommended travel distance. The Community Council should have considered the development in light of the need for such a facility and the benefits which it would have for the local community. The need was highlighted by members of the community in letters of support, but has been ignored by the Community Council.

11.10 It is understood that pressure was also put on the Community Council by the third party objectors who formed the "Stop the Crematorium" action group, which group refused to allow the Applicant to speak to the Community Council without the objectors being present and able to engage. Several

attempts were made to make suitable arrangements, but many were cancelled after the Community Council's further consultation with the objector group representative. Had the Applicant been able to address the Community Council, the need for and benefits of a new crematorium in the locality would have been explained to them.

11.11 It is submitted that the Community Council's objection cannot outweigh the presumption in favour of development having regard to the developments' overall conformity with the development plan and the need for the facility.

Third party representations

11.12 The Report of Handling advises that a total of 866 representations were received in respect of the application, with 775 raising an objection, 89 offering support and 2 providing neutral comments. As the Committee will be aware, the number of objections to an application are not *per se* relevant. Indeed, refusing planning permission based on the volume of objections is considered by the Scottish Ministers to be unreasonable behaviour on the part of a planning authority and can give rise to a claim for expenses in an appeal process.

11.13 Unlike other Planning Authorities, Angus Council continues to accept objections to planning applications after the statutory period for objection is over. This enables objectors to continue submitting comments after the statutory period has expired. Repeated objections from the same person and/or the same household are considered as separate objections, which skews the figures.

11.14 In this case, it can be seen that many of the objections are in a standard form, having been generated by a targeted and concerted campaign of objection led by a near neighbour of the application site who formed the Stop the Crematorium action group. This involved circulating many copies of the same letter for people to sign, along with prepaid envelopes for sending the completed objections to the Council. Members of the public were also stopped in the street and asked to object to the application. A Facebook page was set up to encourage further objections.

11.15 The Applicant has concerns that some of the objections appear to have been submitted without the owner of the relevant property being aware. Document D51 is a redacted letter from a resident indicating that they did not submit an objection in their name or from their address to the application yet the address had been used for the submission of an objection to the Council. A review of the objections also shows that an objection was submitted in the name of Fraser McKenzie, the Planning Officer who was, at that point, the officer appointed to determine the application. Either the objection was fabricated in Mr Mackenzie's name, or he had a conflict of interest and should not have been the case officer. When taken up with the planning officer at the time, the Applicant was assured that the officer had not made any objection to the application. These examples cast doubt over the reliance which the Review Committee can place on the number and veracity of the third party objections. Any objection which has been fraudulently made or obtained requires to be disregarded and consideration given as to whether a criminal offence has taken place.

11.16 It is clear from a review of the repeated submissions to the Roads Authority that eventually the Roads Service, while not objecting to the application, changed their position in light of continued pressure. The Applicant hopes that the Committee, sitting in a quasi-judicial role, will not be so equally swayed.

11.17 The Report of Handling confirms that the development will not result in any significant direct or indirect impacts on natural, built or cultural heritage interests and that there will be no impact on neighbouring properties. The objections which are based on transport and accessibility issues have been addressed above.

11.18 It is submitted that the third party objections do not justify refusing planning permission for the development given the conformity with the development plan; the need for the facility and the benefits which it will bring.

Precedent

11.19 The Report of Handling refers to application 07/00160/OUT (Document D54) to support refusal of the Duntrune application on accessibility grounds. That application appeal related to a crematorium, cemetery and associated licensed public house/restaurant with parking for 200 cars on Linlathen Estate in Dundee in 2008. Aside from being a decision taken 14 years ago, it relates to a different planning authority and a very different site.

11.20 That application site extended to 12 hectares of prime agricultural land with two scheduled ancient monuments (SAMs) within the site. A listed building was located nearby. Dundee City Council wanted to grant consent for the development, but this was opposed by Historic Scotland which led to the application being called in for determination by the Scottish Ministers.

11.21 The Reporter found that the development would substantially change the visual setting of the SAMs which are of national importance and that there may be further unscheduled archaeological remains within the site which would be affected.

11.22 The Reporter also concluded that there was no need for a public house/restaurant as part of the proposals and that the access to it would be unlit and without footways.

11.23 It is acknowledged that the Reporter considered that the Linlathen site did not have good accessibility, but this was largely because the proposals would involve constructing 750 metres of new road and that any bus journey to the cemetery would require a 3 km additional round trip which a bus operator would be unlikely to be willing to undertake. The availability of bus transport was considered by the Reporter to be of more importance for those people visiting the cemetery or memorials on a regular basis and not people attending funeral, most of whom the Reporter accepted would travel by car.

11.24 It is clear that the application proposals differ considerably from the Linlathen development, not just in terms of the site itself, but also because there is already public transport passing the site and another bus operator has agreed to divert its existing service to also pass the site.

11.25 In these circumstances, it is submitted that the Linlathen decision cannot be used to justify refusal of the application.

12 CONCLUSION

12.1 This Statement has assessed the development against all relevant development plan policies and demonstrated that when considered in the round, the proposal conforms to policy. In summary, it has shown that:

12.1.1 that there is a need for the proposed development which will have economic and societal benefits for the Angus community;

12.1.2 that the use is not suitable for a town or edge of centre location;

12.1.3 that there are no sequentially preferable sites available;

12.1.4 that the application site is accessible by a variety of modes of transport appropriate to the scale of the development; and

12.1.5 that the development will have no detrimental impacts on the natural, built or cultural environment nor or residential amenity.

12.2 Since the proposal accords with all relevant development plan policies it benefits from a legal presumption in favour of granting consent for the development. If the Committee considers that there is a breach of any of the development plan policies, it is submitted that there are material considerations in favour of granting consent contrary to any perceived breach.

12.3 There are no material considerations which justify refusing planning permission.

12.4 In these circumstances, the officer's refusal of planning permission for the development requires to be set aside and permission granted for this much needed development.

13 LIST OF DOCUMENTS

13.1 Listed below are the documents which were submitted by the Applicant, together with the consultation responses from statutory consultees which are relevant to the determination of this review.

13.2 Documents D47-57 are new documents which either seek to respond to matters raised in the Report of Handling or are updated versions of documents which were submitted with the application.

13.3 Two court decisions have also been provided which are relevant to how the review requires to be determined.

D1	Planning Application 20/00830/FULL – Application Form, dated 26 November 2020	
D2	Report of Handling 20/00830/FULL, dated 20 January 2022	
D3	Decision Notice 20/00830/FULL, dated 24 January 2022	
D4	Refused Drawing – Survey Plan	1266/SD/01
D5	Refused Drawing - Site Sections	1266/PD/04 Rev B
D6	Refused Drawing - Location Plan	1266/PD/03 Rev B
D7	Refused Drawing – Drainage Layout	A/190889 – 920 Rev 1
D8	Refused Drawing – Proposed Site Levels	A/190889 – 910 Rev 1
D9	Refused Drawing – Building Plans	1266/PD/05
D10	Refused Drawing – Road Access Plan	1266/SK/06 Rev C
D11	Refused Drawing – Site Plan	1266/PD/02 Rev C
D12	Refused Drawing – Building and External Works (Car Parking) Plan	1266/PD/01 Rev C
D13	Refused Drawing – Visibility Splays Sheet 3	A/190889 – 906 Rev 1
D14	Stack Emission Monitoring Report dated January 2020, Parts 1A, 1B, 1C, 2A, 2B, 2C and 3	
D15	Technical Specification dated June 2010, Parts A, B and C	
D16	Emissions Monitoring Test Report dated 11 August 2011, Parts A, B and C	
D17	Traffic Survey Report dated 22 October 2018	
D18	Scotland Rural Collage SAC Prime Agricultural Land Quality Correspondence dated 23 August 2019	
D19	LCA Agricultural Land Plan Extract	
D20	Geotechnical Investigation Report dated 31 October 2019	

D21	Swept Path Analysis dated 25 June 2020	A/190889 – 902 Rev 2
D22	Drainage Statement dated 19 November 2020	
D23	Transport Assessment Committed Development Response, dated 13 February 2021	
D24	Odour Impact Assessment Report dated March 2021	
D25	Air Quality Assessment Report dated 5 July 2021	Rev 3.0
D26	Cover email from Paul Fretwell to Fraser Mackenzie dated 30 April 2021 regarding further supporting information	
D27	Ecology and Protected Species Report dated May 2021	
D28	Planning Design and Access Statement dated September 2021	Rev B
D29	Air Quality Assessment Response to SEPA dated 5 July 2021	
D30	Transportation Assessment dated September 2021	Rev – 03
D31	Environmental Impact Assessment by Angus Council	
D32	Scottish Water Consultation Response dated 22 December 2020	
D33	Aberdeenshire Council Archaeology Service Consultation Response dated 29 December 2020	
D34	Environmental Health Consultation Response dated 11 January 2021	
D35	Roads Service (Traffic) Consultation Response dated 19 January 2021	
D36	Roads Service (Traffic) Comments dated 1 April 2020	
D37	Road Service (Traffic) Comments dated 21 June 2021	
D38	Roads Service (Traffic) Comments dated 13 August 2021	
D39	Roads Service (Traffic) Consultation Response dated 14 December 2021	
D40	Dundee City Council Roads Comments dated 7 April 2020	
D41	Dundee City Council Consultation Response dated 4 February 2021	
D42	Murroes and Wellbank Community Council Consultation Response	
D43	Environmental Health Consultation Response dated 14 May 2021	
D44	SEPA Consultation Response dated 28 May 2021	
D45	Email from Marc Winsland of Xplore Dundee to Angus Council dated 8 September 2021	
D46	Post Application Consultation Response Report 20/00830/FULL, dated April 2021	
D47	Competition and Markets Authority (CMA) Funerals Market Investigation dated January 2020	

D48	Cremation Fee League Table dated January 2021	
D49	Federation of Burial and Cremation Authorities Guidance dated January 2019	
D50	Aerial photograph of speed limits	
D51	Redacted email from resident	
D52	*City of Edinburgh Council* v *Secretary of State for Scotland* 1998 SLT 120	
D53	*Tesco Stores Limited* v *Dundee City Council* [2012] UKSC 13	
D54	Decision on application 07/00160/OUT	
D55	Scottish Planning Policy (https://www.gov.scot/publications/scottish-planning-policy/)	
D56	TAYPlan (https://www.gov.scot/binaries/content/documents/govscot/publications/factsheet/2018/05/planning-core-documents-library/documents/tayplan-pdf/tayplan-pdf/govscot%3Adocument/Tayplan.pdf)	
D57	Angus Local Development Plan (https://www.angus.gov.uk/sites/default/files/Angus%20local%20development%20plan%20adopted%20September%202016.pdf)	

BRODIES LLP

Solicitors, Aberdeen

AGENT FOR THE APPLICANT

28 February 2022

Angus House Orchardbank Business Park Forfar DD8 1AN Tel: 01307 473360 Fax: 01307 461 895 Email: plnprocessing@angus.gov.uk

Applications cannot be validated until all the necessary documentation has been submitted and the required fee has been paid.

Thank you for completing this application form:

ONLINE REFERENCE 100335797-001

The online reference is the unique reference for your online form only. The Planning Authority will allocate an Application Number when your form is validated. Please quote this reference if you need to contact the planning Authority about this application.

Type of Application

What is this application for? Please select one of the following: *

☒ Application for planning permission (including changes of use and surface mineral working).

☐ Application for planning permission in principle.

☐ Further application, (including renewal of planning permission, modification, variation or removal of a planning condition etc)

☐ Application for Approval of Matters specified in conditions.

Description of Proposal

Please describe the proposal including any change of use: * (Max 500 characters)

Proposed New Crematorium at Burnside of Duntrune

Is this a temporary permission? * ☐ Yes ☒ No

If a change of use is to be included in the proposal has it already taken place? (Answer 'No' if there is no change of use.) * ☐ Yes ☒ No

Has the work already been started and/or completed? *

☒ No ☐ Yes – Started ☐ Yes - Completed

Applicant or Agent Details

Are you an applicant or an agent? * (An agent is an architect, consultant or someone else acting on behalf of the applicant in connection with this application) ☐ Applicant ☒ Agent

Agent Details

Please enter Agent details

Company/Organisation:	Architects Scotland Ltd		
Ref. Number:		You must enter a Building Name or Number, or both: *	
First Name: *	@rchitects	Building Name:	
Last Name: *	Scotland Ltd	Building Number:	15
Telephone Number: *	01307 466480	Address 1 (Street): *	West High Street
Extension Number:		Address 2:	
Mobile Number:		Town/City: *	Forfar
Fax Number:		Country: *	Angus
		Postcode: *	DD8 1BE
Email Address: *	admin@rchitects.org.uk		

Is the applicant an individual or an organisation/corporate entity? *

☐ Individual ☒ Organisation/Corporate entity

Applicant Details

Please enter Applicant details

Title:		You must enter a Building Name or Number, or both: *	
Other Title:		Building Name:	Kinnells Mill
First Name: *		Building Number:	
Last Name: *		Address 1 (Street): *	Friockheim
Company/Organisation	Duntrune Ltd	Address 2:	
Telephone Number: *		Town/City: *	Friockheim
Extension Number:		Country: *	Angus
Mobile Number:		Postcode: *	
Fax Number:			
Email Address: *	admin@rchitects.org.uk		

Site Address Details

Planning Authority: Angus Council

Full postal address of the site (including postcode where available):

Address 1:

Address 2:

Address 3:

Address 4:

Address 5:

Town/City/Settlement:

Post Code:

Please identify/describe the location of the site or sites

Northing 735119 Easting 344879

Pre-Application Discussion

Have you discussed your proposal with the planning authority? * ☒ Yes ☐ No

Pre-Application Discussion Details Cont.

In what format was the feedback given? *

☐ Meeting ☒ Telephone ☐ Letter ☒ Email

Please provide a description of the feedback you were given and the name of the officer who provided this feedback. If a processing agreement [note 1] is currently in place or if you are currently discussing a processing agreement with the planning authority, please provide details of this. (This will help the authority to deal with this application more efficiently.) * (max 500 characters)

Areas requiring additional attention identified, to be elaborated and addressed prior to application.

Title: Mr Other title:

First Name: Fraser Last Name: Mackenzie

Correspondence Reference Number: 20/00651/PREAPP Date (dd/mm/yyyy): 30/09/2020

Note 1. A Processing agreement involves setting out the key stages involved in determining a planning application, identifying what information is required and from whom and setting timescales for the delivery of various stages of the process.

Site Area

Please state the site area: 19931.64

Please state the measurement type used: ☐ Hectares (ha) ☒ Square Metres (sq.m)

Existing Use

Please describe the current or most recent use: * (Max 500 characters)

Under used Field

Access and Parking

Are you proposing a new altered vehicle access to or from a public road? * ☒ Yes ☐ No

If Yes please describe and show on your drawings the position of any existing. Altered or new access points, highlighting the changes you propose to make. You should also show existing footpaths and note if there will be any impact on these.

Are you proposing any change to public paths, public rights of way or affecting any public right of access? * ☐ Yes ☒ No

If Yes please show on your drawings the position of any affected areas highlighting the changes you propose to make, including arrangements for continuing or alternative public access.

How many vehicle parking spaces (garaging and open parking) currently exist on the application Site? 0

How many vehicle parking spaces (garaging and open parking) do you propose on the site (i.e. the Total of existing and any new spaces or a reduced number of spaces)? * 71

Please show on your drawings the position of existing and proposed parking spaces and identify if these are for the use of particular types of vehicles (e.g. parking for disabled people, coaches, HGV vehicles, cycles spaces).

Water Supply and Drainage Arrangements

Will your proposal require new or altered water supply or drainage arrangements? * ☒ Yes ☐ No

Are you proposing to connect to the public drainage network (eg. to an existing sewer)? *

☐ Yes – connecting to public drainage network

☒ No – proposing to make private drainage arrangements

☐ Not Applicable – only arrangements for water supply required

As you have indicated that you are proposing to make private drainage arrangements, please provide further details.

What private arrangements are you proposing? *

☐ New/Altered septic tank.

☒ Treatment/Additional treatment (relates to package sewage treatment plants, or passive sewage treatment such as a reed bed).

☐ Other private drainage arrangement (such as chemical toilets or composting toilets).

Please explain your private drainage arrangements briefly here and show more details on your plans and supporting information: *

Discharge to Treatment plant and soakaway for Foul and Surface water to soakaway.

Do your proposals make provision for sustainable drainage of surface water?? * ☒ Yes ☐ No
(e.g. SUDS arrangements) *

Note:-

Please include details of SUDS arrangements on your plans

Selecting 'No' to the above question means that you could be in breach of Environmental legislation.

Are you proposing to connect to the public water supply network? *

☒ Yes

☐ No, using a private water supply

☐ No connection required

If No, using a private water supply, please show on plans the supply and all works needed to provide it (on or off site).

Assessment of Flood Risk

Is the site within an area of known risk of flooding? * ☐ Yes ☒ No ☐ Don't Know

If the site is within an area of known risk of flooding you may need to submit a Flood Risk Assessment before your application can be determined. You may wish to contact your Planning Authority or SEPA for advice on what information may be required.

Do you think your proposal may increase the flood risk elsewhere? * ☐ Yes ☒ No ☐ Don't Know

Trees

Are there any trees on or adjacent to the application site? * ☒ Yes ☐ No

If Yes, please mark on your drawings any trees, known protected trees and their canopy spread close to the proposal site and indicate if any are to be cut back or felled.

Waste Storage and Collection

Do the plans incorporate areas to store and aid the collection of waste (including recycling)? * ☒ Yes ☐ No

If Yes or No, please provide further details: * (Max 500 characters)

Bin storage area to the rear of the building . Internaal store includes areas for waste sorting and storage

Residential Units Including Conversion

Does your proposal include new or additional houses and/or flats? * ☐ Yes ☒ No

All Types of Non Housing Development – Proposed New Floorspace

Does your proposal alter or create non-residential floorspace? * ☒ Yes ☐ No

All Types of Non Housing Development – Proposed New Floorspace Details

For planning permission in principle applications, if you are unaware of the exact proposed floorspace dimensions please provide an estimate where necessary and provide a fuller explanation in the 'Don't Know' text box below.

Please state the use type and proposed floorspace (or number of rooms if you are proposing a hotel or residential institution): *

Not in a Use Class

Gross (proposed) floorspace (In square meters, sq.m) or number of new (additional) Rooms (If class 7, 8 or 8a): * 480

If Class 1, please give details of internal floorspace:

Net trading spaces:

Non-trading space:

Total:

If Class 'Not in a use class' or 'Don't know' is selected, please give more details: (Max 500 characters)

Crematorium and Funeral Service.

Schedule 3 Development

Does the proposal involve a form of development listed in Schedule 3 of the Town and Country Planning (Development Management Procedure (Scotland) Regulations 2013 * ☐ Yes ☒ No ☐ Don't Know

If yes, your proposal will additionally have to be advertised in a newspaper circulating in the area of the development. Your planning authority will do this on your behalf but will charge you a fee. Please check the planning authority's website for advice on the additional fee and add this to your planning fee.

If you are unsure whether your proposal involves a form of development listed in Schedule 3, please check the Help Text and Guidance notes before contacting your planning authority.

Planning Service Employee/Elected Member Interest

Is the applicant, or the applicant's spouse/partner, either a member of staff within the planning service or an elected member of the planning authority? * ☐ Yes ☒ No

Certificates and Notices

CERTIFICATE AND NOTICE UNDER REGULATION 15 – TOWN AND COUNTRY PLANNING (DEVELOPMENT MANAGEMENT PROCEDURE) (SCOTLAND) REGULATION 2013

One Certificate must be completed and submitted along with the application form. This is most usually Certificate A, Form 1, Certificate B, Certificate C or Certificate E.

Are you/the applicant the sole owner of ALL the land? * ☒ Yes ☐ No

Is any of the land part of an agricultural holding? * ☒ Yes ☐ No

Do you have any agricultural tenants? * ☐ Yes ☒ No

Certificate Required

The following Land Ownership Certificate is required to complete this section of the proposal:

Certificate E

Land Ownership Certificate

Certificate and Notice under Regulation 15 of the Town and Country Planning (Development Management Procedure) (Scotland) Regulations 2013

Certificate E

I hereby certify that –

(1) – No person other than myself/the applicant was the owner of any part of the land to which the application relates at the beginning of the period 21 days ending with the date of the application.

(2) - The land to which the application relates constitutes or forms part of an agricultural holding and there are no agricultural tenants

Or

(1) – No person other than myself/the applicant was the owner of any part of the land to which the application relates at the beginning of the period 21 days ending with the date of the application.

(2) - The land to which the application relates constitutes or forms part of an agricultural holding and there are agricultural tenants.

Name:

Address:

Date of Service of Notice: *

(4) – I have/The applicant has taken reasonable steps, as listed below, to ascertain the names and addresses of the other owners or agricultural tenants and *have/has been unable to do so –

Signed: @rchitects Scotland Ltd

On behalf of: Duntrune Ltd

Date: 26/11/2020

☒ Please tick here to certify this Certificate. *

Checklist – Application for Planning Permission

Town and Country Planning (Scotland) Act 1997

The Town and Country Planning (Development Management Procedure) (Scotland) Regulations 2013

Please take a few moments to complete the following checklist in order to ensure that you have provided all the necessary information in support of your application. Failure to submit sufficient information with your application may result in your application being deemed invalid. The planning authority will not start processing your application until it is valid.

a) If this is a further application where there is a variation of conditions attached to a previous consent, have you provided a statement to that effect? *

☐ Yes ☐ No ☒ Not applicable to this application

b) If this is an application for planning permission or planning permission in principal where there is a crown interest in the land, have you provided a statement to that effect? *

☐ Yes ☐ No ☒ Not applicable to this application

c) If this is an application for planning permission, planning permission in principle or a further application and the application is for development belonging to the categories of national or major development (other than one under Section 42 of the planning Act), have you provided a Pre-Application Consultation Report? *

☐ Yes ☐ No ☒ Not applicable to this application

Town and Country Planning (Scotland) Act 1997

The Town and Country Planning (Development Management Procedure) (Scotland) Regulations 2013

d) If this is an application for planning permission and the application relates to development belonging to the categories of national or major developments and you do not benefit from exemption under Regulation 13 of The Town and Country Planning (Development Management Procedure) (Scotland) Regulations 2013, have you provided a Design and Access Statement? *

☐ Yes ☐ No ☒ Not applicable to this application

e) If this is an application for planning permission and relates to development belonging to the category of local developments (subject to regulation 13. (2) and (3) of the Development Management Procedure (Scotland) Regulations 2013) have you provided a Design Statement? *

☒ Yes ☐ No ☐ Not applicable to this application

f) If your application relates to installation of an antenna to be employed in an electronic communication network, have you provided an ICNIRP Declaration? *

☐ Yes ☐ No ☒ Not applicable to this application

g) If this is an application for planning permission, planning permission in principle, an application for approval of matters specified in conditions or an application for mineral development, have you provided any other plans or drawings as necessary:

☒ Site Layout Plan or Block plan.
☒ Elevations.
☒ Floor plans.
☒ Cross sections.
☐ Roof plan.
☐ Master Plan/Framework Plan.
☐ Landscape plan.
☐ Photographs and/or photomontages.
☒ Other.

If Other, please specify: * (Max 500 characters)

Reports

Provide copies of the following documents if applicable:

A copy of an Environmental Statement. *	☐ Yes	☒ N/A
A Design Statement or Design and Access Statement. *	☒ Yes	☐ N/A
A Flood Risk Assessment. *	☐ Yes	☒ N/A
A Drainage Impact Assessment (including proposals for Sustainable Drainage Systems). *	☐ Yes	☒ N/A
Drainage/SUDS layout. *	☒ Yes	☐ N/A
A Transport Assessment or Travel Plan	☒ Yes	☐ N/A
Contaminated Land Assessment. *	☐ Yes	☒ N/A
Habitat Survey. *	☐ Yes	☒ N/A
A Processing Agreement. *	☐ Yes	☒ N/A

Other Statements (please specify). (Max 500 characters)

Declare – For Application to Planning Authority

I, the applicant/agent certify that this is an application to the planning authority as described in this form. The accompanying Plans/drawings and additional information are provided as a part of this application.

Declaration Name: . @rchitects Scotland Ltd

Declaration Date: 26/11/2020

Payment Details

Departmental Charge Code: Client will pay

Created: 26/11/2020 15:25

Angus Council

Application Number:	20/00830/FULL
Description of Development:	Erection of Crematorium Building and associated Parking, Access, Turning Space, Landscaping and Boundary Enclosures
Site Address:	Land North East Of Duntrune House Duntrune
Grid Ref:	344924 : 735118
Applicant Name:	Duntrune Ltd

Report of Handling

Site Description

The application site is a 1.99ha area of agricultural field located north of the C4 public road and around 300m east of Duntrune House. The site is bound by a wooded area (Duntrune Hill) at the west, a woodland strip and 2 houses at the east, the public road at the south and the balance of the agricultural field at the north with woodland beyond. The site is located around 1km north east of the Dundee City Council boundary.

Proposal

Planning permission is sought for the erection of crematorium building and associated parking, access, turning space, landscaping and boundary enclosures.

The crematorium would be located towards the west boundary of the site and would be a 544sqm, single storey, pitched roof building orientated on an east to west axis. The building would be around 8m high and would provide seating for 120 people The canopy-covered entrance elevation would face east towards the car parking and site entrance. The building would be finished with grey and timber clad walls, slate pitched roof, single-ply membrane flat roof sections and grey coloured aluminium frame glazing. Internally the building would provide a double-height central atrium for the entrance hall and main hall. Ancillary rooms such as offices and toilets would be provided and the crematorium plant would be located towards the rear of the building at its west side. A flue serving the crematorium would terminate around 9m from ground level towards the west end of the roof.

The site would take access from a new junction formed with the C4 public road at the south and would lead to car parking with 124 spaces and turning space formed to the east of the building. The site would be enclosed from the balance of the agricultural field at the north by a post and wire fence. A new drystone wall with entrance posts and gate would be formed at the south boundary of the site and new tree planting is proposed across the site, particularly concentrated towards the south east boundary corner.

The proposal would connect to the mains water supply and would use a private treatment system for foul water. Sustainable drainage would be used for surface water disposal.

Amendments

- Building and External Works Plan drawing no. 1226 / PD / 01 Revision C dated May 2020

amends and supersedes all previous Building and External Works Plan drawings and includes overflow car parking resulting in total of 124 car parking spaces (72 plus 52 overflow spaces).
- Site Plan drawing no. 1266 / PD / 02 Revision C dated May 2020 amends and supersedes all previous Site Plan drawings and includes overflow car parking resulting in total of 124 car parking spaces (72 plus 52 overflow spaces).
- Road Access drawing no. 1266 / SK / 06 Revision C dated May 2020 amends and supersedes all previous Road Access drawings and includes overflow car parking and annotates 'Existing Road to be widened as per Engineers drawings' on the public road.

Publicity

The application was subject to normal neighbour notification procedures.

The application was advertised in the Dundee Courier on 24 December 2020.

The nature of the proposal did not require a site notice to be posted.

Planning History

None.

Applicant's Case

The Drainage Statement reports on a site investigation involving trial pits undertaken with the purpose of infiltration tests. It is indicated that a private treatment system for foul water would be used and the population equivalent is determined using British Flows and Loads Document Version 4. This is calculated to a foul drainage system for the development to be designed for a population equivalent of 22 persons and the infiltration bed area must be at least 50.25sqm. For surface water, it is proposed where possible to utilise permeable pavement construction for the private road and car parking areas. The lower section of access road would be tarmac and drain to a roadside filter drain/soakaway. Roof water runoff would drain to a separate roofwater soakaway. A scheme of maintenance for drainage infrastructure is provided and the foul water and surface water drainage schemes are provided as appendices.

The Geotechnical Investigation Report confirms the findings of trial pits undertaken to ascertain ground bearing conditions for foundation design purposes only and no samples and/or geotechnical or environmental testing was undertaken. It is recommended that foundations are situated at a minimum depth of 0.7m below the original ground level on either the firm clay or medium dense gravels. This should ensure foundations are situated below the softer clays and sand and gravels that were typically encountered in the upper substrata horizons immediately below the topsoil layer. These substrata are considered suitable for an allowable bearing pressure of 100kN/m2.

Correspondence from the Scotland's Rural College and a soil plan of the site which indicates the land within the site is not prime quality agricultural land.

The Planning Design and Access Statement provides an overview of the site, design solution and traffic and access analysis. It indicates a crematorium is not suited to a location within a development boundary because it needs to be at least 200 yards from a dwelling and 50 yards from a highway and should preferably benefit from existing landscaping. It indicates that this site has been selected for its location in South Angus to serve the surrounding population and is considered to be a community facility that will help satisfy the demand in the area to the benefit of the local communities.

In respect of access and transport, the statement suggests that journeys to the crematorium would be made by private car or occasional private bus hire and indicates that public transport is not used. It suggests that there are two existing bus services that run directly past the site which run one in each direction on each working day and operate on a hail and ride basis. It refers to additional bus services outwith a 400m distance from the site and suggests that a bus stop or pull in area could be incorporated as part of the site access or alternatively a call up service could be offered for those who want to be collected from the nearest bus stop.

The statement provides information relating to population and death prediction figures and funeral poverty. It indicates that cremation costs in the local area are the most expensive in Scotland and refers to a Funeral Poverty in Dundee report prepared in July 2019 which suggested Dundee City Council could actively consider the addition of another cremation facility. The statement refers to crematorium-specific locational requirements and emissions. The proposal is discussed in the context of development plan policy and a sequential assessment of alternative sites is provided. The sequential assessment covers a number of sites in south Angus identified in the Angus Employment Land Audit 2019, the Angus Housing Land Audit 2020 and other brownfield opportunities. It indicates that there are no sites within any of the South Angus Housing Market Area settlement boundaries of sufficient size to meet the requirements of the proposal. The statement concludes that, amongst other things, the development would provide a significant benefit to the local community, requires a countryside location and there is no loss of prime agricultural ground.

A Swept Path Analysis plan for a coach, a refuse vehicle and a hearse circulating within the site is provided in support of the application.

The Traffic Survey Report consists of junction turning counts & queue surveys at the B961 (Drumgeith Road) / Kellas Road priority junction; and automatic traffic counts adjacent to the proposed site access (unnamed road, east of Duntrune House) and at Kellas Road - approximately 30m south of junction with unnamed road. The report indicates that the data was compiled on Tuesday 8 October 2019.

A Transportation Assessment to assess the suitability of the site transport infrastructure proposals, the local road network and local transport infrastructure for the development. It outlines the development proposal, considers sustainable travel opportunities, provides a network analysis and provides a conclusion and recommendations.

It indicates that the crematorium would have a seating capacity of 120, with an average of 3 (and a maximum of 5) cremations per day. It estimates that cremations will be attended by an average of 70 people arriving in 24 cars, with an infrequent extreme maximum of 200 people arriving in 67 cars (based on an average occupancy of 3 people per car).

The assessment proposes mitigation on the surrounding road network including the widening of the public road to 5.5m along the site frontage; the installation of passing places on the C4 and U315; crematorium signage to direct traffic from the B978 Kellas Road to the south; and the provision of 90 car parking spaces within the site.

It suggests that bus services are available including two services which pass the site frontage and can be accessed on a hail and ride basis. Additional bus services are provided to the surrounding area which gives the opportunity for staff and funeral attendees to access the site via existing public transport. It indicates that a bus stop or pull in area could be incorporated as part of the access to be formed or alternatively a call up service for those who wanted to be collected from the nearest existing bus stop. It indicates that there are currently no footpath or cycle links to the

site and given the nature of the development there is no proposal to provide a footpath link.

The Air Quality Assessment provides an assessment of the likely impact of air quality on residential receptors around the proposed site of the crematorium development. The assessment indicates that the overall air quality impact associated with the development - even conservatively assuming various worst-case conditions - can be assumed to be negligible and no further modelling evaluation of impact significance is merited.

The Odour Assessment provides an assessment of the likely impact of odour on residential receptors around the site. The proposed cremator technology incorporates several pollutant abatement technologies covering particulate and vapour-phase species, which can be expected to have a significant impact on the controlled odour releases from the process. Fugitive emissions are considered to be negligible. A simple semi-quantitative screening air quality assessment was used, utilising standard "FIDOL" scoring system in accordance with Institute of Air Quality Management (IAQM) guidance. The assessment concluded that the aggregated odour impact - for worst-case constant operation of the facility (6 cycles per day) - is small and the receptor sensitivity is high, resulting in an overall slight adverse impact magnitude. It concludes that this is not sufficiently significant to warrant recommendation of additional mitigation and control measures.

The Ecology and Protected Species Report reports on data and field surveys of the site and indicates that the site is considered poor from an ecology viewpoint. It is considered that no protected species or habitats are present on site. It concludes that the proposed construction work would have no adverse impact on any protected species or habitats and that no further survey work is required.

A Consultation Response Report is provided which responds to issues raised through consultee and third party representations submitted. The report concludes that the applicants view is that the matters raised by the various third party objectors do not have material weight and the proper and a rounded analysis of the development plan and relevant material considerations continue to support the approval of planning permission.

Consultations

Community Council - Objects to the proposal due to conflicts with the Angus Local Development Plan; lack of suitable access to public transport; and due to the unsuitability of roads surrounding the site which are narrow, with acute bends and poor junction visibility. It suggests 4 road accidents took place during October 2021 and raises concern that the additional traffic associated with the development will only increase the risk of further accidents.

Angus Council - Roads – Provided comments in respect of the road network and access, accidents, parking, pedestrian access, cycling access and public transport and has responded to representations submitted in respect of those matters.

In respect of the road network and access, it is indicated that roads in the vicinity of the site are typical of rural roads in Angus, being twisty and relatively narrow in some places. The proposal to widen the carriageway along the site frontage and provide passing places on sections of the C4 and U315 between the site and the B978 is noted.

Roads has indicated that sightlines at the junction of the U315 and the B978 Kellas Road are currently substandard and are impeded by topography to the south west. Visibility at the junction of the C4/U315 and C4/B978 is also substandard, with the latter having a stop sign at its junction with the B978. Roads has indicated that the visibility at U315/B978 and C4/U315 junctions would

need to be improved were planning permission to be granted. On the B978 that would require physical works to alter the vertical alignment of the road and the work at both junctions may affect land outside of the control of the applicant. Roads has indicated that the intensification of use of sub-standard junctions by concentrated levels of new traffic is undesirable and has the potential to be detrimental to road safety.

In respect of parking, the roads service has requested an increase in the level of parking proposed to 120 car parking spaces (1 space per crematorium seat).

In respect of accidents, roads notes that concerns have been raised and evidence provided through representations relating to a recent spate of collisions in the Duntrune and Murroes area during late 2021. Roads has confirmed that the data recorded by Police Scotland relates to injury collisions only and records are no longer kept of collisions resulting in damage only. Recorded collision data over a three year period shows three collisions resulting in injury have been reported in that period, which is low. Damage only collisions are not normally considered by the traffic authority when analysing collision data but that does not mean to imply that concerns raised by local residents are not valid.

Roads notes that there are no formal pedestrian or cycling links in the immediate vicinity of the site. In respect of public transport, it comments that given the location of the site and the fact that the existing public transport services are very low in frequency, the site is not readily accessible by sustainable means of transport. There are two existing bus services that run directly past the proposed site, but they are school bus services and operate before and after school, on school days during term time only. Two additional bus services are cited as running approximately 450m west of the proposed site which is above the recommended desirable walking catchment distance of 400m. Roads notes that the frequency of these bus services is very low and no footways are provided between the site and that bus route. The nature of the public road is such that it would not be desirable to encourage pedestrians to walk on a section of carriageway which is twisty, with changes in level, darkened by tree canopy, unlit, and with a verge with limited opportunities for harbourage by pedestrians to allow vehicles to pass. As such, it is not a route which roads would wish to see pedestrians walk from a bus route to the crematorium facility.

Scottish Water - Offered no objection.

Aberdeenshire Council Archaeology Service – Offered no objection and indicated that no archaeological mitigation is required.

Environmental Health - Offered no objection in terms of air quality, odour and noise subject to the attachment of a planning condition regulating noise levels from fixed plant associated with the development.

Dundee City Council – Indicated that the application does not raise any issues of strategic significance for Dundee City Council and offered no objection.

Scottish Environment Protection Agency – Considered the air quality information submitted and offered no objection.

Representations

A total of 866 representations have been received with 775 raising objection, 89 offering support, and 2 providing neutral comment.

The main points of concern were as follows:

- Proposal is contrary to Scottish Planning Policy and development plan policies;
- Lack of accessibility by a range of transport modes (poor public transport links; lack of footpath and cycle connections);
- The proposal would better serve Dundee than Angus;
- Lack of need, demand and viability for a crematorium in this location;
- Impacts on residential amenity;
- Impacts on air quality/ pollution;
- Impacts on landscape and urbanisation of the countryside;
- Inappropriate building design;
- Impacts on trees, wildlife, protected species and biodiversity;
- Loss of greenfield land/ farmland and impact on farming uses in surrounding area;
- Issues associated with the surrounding road network, substandard visibility at road junctions, narrow and twisty rural roads, frequent accidents, impacts on safety of existing traffic, pedestrians, cyclists and horse riders;
- Insufficient parking provision;
- Impacts on Murroes Primary School and its pupils;
- Would change council/ school catchment boundaries;
- Flooding and drainage issues;
- Issues caused by power supply failure;
- Impact on aviation;
- Deficiencies/ inaccuracies in supporting information;
- Impacts on house prices.

Points in support were as follows:

- Economic benefits including employment during construction and operation of the development and increase in use of nearby hospitality businesses;
- Would reduce journey times/ short travel times from major population;
- There is a demand/waiting lists at existing crematoria and a new facility is needed;
- The site is well located for both Angus and Dundee;
- Provides greater choice for funerals;
- Would reduce costs/help tackle funeral poverty;
- Pleasant setting for a crematorium;
- There would be little environmental/ visual impact;
- The development would result in improvements to the local road network;
- Potential for other community activities within the building;
- Validity of representations submitted in objection and weight that should be attached.

Two letters have been submitted that indicate they are neither in support or objection of the application, but they raise issues similar to those summarised in the matters of objection listed above.

Development Plan Policies

Angus Local Development Plan 2016

Policy DS1 : Development Boundaries and Priorities
Policy DS2 : Accessible Development
Policy DS3 : Design Quality and Placemaking
Policy DS4 : Amenity
Policy TC8 : Community Facilities and Services
Policy TC15 : Employment Development

Policy TC17 : Network of Centres
Policy TC19 : Retail and Town Centre Uses
Policy PV5 : Protected Species
Policy PV6 : Development in the Landscape
Policy PV7 : Woodland, Trees and Hedges
Policy PV15 : Drainage Infrastructure
Policy PV17 : Waste Management Facilities
Policy PV20 : Soils and Geodiversity

TAYplan Strategic Development Plan

Policy 1 Locational Priorities
Policy 2 Shaping Better Places
Policy 5 Town Centres First
Policy 9 Managing TAYplan's assets

The full text of the relevant development plan policies can be viewed at Appendix 1 to this report.

Assessment

Sections 25 and 37(2) of the Town and Country Planning (Scotland) Act 1997 require that planning decisions be made in accordance with the development plan unless material considerations indicate otherwise.

Paragraph 33 of Scottish Planning Policy (SPP) states that where a development plan is more than five years old, the presumption in favour of development that contributes to sustainable development will be a significant material consideration. In this case TAYplan is less than 5-years old but the ALDP has recently become more than 5-years old as it was adopted in September 2016. The assessment that follows considers the content of SPP in relation to the relevant topics.

There are no policies in either TAYplan or the ALDP which deal specifically with applications for crematorium developments. Crematorium developments can attract reasonably significant numbers of people attending funeral services and memorial gardens; they can generate employment and can provide an important and necessary service for the community. Policies relating to the general location of development, accessibility of the site, rural employment, and community facilities are therefore relevant as well as policies relating to design, the natural and built environment, amenity and infrastructure issues.

The suitability of the proposed location

In considering the suitability of the proposed crematorium location, Scottish Planning Policy (SPP) seeks to promote rural development that supports prosperous and sustainable communities. It indicates that *in pressurised areas easily accessible from Scotland's cities and main towns, where ongoing development pressures are likely to continue, it is important to protect against an unsustainable growth in car-based commuting and the suburbanisation of the countryside*. In terms of promoting sustainable transport and active travel, SPP indicates that *planning permission should not be granted for significant travel-generating uses at locations which would increase reliance on the car and where direct links to local facilities via walking and cycling networks are not available or cannot be made available; access to local facilities via public transport networks would involve walking more than 400m; or the transport assessment does not identify satisfactory ways of meeting sustainable transport requirements.* SPP also indicates that a sequential approach should be adopted for uses which generate significant footfall including community facilities. It requires that locations are considered in order of preference: town centres; edge of

centre; other commercial centres identified in the development plan; and out of centre locations that are, or can be, made easily accessible by a choice of transport. The SPP indicates that *it is important that community, education and healthcare facilities are located where they are easily accessible to the communities that they are intended to serve*.

Tayplan Policy 1 *location priorities* states, amongst other things, that *development proposals shall focus the majority of development in the region's principal settlements*. The application site is not within a principal settlement as defined by TAYplan.

TAYplan Policy 1 further indicates that proposals for development in the countryside should be assessed against the need to avoid suburbanisation of the countryside and unsustainable patterns of travel and development. Policy 2 *shaping better quality places* seeks to deliver better quality development and places which respond to climate change with developments which are active and healthy by design. This is achieved by ensuring that transport and land use are integrated to reduce the need to travel and improve accessibility by foot, cycle and public transport.

Policy DS1 in the Angus Local Development Plan (ALDP) indicates that outwith development boundaries proposals will be supported where they are of a scale and nature appropriate to their location and where they are in accordance with relevant policies of the ALDP. The policy promotes the redevelopment of brownfield land in preference to greenfield sites

The ALDP supports development which is accessible by a choice of transport modes including walking, cycling and public transport. Policy DS2 *accessible development* indicates that *development proposals will require to demonstrate, according to scale, type and location, that they are or can be made accessible to existing or proposed public transport networks and provide and/or enhance safe and pleasant paths for walking and cycling which are suitable for use by all, and link existing and proposed path networks*. Policy DS3 *design quality and placemaking* indicates that development proposals should create buildings and places which are well connected and where development connects pedestrians, cyclists and vehicles with the surrounding area and public transport. Policy TC8 *community facilities and services* indicates that new facilities should be accessible and of an appropriate scale and nature for the location. Policy TC15 directs new employment development to employment land allocations and existing employment areas within development boundaries. It also offers support for rural diversification where there is an economic and/or operational need for the location and other relevant issues can be addressed.

The application proposes a new 120 seat crematorium and memorial garden in the countryside to the north of the C4 Monifieth-Kingennie-Duntrune public road around 900m to the east of Burnside of Duntrune.

The Planning Statement includes information which seeks to demonstrate that the site is the most sequentially preferable for the proposed development. It lists and discounts sites in Monifieth and Carnoustie and suggests alternative sites within settlement boundaries which are greenfield are not a reasonable alternative to the application site.

Information submitted in support of the application indicates that the majority of traffic visiting the site would do so via private car. The transportation assessment estimates an average of 3 and a maximum of 5 cremations per day, which it suggests would be attended by an average of 70 people per cremation arriving in 24 cars, with an infrequent extreme maximum of 200 people per cremation arriving in 67 cars (based on an average occupancy of 3 people per car). That assessment indicates that there are no footpath links or dedicated cycling links to the site. Public transport options comprise two bus services which pass the site and there are two additional bus

services passing 450m to the west of the site. The applicant has suggested that a bus stop could be provided outside of the site entrance and/or a call up service could be provided for users who wish to be collected from the nearest existing bus stop.

Public transport options are limited to two school bus services which pass the site entrance and operate before and after school during term time on a hail and ride basis; with two further infrequent services passing 450m to the west of the site and requiring a user to walk to the site along a section of the C4 public road which is winding, with changes in level, darkened by tree canopy, unlit, and with a verge with limited opportunities for harbourage by pedestrians to allow vehicles to pass.

The roads service has commented on the proposal in the context of the accessibility of the development by a choice of transport modes and notes that there is no formalised pedestrian or cycling links between the site and the surrounding area. They comment that given the location of the site and the fact that the existing public transport services are very low in frequency, the site is not readily accessible by sustainable means of transport and suggest that the C4 to the west of the site is not a route which they would wish to see pedestrians walk from a bus route to the crematorium facility.

The level of public transport provision is extremely limited, and it is unrealistic to imagine that persons attending a funeral would reasonably be expected to rely upon a school bus service that operates on school days, before and after school, and during term time only. The bus services that utilises a route which passes 450m west of the site cannot be considered adequate to provide reasonable accessibility for a crematorium at this location given the limited frequency of service and the physical characteristics of the route between the site and the bus services as described above. The mitigation measures proposed would not address the infrequency of the bus services and the proposed call up service cannot be regarded as convenient for users and again would not address issues relating to limited frequency of service. This site is not well connected to public transport and footpath and cycle connections between the site and the wider area are poor. Overall accessibility by means other than private car for a facility of this nature do not meet policy objectives for a use that would attract significant numbers of visitors.

This site is not located within a principal settlement where policy seeks to direct the majority of new development. While it is accepted that the type of use proposed is unlikely to be come forward in a town centre or edge of centre location, the information relating to alternative sites does not consider sites within Dundee or out of centre sites which are (or can be made) easily accessible by a choice of transport such as those on established transport corridors served by regular public transport services. The information does not reasonably demonstrate that there are no sequentially preferable options available, and the site selected is not accessible by a reasonable choice of transport.

The site proposed for development would not be accessible by a choice of transport modes and would increase reliance on the private car in a location where access to walking, cycling and public transport is poor. A crematorium in this location would promote an unsustainable pattern of travel and development contrary to the approach set out in SPP, TAYplan and the ALDP.

Other development plan considerations

The closest sensitive receptors to the site are three houses (Lunaria, No.1 Cottage, Westhall and The Ship, Westhall) located around 180m from the proposed crematorium building to the east and north east. All other surrounding housing is over 250m from the application site. The proposal would impact on the amenity of those that live in the surrounding area through an increase in activity in and around the site, including an increase in traffic associated with the development on

surrounding roads. However, the development would have its own dedicated access onto the public road and there would be reasonable separation between activities within the site and those that reside closest to the development. Impact on neighbouring property would be further reduced if additional planting was provided between the houses and the development.

Technical assessments have been submitted in relation to noise, air quality and odour control and they indicate the impacts from the development would not be unacceptable. The assessments have been reviewed by the council's environmental health service and it has offered no objection to the proposal subject to the attachment of a planning condition regulating noise levels from fixed plant and machinery. SEPA has considered additional information submitted and has offered no objection, noting that the development would require a permit under the Pollution Prevention and Control Regulations. There are no significant amenity issues in respect of air quality, noise, light pollution, odour or loss of privacy to residential property that could not be mitigated by planning conditions.

Development plan policy seeks to ensure that development delivers a high design standard and seeks to protect and enhance the quality of the landscape in Angus. The site selected for development is sloping in nature with rising landform to the north and it is surrounded by established woodland. The building would be sited in the lower part of the field and would be cut into the sloping site, back clothed by landform and woodland which would help it integrate into the landscape. The scale of the proposed building and use of recessive external finishes would also reduce the prominence of the building in views from areas to the south. The new landscaping proposed would also assist with this over time. It is considered that the siting and design of the proposed development would not give rise to any significant design or landscape issues and planning conditions could be attached to secure appropriate external finishes on the building and appropriate new landscaping.

The proposal would result in the loss of around 2HA of agricultural land. Available information and information submitted by the applicant indicates that this field does not contain prime quality agricultural land. It is not clear how the remaining area of agricultural land to the north of the site would be accessed following completion of the development, but that matter could be regulated by planning condition. The proposal has generally been designed to minimise the loss of agricultural land and there is no evidence to demonstrate that the loss of a comparatively small area of non-prime land would affect the viability of a farm unit.

The site is not subject of any natural heritage designation. The ecology and protected species report indicates that the site is poor from an ecology viewpoint and considers that no protected species or habitats are present on site. The report indicates the proposed construction work would have no adverse impact on any protected species or habitats and indicates that no further survey work is required. The woodland to the north and west of the site is subject to a Tree Preservation Order, but that woodland would not be directly affected by the development. The development would include new planting which may enhance the biodiversity contained within the site in the longer term.

The site is not subject to any built or cultural heritage designation and is sufficiently remote and discrete from listed buildings in the surrounding area that it would not impact on their setting. The archaeology service indicated that no archaeological mitigation is required and offer no objection to the proposal. The proposal would not result in any significant direct or indirect impacts on natural, built, or cultural heritage interests.

Information submitted with the application includes a road network analysis and traffic surveys. The trip distribution information suggests that 61.4% of traffic would access the crematorium from the east using the C4 and U315, and 38.5% would access from the west using the C4 and C6.

The assessment indicates that traffic resulting from the development would result in a 27% increase in traffic during the AM peak and 20.3% during the PM peak on the C4 along the site frontage.

The applicant's transportation assessment (TA) asserts that as a result of the low traffic impact on the surrounding road network and the proposed access provision and improvements to existing visibility splays, there is no foreseeable reason for refusal in terms of traffic impact or transport provision. The TA proposes mitigation on the road network including a widening of the C4 public road along the site frontage to 5.5m, the installation of passing places on the C4 and U315 to the east of the site, the provision of signage to direct traffic from the east to use the U315 junction, and improvements to visibility splays at the junction of the U315/B978.

The roads service has reviewed the transportation information submitted by the applicant and has also considered information submitted by or on behalf of third parties (including information provided by a transportation consultant) relating to traffic which is expected to be generated by the development, impacts on the road network and information relating to accidents.

The roads service accepts that aggregated traffic flows associated with the development are anticipated to be below those expected to cause capacity and queuing issues. It also agrees with comments contained within the applicant's TA that suggest it would be desirable to have visibility splays of 4.5m x 160m in both directions at the junction of the U315/B978. Roads also accept the findings of the transportation consultant acting for a third party which identifies that the south-westerly sightline at U315/B978 junction is currently obstructed by the natural topography of the B978 and is currently substandard. Roads indicate that it may be possible for the applicant to improve the topography of the B978 as part of the development mitigation to provide a visibility splay of 4.5m x 160m but has indicated that the physical works to do this would be significant, requiring the vertical alignment of the B978 to be lowered on the north-eastbound approach to the junction. Similarly, the roads service has indicated that sightlines at the junction of the C4/U315 are substandard and require to be improved to 2.4m x 160m. Available information suggests the provision of visibility splay improvements at both junctions could affect land outside of the applicants control and no evidence has been submitted to suggest that the applicant is in a position to make those improvements. While, issues around land ownership or control would not prevent use of a negative, suspensive planning condition to secure provision of improved visibility splays, such works, especially in relation to the U315/B978 junction would be significant.

The roads service has indicated that the intensification of use of sub-standard junctions by concentrated levels of new traffic is undesirable and has the potential to be detrimental to road safety. They indicate that if the development is to go ahead planning conditions would be required to secure improvements and mitigation to the road network, including negative suspensive conditions to secure improvements to the substandard visibility splays at the U315/B978 and C4/U315 junctions.

There is conflicting information regarding the adequacy of the local road network to accommodate development traffic. However, the advice of the council's roads service is that the development could be accommodated subject to identified mitigation. Having regard to their expertise and knowledge of the local area, that advice is accepted.

The site is not shown on SEPA flood maps as being at risk from any source of flooding. The proposal would connect to the public water supply and would utilise a private treatment system for foul drainage which is acceptable outside of areas served by the public drainage network. A soakaway would manage surface water from the development. Supporting technical assessments indicate the site is capable of accommodating the required drainage infrastructure and Scottish Water has offered no objection to the proposal.

The proposal is compatible with some aspects of the development plan and SPP, but it does not comply with policies designed to ensure that development is directed to locations which are accessible by a choice of transport modes and avoids increasing reliance on the private car in situations where access to walking, cycling and public transport is poor. A crematorium in this location would promote an unsustainable pattern of travel and development contrary to the approach set out in SPP, TAYplan and the ALDP. On this basis the proposal is considered contrary to TAYplan and ALDP.

Material considerations

In terms of material considerations, it is relevant to have regard to additional matters raised in the applicants supporting information, issues raised in support and objection to the proposal by third parties, and Scottish Planning Policy (SPP) in so far as that has not been addressed above.

The applicant has submitted information that suggests there is a requirement for additional crematorium facilities in the area and references a report prepared by University of Dundee in July 2019 titled *Tackling Funeral Poverty in Dundee through Social Enterprise*. That report provides a number of recommendations to help address funeral poverty in Dundee including a recommendation that Dundee City Council could actively consider the addition of another crematorium facility. The report suggests that 800-1000 cremations per year are required to make a crematorium viable and given there are approximately 1,800 deaths per year in Dundee, if the surrounding areas were included, there could be potential for additional crematorium capacity. Third parties have suggested that the development would alleviate pressure on existing facilities.

It is relevant to note that a new crematorium has been granted planning permission at Brewsterwells, 6 miles south of St Andrews and that will provide some additional capacity to serve the wider area. Objectors suggest that there is no need for a new crematorium facility, having regard to existing provision at Dundee and Friockheim and the consented development at Brewsterwells. A Drive Time Analysis Report has been submitted by a crematorium development consultant on behalf of a third party, which suggests the need for an additional crematorium is not cogent and that a new facility is unlikely to be viable. The applicant has refuted that suggestion and suggests the figures projected in the consultant's report would be highly satisfactory for the operator in terms of development viability.

There is some suggestion that the proposed crematorium would encourage competition and result in reduced prices in the area, but that cannot be controlled through the planning system.

Third parties have suggested that the development would reduce the need to travel to existing facilities and some comparison is drawn between the locational characteristics of this site and the existing crematorium facility at Parkgrove, located east of Friockheim. However, planning policy has evolved since the establishment of Parkgrove and seeks to reduce reliance on the private car and to direct new development to locations which are accessible by a choice of transport modes including walking, cycling and public transport. A more relevant comparison to this proposal is the crematorium facility which was proposed on Linlathen Estate in 2007 (Dundee City Council ref: 07/00160/OUT), just to the south of Drumsturdy Road and around 1.8km south east of the application site. That proposal, which included a crematorium, cemetery and associated public house/restaurant, was refused planning permission by Scottish Ministers, for amongst other reasons, because it did not enjoy good accessibility, particularly for pedestrians, cyclists and public transport users. That proposal was in a location close to the current application site and with similar characteristics in terms of limited accessibility by sustainable modes of transport. It is clear that Scottish Ministers considered good accessibility, particularly for pedestrians, cyclists and public transport users to be an important requirement for a facility of this nature. Planning

policy has retained, and if anything increased the importance of accessibility by sustainable modes of transport in the intervening period.

Information submitted in support of the application indicates that the development is anticipated to create 4 full time jobs and those making representation in support of the proposal suggest that it would have associated benefits for the hospitality sector. There would also be employment opportunities associated with the construction of the facility. It is accepted that there would likely be additional employment opportunities created through the construction and operation of the business. Potential benefit to the hospitality sector has not been quantified and the provision of an additional crematorium is unlikely, in itself, to increase hospitality trade; it may simply result in displacement of spend. Information has not been provided to quantify net economic impact associated with the proposal.

The community council and third parties raise concerns relating to traffic safety for local residents, public access, public transport provision and the suitability of access roads in the area surrounding the site. These matters are discussed earlier in this report and the lack of accessibility of the site to sustainable modes of transport is an issue which cannot readily be addressed at this location and which renders the proposal contrary to development plan policy and SPP.

The proposal would provide some additional choice and it may provide some economic benefit. However, there is no information to demonstrate that there is an overriding need for the provision of a new crematorium on a site in the countryside that has poor accessibility, and there is no evidence to demonstrate it would provide significant net economic benefit that would justify setting aside SPP or development plan policy requirements regarding location of development and accessibility.

Comment has been submitted raising concern regarding the adverse impact of the proposed development on the amenity and environment of the area. Comment has been submitted suggesting that the development would give rise to little environmental impact and that the site is a good location for a crematorium. Issues regarding these matters are discussed in the policy assessment above having regard to the expert advice provided by consultation bodies and other relevant information. The development would change the environment of the area and it would result in some adverse impact on the amenity of those that live in the vicinity. However, impact could be mitigated through the use of planning conditions and impacts are not such that they would merit refusal of the application. The absence of unacceptable amenity or environmental impact does not justify setting aside SPP or development plan policy requirements regarding location of development and accessibility.

The development would result in the loss of around 2HA of agricultural land, but that land is not identified as being of prime quality and there is no evidence to suggest that there would be any adverse impact on the viability of any farm unit. Additional traffic on the local road network may have some minor impact on the movement of agricultural vehicles, but potential for significant impact would be infrequent and could be mitigated through the provision of passing places.

Significant information has been submitted by the applicant and by objectors regarding road safety matters. Objectors provide evidence of road accidents in the vicinity of the site and raise concerns about the suitability of the surrounding road network to accommodate the development. Supporters refer to improvements which would be made to the road network should the development go ahead, commenting that would be a wider benefit to the public. The roads service indicate that recorded collision data over a three year period shows three collisions resulting in injury have been reported in that period, which is low. While they note the evidence and concerns relating to damage only collisions, they offer no objection to the proposal subject to identified road improvements. As the roads service is satisfied that the development could take place without

unacceptable impacts on the surrounding road network, albeit subject to identified mitigation, this matter does not justify refusal of planning permission. The improvements to the road network which would result from the development may be of minor benefit to road safety on the surrounding road network, but they would not justify approval of development in a location that otherwise has poor accessibility.

Some concern has been raised regarding impacts on Murroes School and the wellbeing of its pupils. However, the site is some distance from the school. While school pupils might pass the facility or be aware of persons attending a service if public transport links were shared, this arrangement would not be unusual or uncommon. There is no basis to consider that approval of this application would result in alteration of administrative boundaries in the area.

The site is not within an area identified by SEPA as being at risk of flooding and there is no evidence to suggest that adequate drainage provision could not be provided in a manner that would avoid significant flood risk to the surrounding area.

There is no development plan policy requirement for a backup power supply to deal with situations where there are power cuts. Issues regarding power supply to the site would be matters for the developer and the relevant utility supplier.

There is no basis to consider that the development would adversely affect aviation interests and there is no requirement to undertake consultation in relation to this matter for a development of this nature.

Third parties suggest that the site could be beneficial in providing opportunity for other community use. That does not form part of this proposal but, in any case, a community building should be located such that it is accessible to all sections of the community by a range of transport modes. This location does not meet that requirement.

Reduction in property value as a result of development is not a material planning consideration.

The information submitted in relation to the application is adequate to allow a decision to be made.

A significant number of representations have been submitted both in objection to and in support of the application. All relevant planning issues raised in those letters have been considered irrespective whether they are submitted using a standard format.

As indicated above SPP states that where a development plan is more than five years old, the presumption in favour of development that contributes to sustainable development will be a significant material consideration. In this case TAYplan is less than 5-years old but the ALDP has recently become more than 5-years old as it was adopted in September 2016.

This is a proposal for a use that would attract a significant number of visitors. The applicant has suggested that persons attending cremations are likely to travel by car. However, there are those in the community that do not have access to a private car and that rely upon other means of transport. There are also those in the community that want to exercise the ability to use sustainable means of transport. In addition, planning policy at all levels promotes an approach that directs new travel generating uses to locations that are accessible by sustainable modes of transport.

TAYplan and SPP indicate that uses that generate significant numbers of visitors should be directed to locations which are accessible by a choice of transport modes and that avoid increasing reliance on the private car in situations where access to walking, cycling and public

transport is poor. This proposal is not in a location that would meet those requirements regarding accessibility. It is in a location where direct links by walking and cycling networks are not available, and where public transport accessibility is poor. This development would increase reliance on the private car.

The proposal is compatible with some aspects of TAYplan and SPP and account has been had for the principles identified at paragraph 29 of the SPP along with its wider policy objectives. However, the proposal is not consistent with those policies in both documents which seek to ensure new development that would generate significant numbers of visitors is located in areas that are accessible by a choice of sustainable transport modes and that reduce reliance upon the private car. The proposal does not constitute a sustainable form of development given the reliance upon the private car and the lack of accessibility by sustainable modes of transport.

NPF4 has been published in draft form and contains national planning policy that will form part of the development plan. However, it has been published for consultation purposes and therefore the policies it contains merit little weight at this time. Notwithstanding that, it is relevant to note that the document retains a general policy objective to ensure that new development is located in locations that are accessible by sustainable modes of transport and that reduce reliance on travel by private car.

In conclusion, a development that would generate a significant number of visitors but that would increase reliance on access by private car is contrary to policies of SPP, TAYplan and the ALDP which are designed to ensure that new development is accessible by a range of transport modes including walking, cycling and public transport. The development is proposed at a location that does not have good accessibility, particularly for pedestrians, cyclists and public transport users and there is a significant level of objection to the application raising this concern. While the proposal may be compatible with some aspects of relevant policy, it is contrary to SPP, TAYplan and the ALDP for reasons related to accessibility. A facility of this nature should be provided at a location with good accessibility for all sections of the community, and not just those can or wish to travel by private car. Account has been had for all matters raised in support and objection to the application, but there are no material considerations which justify approval of planning permission contrary to the provisions of the development plan.

Human Rights Implications

The decision to refuse this application has potential implications for the applicant in terms of his entitlement to peaceful enjoyment of his possessions (First Protocol, Article 1). For the reasons referred to elsewhere in this report justifying the decision in planning terms, it is considered that any actual or apprehended infringement of such Convention Rights, is justified. Any interference with the applicant's right to peaceful enjoyment of his possessions by refusal of the present application is in compliance with the Council's legal duties to determine this planning application under the Planning Acts and such refusal constitutes a justified and proportionate control of the use of property in accordance with the general interest and is necessary in the public interest with reference to the Development Plan and other material planning considerations as referred to in the report.

Decision

The application is refused

Reason(s) for Decision:

1. The development would result in an unsustainable pattern of travel and development and

would not be accessible by a choice of transport modes, increasing reliance on the private car in a situation where access to walking, cycling and public transport is poor. The proposal is therefore contrary to TAYplan policies 1 and 2, Angus Local Development Plan policies DS2, DS3 and TC8, and Scottish Planning Policy in so far as it relates to locating development in accessible locations.

2. The application is contrary to Policy DS1 of the Angus Local Development Plan 2016 because the scale and nature of the development is not appropriate for its location because it does not enjoy good accessibility, particularly for pedestrians, cyclists and public transport; and because the proposal is not in accordance with other relevant policies, namely policies DS2, DS3 and TC8.

Case Officer: Ed Taylor
Date: 20 January 2021

Appendix 1 - Development Plan Policies

TAYplan

Policy 1 Location Priorities
Principal Settlement Hierarchy
Strategies, plans, programmes and development proposals shall focus the majority of development in the region's principal settlements as shown on Map 1 (opposite):

A. Tier 1 principal settlements which have the potential to accommodate the majority of the region's additional development over the plan period and make a major contribution to the region's economy;

• Within Dundee Core Area in the principal settlements of Dundee City; including Dundee Western Gateway, and Invergowrie, Monifieth, Tayport/Newport/Wormit, Birkhill/Muirhead; and,

• Within Perth Core Area in the principal settlements of Perth City, Scone, Almondbank, Bridge of Earn, Oudenarde, Methven, Stanley, Luncarty, Balbeggie, Perth Airport.

Tier 2 principal settlements which have the potential to make a major contribution to the regional economy but will accommodate a smaller share of the additional development; and,

Tier 3 principal settlements which have the potential to play an important but more modest role in the regional economy and will accommodate a small share of the additional development.

B. Sequential Approach
Strategies, plans and programmes shall prioritise land release for all principal settlements using the sequential approach in this Policy; shall prioritise within each category, as appropriate, the reuse of previously developed land and buildings (particularly listed buildings); and shall ensure that such land is effective or expected to become effective in the plan period, and that a range of sites is made available, as follows:

1. Land within principal settlements; then,

2. Land on the edge of principal settlements; then,

3. Where there is insufficient land or where the nature/scale of land use required to deliver the Plan cannot be accommodated within or on the edge of principal settlements, and where it is consistent with Part A of this policy and with Policy 2, the expansion of other settlements should be considered.

C. Outside of Principal Settlements
Local Development Plans may also provide for some development in settlements that are not defined as principal settlements (Policy 1A). This is provided that it can be accommodated and supported by the settlement, and in the countryside; that the development genuinely contributes to the outcomes of this Plan; and, it meets specific local needs or does not undermine regeneration of the cities or respective settlement.

Proposals for development in the countryside should be assessed against the need to avoid suburbanisation of the countryside and unsustainable patterns of travel and development.

D. Green belts
Local Development Plans shall continue the implementation of green belt boundaries at both St Andrews and Perth to preserve their settings, views and special character including their historic cores; protect and provide access to open space; assist in safeguarding the countryside from encroachment; to manage long term planned growth including infrastructure on Map 10 and Strategic Development Areas in Policy 3; and define the types and scales of development that are appropriate within the green belt based on Scottish Planning Policy.

Policy 2 SHAPING BETTER QUALITY PLACES
To deliver better quality development and places which respond to climate change, Local Development Plans, design frameworks masterplans/briefs and development proposals should be:

A. Place-led to deliver distinctive places by ensuring that the arrangement, layout, design, density and mix of development are shaped through incorporating and enhancing natural and historic assets*, natural processes, the multiple roles of infrastructure and networks, and local design context.

B. Active and healthy by design by ensuring that:

i. the principles of lifetime communities (p. 17) are designed-in;
ii. new development is integrated with existing community infrastructure and provides new community infrastructure/facilities where appropriate;
iii. collaborative working with other delivery bodies concentrates and co-locates new buildings, facilities and infrastructure; and,
iv. transport and land use are integrated to:
a. reduce the need to travel and improve accessibility by foot, cycle and public transport and related facilities;
b. make the best use of existing infrastructure to achieve an active travel environment combining different land uses with green space; and,
c. support land use and transport integration by transport assessments/ appraisals and travel plans where appropriate, including necessary on and off-site infrastructure.

C. Resilient and future-ready by ensuring that adaptability and resilience to a changing climate are built into the natural and built environments through:
i. a presumption against development in areas vulnerable to coastal erosion, flood risk and rising sea levels;
ii. assessing the probability of risk from all sources of flooding;

iii. the implementation of mitigation and management measures, where appropriate, to reduce flood risk; such as those envisaged by Scottish Planning Policy, Flood Risk Management Strategies and Local Flood Risk Management Plans when published;
iv. managing and enhancing the water systems within a development site to reduce surface water runoff including through use of sustainable drainage systems and storage;
v. protecting and utilising the natural water and carbon storage capacity of soils, such as peat lands, and woodland/other vegetation;
vi. Identifying, retaining and enhancing existing green networks and providing additional networks of green infrastructure (including planting in advance of development), whilst making the best use of their multiple roles; and,
vii. design-in and utilise natural and manmade ventilation and shading, green spaces/networks, and green roofs and walls.

D. Efficient resource consumption by ensuring that:
i. waste management solutions are incorporated into development;
ii. high resource efficiency is incorporated within development through:
a. the orientation and design of buildings and the choice of materials to support passive standards; and,
b. the use of or designing in the capability for low/zero carbon heat and power generating technologies and storage to reduce carbon emissions and energy consumption; and,
c. the connection to heat networks or designing-in of heat network capability.

Footnotes
**Natural and historic assets: Landscapes, habitats, wildlife sites and corridors, vegetation, biodiversity, green spaces, geological features, water courses and ancient monuments, archaeological sites and landscape, historic battlefields, historic buildings, townscapes, parks, gardens and other designed landscapes, and other features (this includes but is not restricted to designated buildings or areas).*

Policy 5 TOWN CENTRES FIRST
To protect and enhance the vitality, viability and vibrancy of city/town centres:

A. strategies, plans, programmes and development proposals should focus land uses that generate significant footfall in city/town centres defined in the network of centres (below) ahead of other locations (including retail, commercial leisure, offices, community and cultural facilities, civic activity and, where appropriate public buildings such as libraries, education and health care facilities). Other land uses including residential, hospitality and catering, events and markets should be encouraged in town centres.

B. Local Development Plans should:
i. identify specific boundaries, where appropriate, for each city/town centre, local centre and commercial centre in the network (below); including those subsequently identified in Local Development Plans;
ii. specify the appropriate functions that can take place at individual commercial centres; and,
iii. identify any other town centres and commercial centres, as appropriate; this will be particularly likely in larger, multi-centre settlements such as Dundee, Perth and Arbroath.

C. Local Development Plans and planning decisions should recognise that hospitality, catering and leisure facilities play a prominent role in supporting the visitor function of settlements and in the daytime and evening economy of all centres. They should also support improvements to town centres that enable events, festivals or markets to take place and which improve the general maintenance, character and wellbeing of the centre.

D. planning decisions for land uses that generate significant footfall should be based on the sequential priority (below – taken from Scottish Planning Policy) and other local considerations as appropriate.

Policy 9 MANAGING TAYPLAN'S ASSETS
Land should be identified through Local Development Plans to ensure responsible management of TAYplan's assets by:

A. Finite Resources using the location priorities set out in Policy 1 of this Plan to:
i. identify and protect known deposits of solid, liquid and gas minerals of economic importance;
ii. maintain a minimum of 10 years supply of construction aggregates at all times in all market areas;
iii. identify and protect deposits of nationally important minerals identified on the British Geological Survey's Critical List; and,
iv. protect prime agricultural land or land of lesser quality that is locally important, new and existing forestry areas, and carbon rich soils where the advantages of development do not outweigh the loss of this land.

B. Protecting Natura 2000 sites ensuring development likely to have a significant effect on a designated or proposed Natura 2000 site(s) (either alone or in combination with other sites or projects), will be subject to an appropriate assessment. Appropriate mitigation must be identified, where necessary, to ensure there will be no adverse effect on the integrity of Natura 2000 sites in accordance with Scottish Planning Policy.

C. Safeguarding the integrity of natural and historic assets
i. understanding and respecting the regional distinctiveness and scenic value of the TAYplan area through safeguarding the integrity of natural and historic assets; including habitats, wild land, sensitive green spaces, forestry, water environment, wetlands, floodplains (in-line with the Water Framework Directive), carbon sinks, species and wildlife corridors, and also geo-diversity, landscapes, parks, townscapes, archaeology, historic battlefields, historic buildings and monuments; and by allowing development where it does not adversely impact upon or preferably enhances these assets. Local Development Plans should set out the factors which will be taken into account in development management. The level of protection given to local designations should not be as high as that given to international or national designations. International, national and locally designated areas and sites should be identified and afforded the appropriate level of protection, and the reasons for local designations should be clearly explained and their function and continuing relevance considered, when preparing plans.
ii. Protecting and improving the water environment (including groundwater) in accordance with the legal requirements in the *Water Framework Directive 2000/60/EC* and the *Water Environment and Water Services (Scotland) Act 2003* which require greater integration between planning and water management through River Basin Management Plans.

D. Safeguarding the qualities of unspoiled coast identifying and safeguarding parts of the unspoiled coastline along the River Tay Estuary and in Angus and North Fife, that are unsuitable for development. Local Development Plans should also set out policies for their management; identifying areas at risk from flooding and sea level rise and develop policies to manage retreat and realignment, as appropriate. Local Development Plans should have regard to the National Marine Plan, and Regional Marine Plans, where appropriate.

Angus Local Development Plan 2016

Policy DS1 : Development Boundaries and Priorities

All proposals will be expected to support delivery of the Development Strategy.

The focus of development will be sites allocated or otherwise identified for development within the Angus Local Development Plan, which will be safeguarded for the use(s) set out. Proposals for alternative uses will only be acceptable if they do not undermine the provision of a range of sites to meet the development needs of the plan area.

Proposals on sites not allocated or otherwise identified for development, but within development boundaries will be supported where they are of an appropriate scale and nature and are in accordance with relevant policies of the ALDP.

Proposals for sites outwith but contiguous* with a development boundary will only be acceptable where it is in the public interest and social, economic, environmental or operational considerations confirm there is a need for the proposed development that cannot be met within a development boundary.

Outwith development boundaries proposals will be supported where they are of a scale and nature appropriate to their location and where they are in accordance with relevant policies of the ALDP.

In all locations, proposals that re-use or make better use of vacant, derelict or under-used brownfield land or buildings will be supported where they are in accordance with relevant policies of the ALDP.

Development of greenfield sites (with the exception of sites allocated, identified or considered appropriate for development by policies in the ALDP) will only be supported where there are no suitable and available brownfield sites capable of accommodating the proposed development.

Development proposals should not result in adverse impacts, either alone or in combination with other proposals or projects, on the integrity of any European designated site, in accordance with Policy PV4 Sites Designated for Natural Heritage and Biodiversity Value.

*Sharing an edge or boundary, neighbouring or adjacent

Policy DS2 : Accessible Development
Development proposals will require to demonstrate, according to scale, type and location, that they:

- are or can be made accessible to existing or proposed public transport networks;
- make provision for suitably located public transport infrastructure such as bus stops, shelters, lay-bys, turning areas which minimise walking distances;
- allow easy access for people with restricted mobility;
- provide and/or enhance safe and pleasant paths for walking and cycling which are suitable for use by all, and link existing and proposed path networks; and
- are located where there is adequate local road network capacity or where capacity can be made available.

Where proposals involve significant travel generation by road, rail, bus, foot and/or cycle, Angus Council will require:

- the submission of a Travel Plan and/or a Transport Assessment.
- appropriate planning obligations in line with Policy DS5 Developer Contributions.

Policy DS3 : Design Quality and Placemaking

Development proposals should deliver a high design standard and draw upon those aspects of landscape or townscape that contribute positively to the character and sense of place of the area in which they are to be located. Development proposals should create buildings and places which are:

- Distinct in Character and Identity: Where development fits with the character and pattern of development in the surrounding area, provides a coherent structure of streets, spaces and buildings and retains and sensitively integrates important townscape and landscape features.
- Safe and Pleasant: Where all buildings, public spaces and routes are designed to be accessible, safe and attractive, where public and private spaces are clearly defined and appropriate new areas of landscaping and open space are incorporated and linked to existing green space wherever possible.
- Well Connected: Where development connects pedestrians, cyclists and vehicles with the surrounding area and public transport, the access and parking requirements of the Roads Authority are met and the principles set out in 'Designing Streets' are addressed.
- Adaptable: Where development is designed to support a mix of compatible uses and accommodate changing needs.
- Resource Efficient: Where development makes good use of existing resources and is sited and designed to minimise environmental impacts and maximise the use of local climate and landform.

Supplementary guidance will set out the principles expected in all development, more detailed guidance on the design aspects of different proposals and how to achieve the qualities set out above. Further details on the type of developments requiring a design statement and the issues that should be addressed will also be set out in supplementary guidance.

Policy DS4 : Amenity
All proposed development must have full regard to opportunities for maintaining and improving environmental quality. Development will not be permitted where there is an unacceptable adverse impact on the surrounding area or the environment or amenity of existing or future occupiers of adjoining or nearby properties.
Angus Council will consider the impacts of development on:

- Air quality;
- Noise and vibration levels and times when such disturbances are likely to occur;
- Levels of light pollution;
- Levels of odours, fumes and dust;
- Suitable provision for refuse collection / storage and recycling;
- The effect and timing of traffic movement to, from and within the site, car parking and impacts on highway safety; and
- Residential amenity in relation to overlooking and loss of privacy, outlook, sunlight, daylight and overshadowing.

Angus Council may support development which is considered to have an impact on such considerations, if the use of conditions or planning obligations will ensure that appropriate mitigation and / or compensatory measures are secured.

Applicants may be required to submit detailed assessments in relation to any of the above criteria to the Council for consideration.

Where a site is known or suspected to be contaminated, applicants will be required to undertake investigation and, where appropriate, remediation measures relevant to the current or proposed

use to prevent unacceptable risks to human health.

Policy TC8 : Community Facilities and Services
The Council will encourage the retention and improvement of public facilities and rural services.

Proposals resulting in the loss of existing public community facilities will only be supported where it can be demonstrated that:

- The proposal would result in the provision of alternative facilities of equivalent community benefit and accessibility; or
- The loss of the facility would not have an adverse impact on the community; or
- The existing use is surplus to requirements or no longer viable; and
- No suitable alternative community uses can be found for the buildings and land in question.

The Council will seek to safeguard rural services that serve a valuable local community function such as local convenience shops, hotels, public houses, restaurants and petrol stations. Proposals for alternative uses will only be acceptable where it can be demonstrated that:

- the existing business is no longer viable and has been actively marketed for sale as a going concern at a reasonable price/rent for a reasonable period of time;
- the building is incapable of being reused for its existing purpose or redeveloped for an appropriate local community or tourism use; or
- equivalent alternative facilities exist elsewhere in the local community.

New community facilities should be accessible and of an appropriate scale and nature for the location. In the towns of Angus, and where appropriate to the type of facility, a town centre first approach should be applied to identifying a suitable location.

Policy TC15 Employment Development
Proposals for new employment development (consisting of Class 4, 5, or 6) will be directed to employment land allocations or existing employment areas within development boundaries, subject to the application of the sequential approach required by Policy TC19 Retail and Town Centre Uses for office developments of over 1,000 square metres gross floorspace.

Proposals for employment development outside of employment land allocations or existing employment areas, but within the development boundaries of the towns and the settlements within the rural area will be supported where:

- there are no suitable or viable sites available within an employment land allocation or existing employment area; or
- the use is considered to be acceptable in that location; and
- there is no unacceptable impact on the built and natural environment, surrounding amenity, access and infrastructure.

Proposals for employment development (consisting of Class 4, 5, or 6) outwith development boundaries will only be supported where:

- the criteria relating to employment development within development boundaries are met;
- the scale and nature of the development is in keeping with the character of the local landscape and pattern of development; and
- the proposal constitutes rural diversification where:

- the development is to be used directly for agricultural, equestrian, horticultural or forestry operations, or for uses which by their nature are appropriate to the rural character of the area; or
- the development is to be used for other business or employment generating uses, provided that the Council is satisfied that there is an economic and/or operational need for the location.

Policy TC17 : Network of Centres
Angus Council will seek to protect and enhance the scale and function of the centres as set out in Table 2 below.

A town centre first policy is applied to uses including retail, commercial leisure, offices, community and cultural facilities that attract significant numbers of people. Support will be given to development proposals in town centres which are in keeping with the townscape and pattern of development and which conform with the character, scale and function of the town centres.

All development proposals within a Commercial Centre will have to satisfy criteria within Policy TC19 Retail and Town Centre Uses.

Policy TC19 : Retail and Town Centre Uses
Proposals for retail and other town centre uses* over 1000 m2 gross floorspace (including extensions) on the edge of or outside of defined town centres (including in out of town locations) will be required to submit relevant assessments (including retail/town centre impact and transport assessments) and demonstrate that the proposal:

- has followed a sequential approach to site selection, giving priority to sites within the defined town centre before edge of centre, commercial centre or out of centre sites which are, or can be made accessible;
- does not individually or cumulatively undermine the vibrancy, vitality and viability of any of the town centres identified in Table 2 in Angus;
- tackles deficiencies in existing provision, in qualitative or quantitative terms; and
- is compatible with surrounding land uses and there is no unacceptable impact on the built and natural environment, surrounding amenity, access and infrastructure.

Proposals for retail and other town centre uses8 under 1000 m2 gross floorspace (including extensions) on the edge of or outside of defined town centres may be required to submit relevant assessments (including retail / town centre impact, transport and sequential assessments) where it is considered that the proposal may have a significant impact on the vibrancy, vitality and viability of any of the town centres in Angus.

*Town centre uses include commercial leisure, offices, community and cultural facilities.

Policy PV5 : Protected Species
Angus Council will work with partner agencies and developers to protect and enhance all wildlife including its habitats, important roost or nesting places. Development proposals which are likely to affect protected species will be assessed to ensure compatibility with the appropriate regulatory regime.

European Protected Species
Development proposals that would, either individually or cumulatively, be likely to have an unacceptable adverse impact on European protected species as defined by Annex 1V of the Habitats Directive (Directive 92/24/EEC) will only be permitted where it can be demonstrated to the satisfaction of Angus Council as planning authority that:

- there is no satisfactory alternative; and
- there are imperative reasons of overriding public health and/or safety, nature, social or economic interest and beneficial consequences for the environment, and
- the development would not be detrimental to the maintenance of the population of a European protected species at a favourable conservation status in its natural range

.

Other Protected Species

Development proposals that would be likely to have an unacceptable adverse effect on protected species unless justified in accordance with relevant species legislation (Wildlife and Countryside Act 1981 and the Protection of Badgers Act 1992) subject to any consequent amendment or replacement.

Further information on protected sites and species and their influence on proposed development will be set out in a Planning Advice Note.

Policy PV6 : Development in the Landscape

Angus Council will seek to protect and enhance the quality of the landscape in Angus, its diversity (including coastal, agricultural lowlands, the foothills and mountains), its distinctive local characteristics, and its important views and landmarks.

Capacity to accept new development will be considered within the context of the Tayside Landscape Character Assessment, relevant landscape capacity studies, any formal designations and special landscape areas to be identified within Angus. Within the areas shown on the proposals map as being part of 'wild land', as identified in maps published by Scottish Natural Heritage in 2014, development proposals will be considered in the context of Scottish Planning Policy's provisions in relation to safeguarding the character of wild land.

Development which has an adverse effect on landscape will only be permitted where:

- the site selected is capable of accommodating the proposed development;
- the siting and design integrate with the landscape context and minimise adverse impacts on the local landscape;
- potential cumulative effects with any other relevant proposal are considered to be acceptable; and
- mitigation measures and/or reinstatement are proposed where appropriate.

Landscape impact of specific types of development is addressed in more detail in other policies in this plan and work involving development which is required for the maintenance of strategic transport and communications infrastructure should avoid, minimise or mitigate any adverse impact on the landscape.

Further information on development in the landscape, including identification of special landscape and conservation areas in Angus will be set out in a Planning Advice Note.

Policy PV7 : Woodland, Trees and Hedges

Ancient semi-natural woodland is an irreplaceable resource and should be protected from removal and potential adverse impacts of development. The council will identify and seek to enhance woodlands of high nature conservation value. Individual trees, especially veteran trees or small groups of trees which contribute to landscape and townscape settings may be protected through the application of Tree Preservation Orders (TPO).

Woodland, trees and hedges that contribute to the nature conservation, heritage, amenity, townscape or landscape value of Angus will be protected and enhanced. Development and

planting proposals should:

- protect and retain woodland, trees and hedges to avoid fragmentation of existing provision;
- be considered within the context of the Angus Woodland and Forestry Framework where woodland planting and management is planned;
- ensure new planting enhances biodiversity and landscape value through integration with and contribution to improving connectivity with existing and proposed green infrastructure and use appropriate species;
- ensure new woodland is established in advance of major developments;
- undertake a Tree Survey where appropriate; and
- identify and agree appropriate mitigation, implementation of an approved woodland management plan and re-instatement or alternative planting.

Angus Council will follow the Scottish Government Control of Woodland Removal Policy when considering proposals for the felling of woodland.

Policy PV15 : Drainage Infrastructure
Development proposals within Development Boundaries will be required to connect to the public sewer where available.

Where there is limited capacity at the treatment works Scottish Water will provide additional wastewater capacity to accommodate development if the Developer can meet the 5 Criteria*. Scottish Water will instigate a growth project upon receipt of the 5 Criteria and will work with the developer, SEPA and Angus Council to identify solutions for the development to proceed.

Outwith areas served by public sewers or where there is no viable connection for economic or technical reasons private provision of waste water treatment must meet the requirements of SEPA and/or The Building Standards (Scotland) Regulations. A private drainage system will only be considered as a means towards achieving connection to the public sewer system, and when it forms part of a specific development proposal which meets the necessary criteria to trigger a Scottish Water growth project.

All new development (except single dwelling and developments that discharge directly to coastal waters) will be required to provide Sustainable Drainage Systems (SUDs) to accommodate surface water drainage and long term maintenance must be agreed with the local authority. SUDs schemes can contribute to local green networks, biodiversity and provision of amenity open space and should form an integral part of the design process.

Drainage Impact Assessment (DIA) will be required for new development where appropriate to identify potential network issues and minimise any reduction in existing levels of service.

*Enabling Development and our 5 Criteria (http://scotland.gov.uk/Resource/0040/00409361.pdf)

Policy PV17 : Waste Management Facilities
Existing waste management facilities will be safeguarded from alternative development except where it is demonstrated that they are surplus or no longer suitable to meet future requirements or where alternative provision of equal or improved standard is provided on another site.

Development proposals adjacent to existing or proposed waste management facilities should not directly or indirectly compromise the present or future operation of the facility.

Proposals for new waste management facilities will be supported where they deliver the objectives outlined in the Zero Waste Plan (to prevent, reduce, recycle, recover and pre-treat waste).

The preferred location for new waste management facilities will be within or adjacent to existing waste management sites or on land identified for employment or industrial use. Former mineral sites and derelict or degraded land may also be acceptable. Such facilities should have regard to the local townscape and pattern of development.

Outwith these locations, proposals for new waste management facilities may be acceptable where they meet an identified community need and are in a location that minimises travel distances for that community.

Proposals will be supported where:

- impacts on the natural and built environment, amenity, landscape character, visual amenity, air quality, water quality, groundwater resources, site access, traffic movements, road capacity and road safety are acceptable or could be satisfactorily mitigated through planning conditions or planning agreement; and
- appropriate details of restoration, aftercare and after use are submitted for approval by Angus Council, recognising that ecological solutions are the preferred from of restoration. Opportunities to enhance, extend and / or link to existing green networks should be investigated. Prior to commencement of development Angus Council may require a bond to cover the cost of the agreed scheme of restoration, aftercare and after use.

Energy from waste recovery facilities will also be assessed against Policy PV9 Renewable and Low Carbon Energy Development and the Scottish Environment Protection Agency's Thermal Treatment of Waste Guidelines 2014.

Policy PV20 : Soils and Geodiversity
Development proposals on prime agricultural land will only be supported where they:

- support delivery of the development strategy and policies in this local plan;
- are small scale and directly related to a rural business or mineral extraction; or
- constitute renewable energy development and are supported by a commitment to a bond commensurate with site restoration requirements.

Design and layout should minimise land required for development proposals on agricultural land and should not render any farm unit unviable.

Development proposals affecting deep peat or carbon rich soils will not be allowed unless there is an overwhelming social or economic need that cannot be met elsewhere. Where peat and carbon rich soils are present, applicants should assess the likely effects of development proposals on carbon dioxide emissions.
All development proposals will incorporate measures to manage, protect and reinstate valuable soils, groundwater and soil biodiversity during construction.

ANGUS COUNCIL

TOWN AND COUNTRY PLANNING (SCOTLAND) ACT 1997
(AS AMENDED)
TOWN AND COUNTRY PLANNING (DEVELOPMENT MANAGEMENT PROCEDURE)
(SCOTLAND)
REGULATIONS 2013

PLANNING PERMISSION REFUSAL
REFERENCE : 20/00830/FULL

To **Duntrune Ltd**
c/o @rchitects Scotland Ltd
Paul Fretwell
15 West High Street
Forfar
DD8 1BE

With reference to your application dated 14 December 2020 for planning permission under the above mentioned Acts and Regulations for the following development, viz.:-

Erection of Crematorium Building and associated Parking, Access, Turning Space, Landscaping and Boundary Enclosures at **Land North East Of Duntrune House Duntrune** for **Duntrune Ltd**

The Angus Council in exercise of their powers under the above mentioned Acts and Regulations hereby **Refuse Planning Permission (Delegated Decision)** for the said development in accordance with the particulars given in the application and plans docqueted as relative hereto in paper or identified as refused on the Public Access portal.

The reasons for the Council's decision are:-

1. The development would result in an unsustainable pattern of travel and development and would not be accessible by a choice of transport modes, increasing reliance on the private car in a situation where access to walking, cycling and public transport is poor. The proposal is therefore contrary to TAYplan policies 1 and 2, Angus Local Development Plan policies DS2, DS3 and TC8, and Scottish Planning Policy in so far as it relates to locating development in accessible locations.

2. The application is contrary to Policy DS1 of the Angus Local Development Plan 2016 because the scale and nature of the development is not appropriate for its location because it does not enjoy good accessibility, particularly for pedestrians, cyclists and public transport; and because the proposal is not in accordance with other relevant policies, namely policies DS2, DS3 and TC8.

Amendments:

1. Building and External Works Plan drawing no. 1226 / PD / 01 Revision C dated May 2020 amends and supersedes all previous Building and External Works Plan drawings and includes overflow car parking resulting in total of 124 car parking spaces (72 plus 52 overflow spaces).

2. Site Plan drawing no. 1266 / PD / 02 Revision C dated May 2020 amends and supersedes all previous Site Plan drawings and includes overflow car parking resulting in total of 124 car parking spaces (72 plus 52 overflow spaces).

3. Road Access drawing no. 1266 / SK / 06 Revision C dated May 2020 amends and supersedes all previous Road Access drawings and includes overflow car parking and annotates 'Existing Road to be widened as per Engineers drawings' on the public road.

Dated this **24 January 2022**
Jill Paterson
Service Lead
Planning and Sustainable Growth
Angus Council
Angus House
Orchardbank Business Park
Forfar
DD8 1AN

Planning Decisions – Guidance Note

Please retain – this guidance forms part of your Decision Notice

You have now received your Decision Notice. This guidance note sets out important information regarding appealing or reviewing your decision. There are also new requirements in terms of notifications to the Planning Authority and display notices on-site for certain types of application. You will also find details on how to vary or renew your permission.

Please read the notes carefully to ensure effective compliance with the new regulations.

DURATION

This permission will lapse 3 years from the date of this decision, unless there is a specific condition relating to the duration of the permission or development has commenced by that date.

PLANNING DECISIONS

Decision Types and Appeal/Review Routes

The 'decision type' as specified in your decision letter determines the appeal or review route. The route to do this is dependent on the how the application was determined. Please check your decision letter and choose the appropriate appeal/review route in accordance with the table below. Details of how to do this are included in the guidance.

Determination Type	What does this mean?	Appeal/Review Route
Development Standards Committee/Full Council	National developments, major developments and local developments determined at a meeting of the Development Standards Committee or Full Council whereby relevant parties and the applicant were given the opportunity to present their cases before a decision was reached.	***DPEA (appeal to Scottish Ministers) – See details on attached Form 1***
Delegated Decision	Local developments determined by the Service Manager through delegated powers under the statutory scheme of delegation. These applications may have been subject to less than five representations, minor breaches of policy or may be refusals.	***Local Review Body – See details on attached Form 2***
Other Decision	All decisions other than planning permission or approval of matters specified in condition. These include decisions relating to Listed Building Consent, Advertisement Consent, Conservation Area Consent and Hazardous Substances Consent.	***DPEA (appeal to Scottish Ministers) – See details on attached Form 1***

Notification of initiation of development (NID)

Once planning permission has been granted and the applicant has decided the date they will commence that development they must inform the Planning Authority of that date. The notice must be submitted before development commences – failure to do so would be a breach of planning control. The relevant form is included with this guidance note.

Notification of completion of development (NCD)

Once a development for which planning permission has been given has been completed the applicant must, as soon as practicable, submit a notice of completion to the planning authority. Where development is carried out in phases there is a requirement for a notice to be submitted at the conclusion of each phase. The relevant form is included with this guidance note.

Display of Notice while development is carried out

For national, major or 'bad neighbour' developments (such as public houses, hot food shops or scrap yards), the developer must, for the duration of the development, display a sign or signs containing prescribed information.

The notice must be in the prescribed form and:-

- displayed in a prominent place at or in the vicinity of the site of the development;
- readily visible to the public; and
- printed on durable material.

A display notice is included with this guidance note.

Should you have any queries in relation to any of the above, please contact:

Angus Council
Angus House
Orchardbank Business Park
Forfar
DD8 1AN

Telephone 01307 492076 / 492533
E-mail: planning@angus.gov.uk
Website: www.angus.gov.uk

FORM 1

TOWN AND COUNTRY PLANNING (SCOTLAND) ACT 1997 (AS AMENDED)

The Town & Country Planning (Development Management Procedure) (Scotland) Regulations 2013 – Schedule to Form 1

Notification to be sent to applicant on refusal of planning permission or on the grant of permission subject to conditions decided by Angus Council

1. If the applicant is aggrieved by the decision of the planning authority-

a) to refuse permission for the proposed development;
b) to refuse approval, consent or agreement required by condition imposed on a grant of planning permission;
c) to grant planning permission or any approval, consent or agreement subject to conditions,

the applicant may appeal to the Scottish Ministers to review the case under section 47 of the Town and Country Planning (Scotland) Act 1997 within three months beginning with the date of this notice. The notice of appeal should be addressed to The Planning and Environmental Appeals Division, Scottish Government, Ground Floor, Hadrian House, Callendar Business Park, Callendar Road, Falkirk, FK1 1XR. Alternatively you can submit your appeal directly to DPEA using the national e-planning web site https://eplanning.scotland.gov.uk.

2. If permission to develop land is refused or granted subject to conditions and the owner of the land claims that the land has become incapable of reasonably beneficial use in its existing state and cannot be rendered capable of reasonably beneficial use by the carrying out of any development which has been or would be permitted, the owner of the land may serve on the planning authority a purchase notice requiring the purchase of the owner of the land's interest in the land in accordance with Part 5 of the Town and Country Planning (Scotland) Act 1997.

TOWN AND COUNTRY PLANNING (SCOTLAND) ACT 1997 (AS AMENDED)

The Town & Country Planning (Development Management Procedure) (Scotland) Regulations 2013 – Schedule to Form 2

Notification to be sent to applicant on refusal of planning permission or on the grant of permission subject to conditions decided through Angus Council's Scheme of Delegation

1. If the applicant is aggrieved by the decision of the planning authority-

   a) to refuse permission for the proposed development;
   b) to refuse approval, consent or agreement required by condition imposed on a grant of planning permission;
   c) to grant planning permission or any approval, consent or agreement subject to conditions,

   the applicant may require the planning authority to review the case under section 43A of the Town and Country Planning (Scotland) Act 1997 within three months beginning with the date of this notice. The notice of review should be addressed to Committee Officer, Angus Council, Resources, Legal & Democratic Services, Angus House, Orchardbank Business Park, Forfar, DD8 1AN.

   A Notice of Review Form and guidance can be found on the national e-planning website https://eplanning.scotland.gov.uk. Alternatively you can return your Notice of Review directly to the local planning authority online on the same web site.

2. If permission to develop land is refused or granted subject to conditions and the owner of the land claims that the land has become incapable of reasonably beneficial use in its existing state and cannot be rendered capable of reasonably beneficial use by the carrying out of any development which has been or would be permitted, the owner of the land may serve on the planning authority a purchase notice requiring the purchase of the owner of the land's interest in the land in accordance with Part 5 of the Town and Country Planning (Scotland) Act 1997.

PLANNING

Your experience with Planning

Please indicate whether you agree or disagree with the following statements about your most recent experience of the Council's handling of the planning application in which you had an interest.

Q.1 I was given the advice and help I needed to submit my application/representation:-

Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	It does not apply
☐	☐	☐	☐	☐	☐

Q.2 The Council kept me informed about the progress of the application that I had an interest in:-

Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	It does not apply
☐	☐	☐	☐	☐	☐

Q.3 The Council dealt promptly with my queries:-

Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	It does not apply
☐	☐	☐	☐	☐	☐

Q.4 The Council dealt helpfully with my queries:-

Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	It does not apply
☐	☐	☐	☐	☐	☐

Q.5 I understand the reasons for the decision made on the application that I had an interest in:-

Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	It does not apply
☐	☐	☐	☐	☐	☐

Q.6 I feel that I was treated fairly and that my view point was listened to:-

Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	It does not apply
☐	☐	☐	☐	☐	☐

OVERALL SATISFACTION: Overall satisfaction with the service: ……

Q.7 Setting aside whether your application was successful or not, and taking everything into account, how satisfied or dissatisfied are you with the service provided by the council in processing your application?

Very satisfied	Fairly satisfied	Neither Satisfied nor Dissatisfied	Fairly Dissatisfied	Very Dissatisfied
☐	☐	☐	☐	☐

OUTCOME: Outcome of the application:

Q.8 Was the application that you had an interest in:-

Granted Permission/Consent ☐ Refused Permission/Consent ☐ Withdrawn ☐

Q.9 Were you the:- Applicant ☐ Agent ☐ Third Party objector who made a representation ☐

Please complete the form and return in the pre-paid envelope provided.
Thank you for taking the time to complete this form.

NOTES

D4

REVISIONS

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CLIENT

Duntrune Ltd.
Kinnells Mill
Friockheim
Angus
DD11 4UL

PROJECT

Proposed New Crematorium
Burnside of Duntrune
By Dundee
Angus

DRAWING TITLE

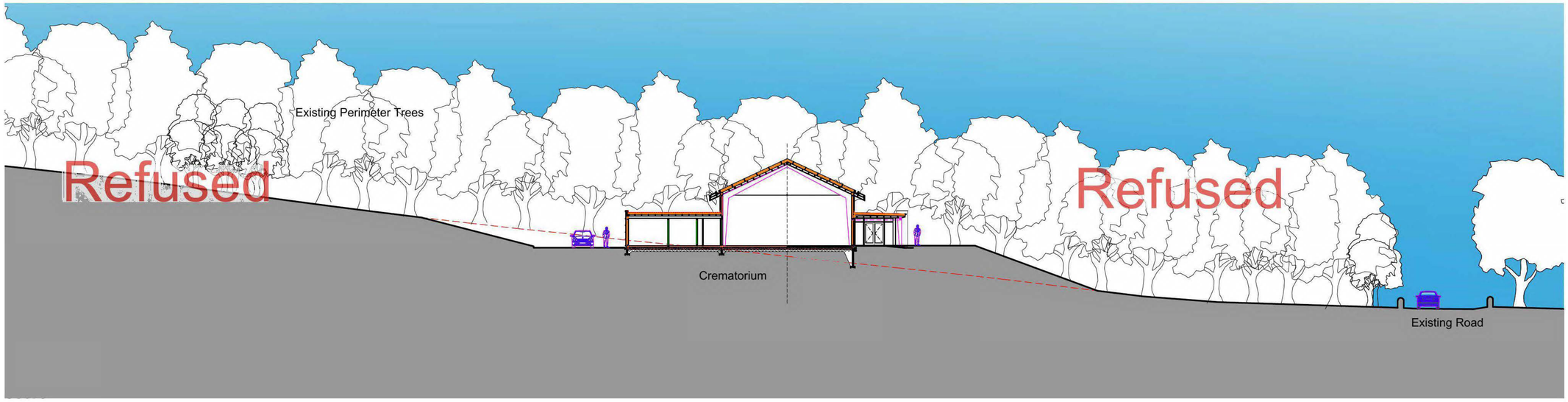
Survey Plan

SCALE	DATE
1:500	May 2020
CAD FILE	DRAWN BY
1266	PF

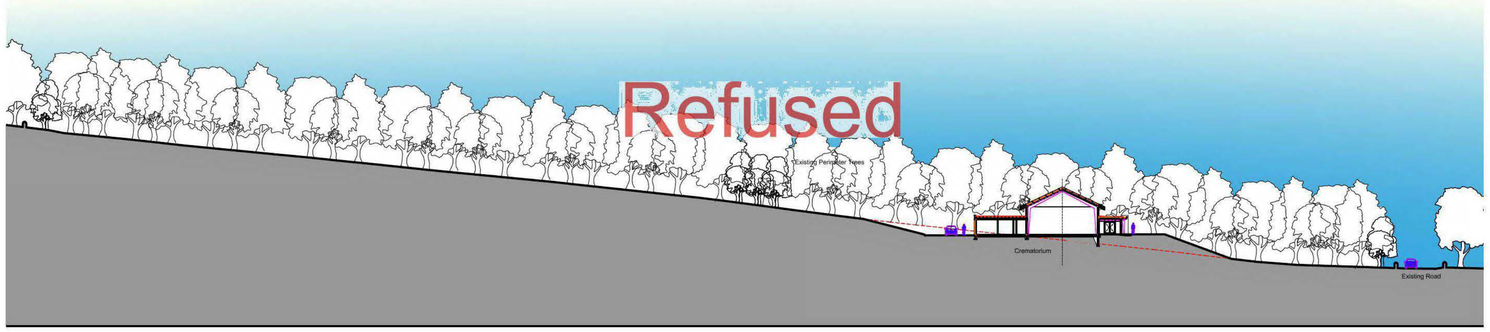
@rchitects
Chartered Architects
15 West High Street
Forfar, Angus
DD8 1BE
Tel: 01307 466480
Email: paul@rchitects.org.uk

DWG NO.

1266 / SD / 01



Section A-A



Section A-A in context

NOTES

D5

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CLIENT

Duntrune Ltd.
Kinnells Mill
Friockheim
Angus
DD11 4UL

PROJECT

Proposed New Crematorium
Burnside of Duntrune
By Dundee
Angus

DRAWING TITLE

Site Section

SCALE	DATE
1:500 & 1:200	May 2020
CAD FILE	DRAWN BY
1266	PF

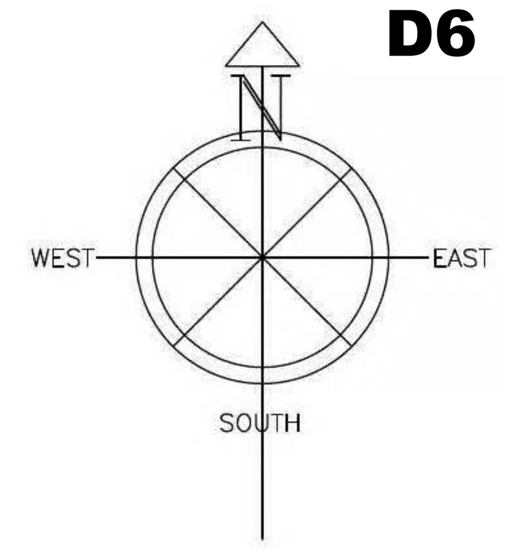
@rchitects
15 West High Street
Forfar, Angus
DD8 1BE
Tel: 01307 466480
Email: paul@rchitects.org.uk

DWG NO.

1266 / PD / 04 Rev B

NOTES

D6



0 20 40 60 80 100 120 140 160 180 200

Scale : 1:2500

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CLIENT

Duntrune Ltd.
Kinnells Mill
Friockheim
Angus
DD11 4UL

SCALE	DATE
1:2500	May 2020
CAD FILE	DRAWN BY
1266	PF

PROJECT

Proposed New Crematorium
Burnside of Duntrune
By Dundee
Angus

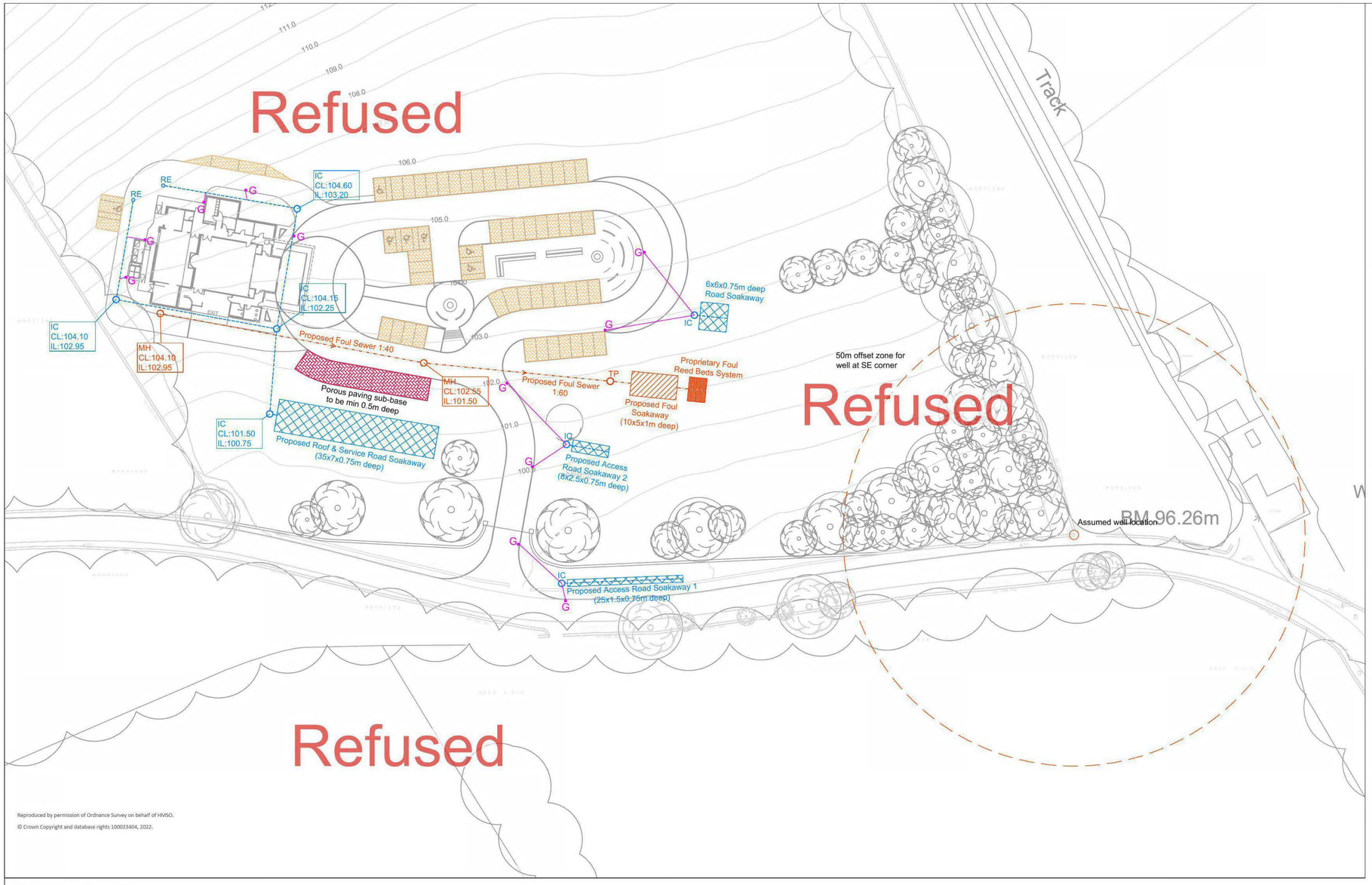
DRAWING TITLE

Context Plan

@rchitects
15 West High Street
Forfar, Angus
DD8 1BE
Tel: 01307 466480
Email: paul@rchitects.org.uk

DWG NO.

1266 / PD / 03 Rev B



FIGURED DIMENSIONS ONLY TO BE USED

General notes:

This drawing is to be read in conjunction with all relevant engineers and architects drawings.

Drainage - all sewers to be constructed in accordance with Scottish water's publication ``Sewers for Scotland (4th edition) a policy, design and construction guide for developers in Scotland"

Sewers laid within roads should have a minimum cover of 1.5m from final road surface to pipe soffit level. Where this cannot be achieved then ridged pipes shall be protected by a full concrete surround, similarly, flexible pipes shall be protected by a concrete slab at a depth less than 1.2m.

The contractor is responsible for checking the line and level of all existing services prior to commencement of works. Any discrepancies from design information must be reported to the site manager and site engineer in writing.

The contractor should allow for CCTV camera survey of entire drainage system upon substantial completion of works. If any remedial works are required a repeat survey should also be carried out prior to formal submission to Engineer together with as-built drawing including manhole co-ordinates, cover and invert levels and pipe gradients .

Note:-

Soakaway to be least 5m from building foundations.

Maintenance of proposed surface water drainage

1.Soakaway
Inlet chamber to be checked at six monthly intervals and any organic matter and silt build up removed. Soakaway to be checked also to ensure that there is no build up of standing water once a rainfall event has passed (six monthly). Surface over soakaway to be constructed of material that is easily removed (e.g. lock block) to allow filter gravel to be replaced if required in the future. No trees or large shrubs to be planted within 5 metres of the soakaway.

2.Drainage Pipes
Inlet pipes to be checked at six month intervals for blockages and silt build up. Blockages and structural damage to be repaired or cleaned as necessary.

D7

Surface Drainage Legend

- Surface water sewer (uPVC Marley Quantum rigid solid pipework) unless otherwise noted on drawing.
- Surface Water Soakaway
- Porous Paving with standard 450mm deep sub-base
- Porous Paving with increased depth of sub-base
- S1 — Surface Water Manhole with Reference Number
- IC — Surface Water Inspection Chamber
- RE — Surface Water Rodding Eye
- G — Road Gully with associated tail

Foul Drainage Legend

- Foul water sewer (uPVC Marley Quantum rigid solid pipework) unless otherwise noted on drawing.
- Foul Infiltration Bed
- 8No Klargester Foul Reed Beds
- F1 — Foul Water Manhole with Reference Number
- TP — Denotes Klargester BioFicient 6 Treatment Plant (30 Person Unit)

Drainage tail positions to be confirmed on site to suit house type discharge points. A surface water and foul water branch should be established for each plot.

Refer to Architects drawings for internal drainage runs and details.

Drainage Layout
Scale 1:500

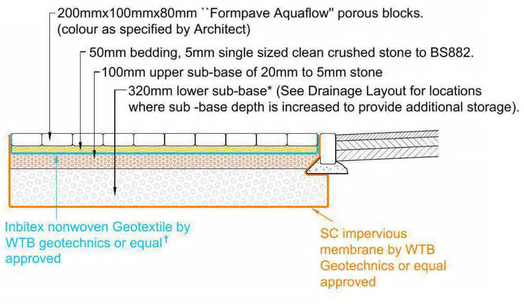
Notes:

Supplied by WTB Geotextiles

* Specification for sub-base, laying course and blinding layer: the crushed stone must possess well defined edges and have a minimum 10% fines value of 150kN when tested in accordance with BS812 Part 111.

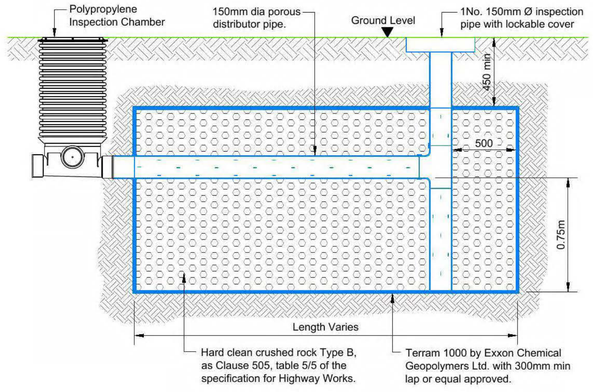
Grading of Sub-base stone

SIEVE SIZE	% PASSING
100mm	100
75mm	80-100
60mm	60-80
37.5mm	30-60
20mm	0-20
10mm	0-5



SECTION THROUGH POROUS PAVING
Scale 1:20

Note:- Sub-base to be increased to as per depth noted on plan



TYPICAL PRIVATE SURFACE WATER SOAKAWAY LONGITUDINAL SECTION
Scale 1:20

Note:

Soakaway dimensions based on a soil infiltration rate (f) = 8.85×10^{-5} m/sec as determined by Cameron + Ross' site investigation of 09/10/2019 in accordance with in BRE Digest 365 with 30% free volume of fill material.

Issue	Revision	Initial	Date
1	Drainage updated to suit amended layout	SAD/BAC	19/11/2020

Cameron + Ross
CIVIL + STRUCTURAL ENGINEERING
Forbes House | 15 Victoria Street | Aberdeen | AB10 1XB | t 01224 642 400 | w cameronross.co.uk
Mulberry House | 39-41 Harbour Road | Inverness | IV1 1UF | t 01463 570 100 | w cameronross.co.uk

Client:
FM & G Batchelor

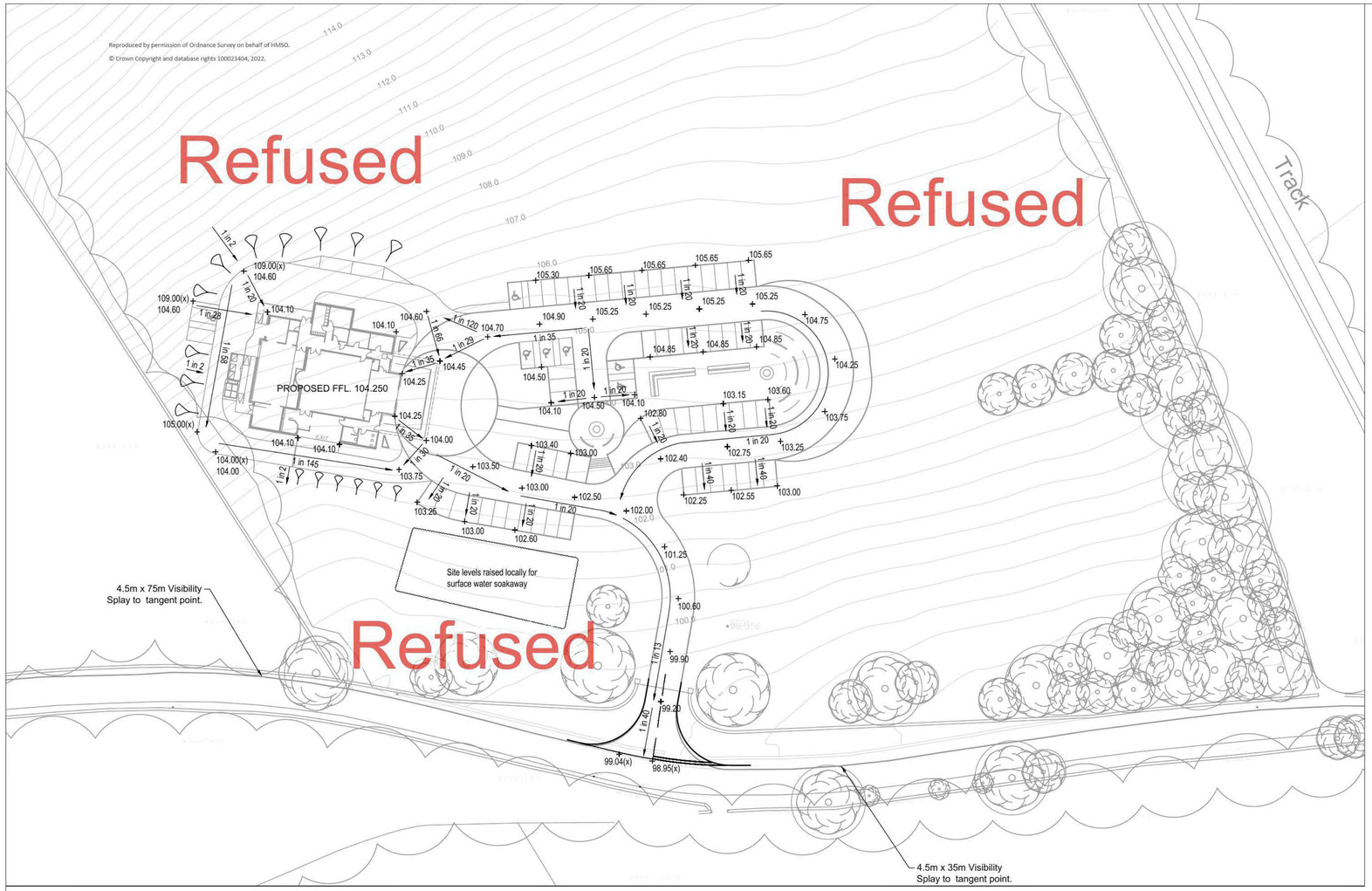
Project:
Crematorium at Burnside of Duntrune, Duntrune, Angus

Drawing Title:
Drainage Layout

Status: Planning
North

Scale:	1:500 @ A1	Date:	31/08/2020
By:	SAD	Checked:	BAC
Approved:	RAG		

Dwg. No. A/190889 – 920
Rev. 1



Site Layout
Scale 1:500

D8

FIGURED DIMENSIONS ONLY TO BE USED

Legend

FFL ??.??	Finished Floor Level
+ ??.??	Proposed Ground Level
+ ??.??(x)	Existing Ground Level
1 in ??	Gradient

Issue	Revision	Initial	Date
1	Site Levels updated to suit amended layout	SAD/BAC	19/11/2020

Cameron + Ross
CIVIL + STRUCTURAL ENGINEERING
Forbes House | 15 Victoria Street | Aberdeen | AB10 1XB
t. 01224 642 400 | w. cameronross.co.uk
Mulberry House | 39-41 Harbour Road | Inverness | IV1 1UF
t. 07483 970 100 | w. cameronross.co.uk

Client:
FM & G Batchelor

Project:
Crematorium at Burnside of Duntrune, Duntrune, Angus

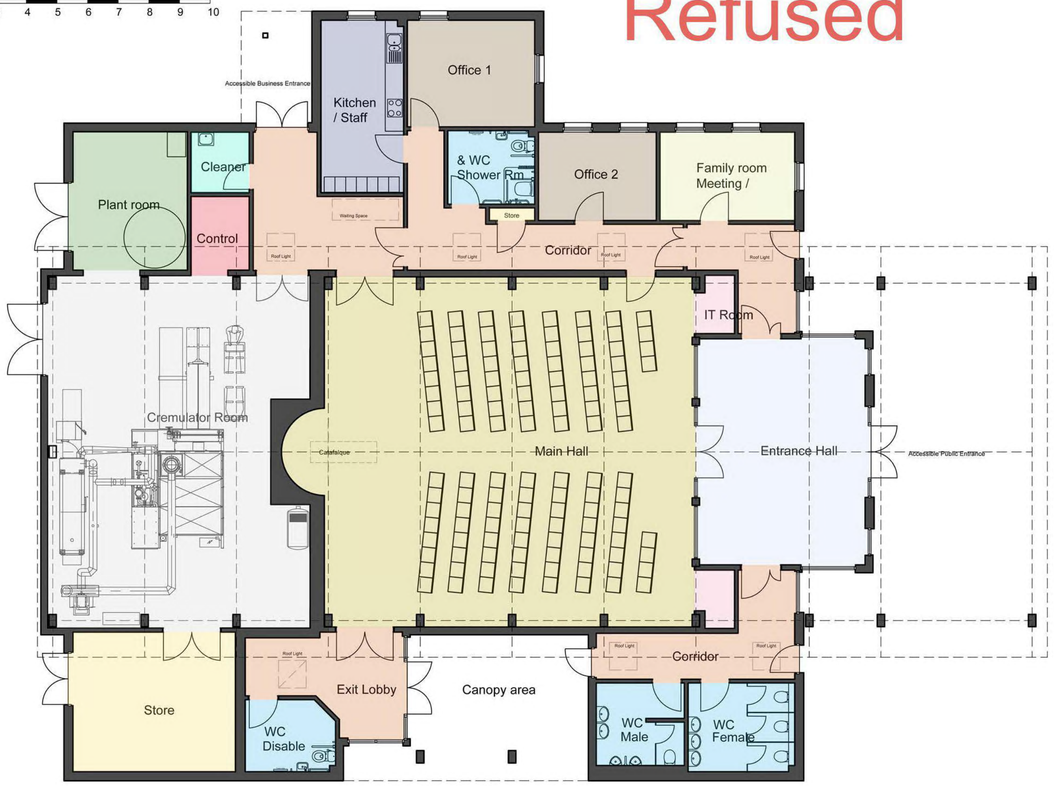
Drawing Title:
Site Access Road Layout Plan

Status: Planning
North

Scale:	1:500 @ A1	Date:	31/08/2020
By:	SAD	Checked:	BAC
Approved:	RAG		

Dwg. No. A/190889 – 910
Rev. 1

Refused



Ground Floor Plan

East Elevation

NOTES

Materials

Walls - Grey Cladding

Frame - Timber Glulam

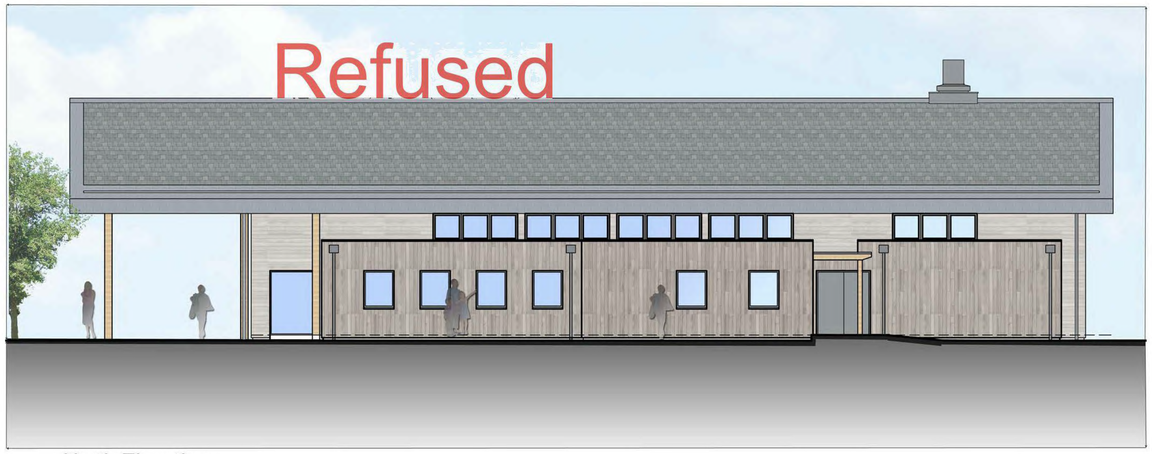
Roof - Main Roof Slate with Grey Aluminium Perimeter

Flat Roof - Grey Single Ply Membrane

Windows/Doors - Grey Aluclad Windows

D9

Refused



North Elevation

Refused

South Elevation

Refused

West Elevation

REVISIONS

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CLIENT

Duntrune Ltd.
Kinnells Mill
Friockheim
Angus
DD11 4UL

PROJECT

Proposed New Crematorium
Burnside of Duntrune
By Dundee
Angus

DRAWING TITLE

Elevations & Section

SCALE	DATE
1:100	May 2020
CAD FILE	DRAWN BY
1266	PF

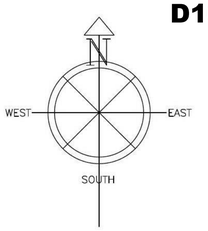
@rchitects
Chartered Architects
15 West High Street
Forfar, Angus
DD8 1BE
Tel: 01307 466480
Email: paul@rchitects.org.uk

DWG NO.

1266 / PD / 05

NOTES

D10



Refused

Refused

New Trees

New Dry Stone Wal

Refused

New Access

A

Block Paving

Block Paving

Paving

Landscape Feature

Rendered Retaining Wall

Grass

Memorial Walls

Shrubs

Shrubs

Overflow Parking 5No

Access Road

Overflow Parking 8No

Overflow Parking 7No

Existing Trees

Existing Trees

Existing Road to be widened as per Engineers drawings

Existing Road to be widened as per Engineers drawings

Existing Road to be widened as p Engineers drawings

Grass Verge

Grass Verge

Visible Splay

Visible Splay

New Stone Gate

New Tree

0 1 2 3 4 5 10 15 20

Scale : 1:200

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CLIENT

Duntrune Ltd.
Kinnells Mill
Friockheim
Angus
DD11 4UL

PROJECT

Proposed New Crematorium
Burnside of Duntrune
By Dundee
Angus

DRAWING TITLE

Road Access

SCALE 1:200

DATE May 2020

CAD FILE 1266

DRAWN BY PF

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DWG NO.

1266 / SK / 06 Rev C

NOTES

D11

Refused

Refused

Refused

Glack Hill

Duntrune Hill

BM 113.55m

118.1m

108.1m

New Tree Edge Planting

Existing Woodland

Post & Wire Fence

New Trees

New Dry Stone Wall

New Tree Planting

BM 96.26m

Westhall Cottage

New Access

New Native Hedge

Existing Woodland

Existing Woodland

Eglismonithie

Duntrune House

Duntrune House

A

A

0 10 20 30 40 50 60 70 80 90 100

Scale : 1:1250

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CLIENT

Duntrune Ltd.
Kinnells Mill
Friockheim
Angus
DD11 4UL

PROJECT

Proposed New Crematorium
Burnside of Duntrune
By Dundee
Angus

DRAWING TITLE

Site Plan

SCALE	DATE
1:1250	May 2020
CAD FILE	DRAWN BY
1266	PF

@rchitects
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Refused

Post & Wire Fence

NOTES

D12

N
WEST
EAST
SOUTH

Total parking provided = 72 spaces (includes 4 staff spaces).
The total parking figure above includes 7 disabled spaces, 1 of which is for staff..

52 overflow spaces, 1No bus waiting area

Electric Car Charger
Service Road
Bin Store
Block Paving
Block Paving
Overflow Parking 10 No
Refused
Grass
New Tree
New Tree
New Tree
Paving
Landscape Feature
New Tree
New Tree
New Tree
Grass
Memorial Walls
Shrubs
Shrubs
Memorial Walls
Memorial Walls
Memorial Garden
New Tree
New Tree
New Tree
Rendered Retaining Wall
Bus Waiting
Overflow Parking 5No
Refused
Access Road
New Tree
Overflow Parking 8No
New Trees
New Tree
Overflow Parking 7No
New Tree
Existing Trees
WOODLAND
WOODLAND
New Dry S

0 1 2 3 4 5 10 15 20
Scale : 1:200

REVISIONS

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CLIENT
Duntrune Ltd.
Kinnells Mill
Friockheim
Angus
DD11 4UL

PROJECT
Proposed New Crematorium
Burnside of Duntrune
By Dundee
Angus

DRAWING TITLE
Building & External Works Plan

SCALE 1:200
DATE May 2020
CAD FILE 1266
DRAWN BY PF

@rchitects
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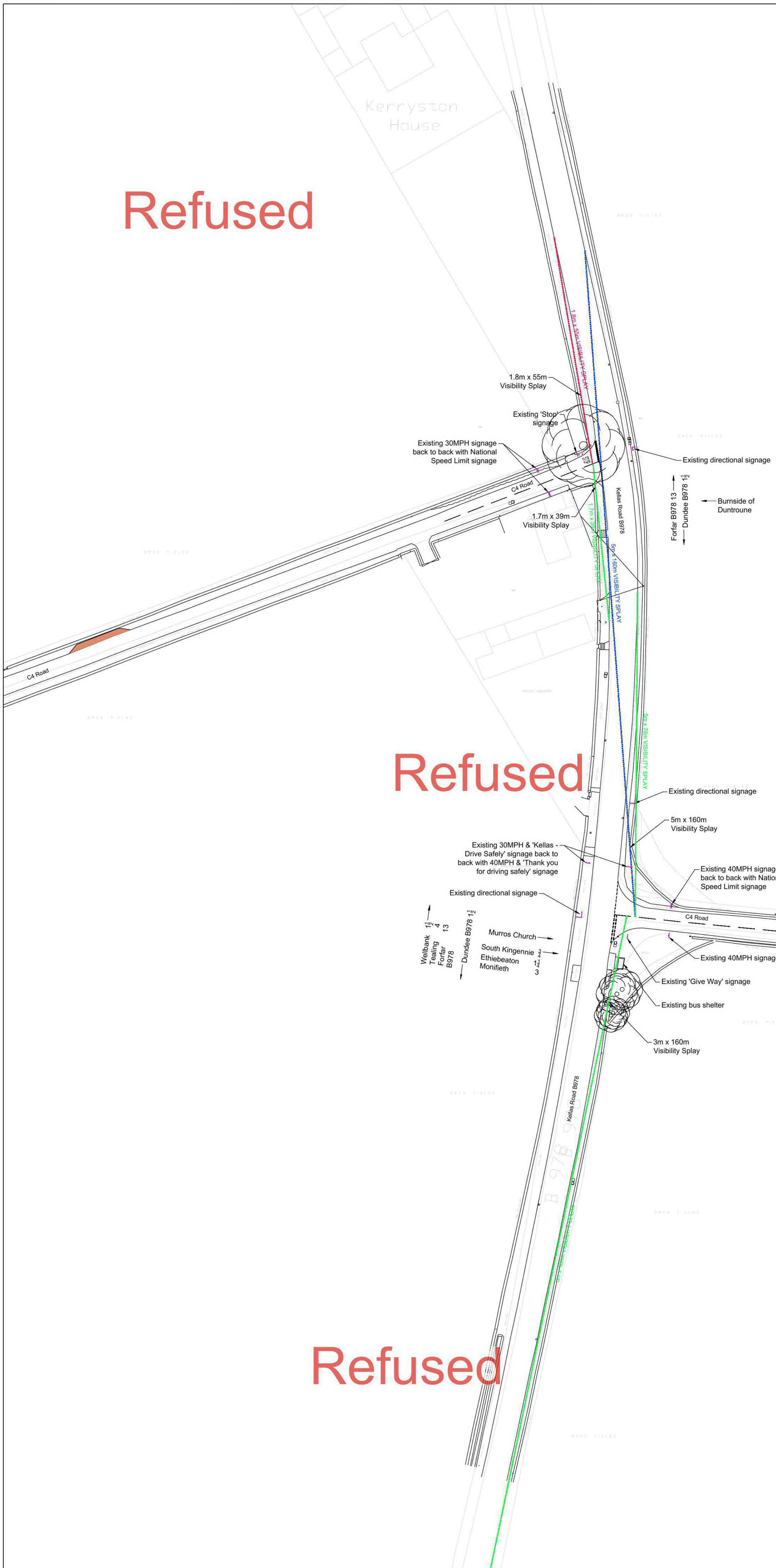
FIGURED DIMENSIONS ONLY TO BE USED

North

D13



Issue	Revision	Initial	Date
1	Visibily splay to Tangent added	BAC	15.02.21

Cameron + Ross
CIVIL + STRUCTURAL ENGINEERING
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Client:
FM & G Batchelor

Project:
Crematorium at Burnside of Duntrune, Duntrune, Angus

Drawing Title:
Roads Visibility Splays
Sheet 3 of 3

Status:
Concept

Scale:	1:500 @ A1	Date:	20/02/2020
By:	CRM	Checked: BAC	Approved: RAG

Dwg. No.	Rev.
A/190889 – 906	1

SCIENTIFICS MONITORING REPORT FORM
Hydrogen chloride to BS EN 1911

Company	City of London
Site	Crematorium
Sample point	Cremator 1 run 2
Test carried out by	S Huntley & T Swanneck
Determinand	Hydrogen chloride to BS EN 1911

Test Ref	HCl
Date	07-Jan-10
Time start	11:40
Time End	13:10
Duration (min)	90
Sampling conditions	crem 1 (b)

ANALYSIS OF COLLECTED SOLUTIONS

Determination		HCl
Volume of sampling solution in first stage (Vs1)	ml	680
Volume of sampling solution in field blank (Vsb)	ml	190
Chloride detection limit in sampling solution (qd)	mg/l	0.10
Chloride in first stage sampling solution (qs1)	mg/l	0.25
Chloride in field blank sampling solution (qcb)	mg/l	0.00
Emission limit value (ELV, daily)	mg/m³	200

Calculation of hydrogen chloride concentration in duct gas, Cg

C_g (mg/m³) = $(([V_{s1} \times q_{s1}]+[V_{sb} \times q_{cb}]) \times MW_c)/(V_{std} \times MW_{cl} \times N_a)$

where MWc is the molecular weight of hydrogen chloride (i.e. 36.5 kg/kgmole)
MWcl is the molecular weight of the chloride ion (i.e. 35.5 kg/kgmole)
Na is the number of chloride ions in hydrogen chloride (i.e. 1)

Calculation of hydrogen chloride discharge rate, Dg

$D_g = C_g \times Q_{s,w} \times 0.0036$

MEASUREMENTS OF HYDROGEN CHLORIDE

Determination		HCl
Concentration at reference conditions (C_g)	mg/m³	0.80
Uncertainty (95% confidence limit)	mg/m³	0.80
Uncertainty as a proportion of ELV	%	0.40
Discharge rate (D_g)	kg/h	0.001
Uncertainty (95% confidence limit)	kg/h	0.001
Detection limit	mg/m³	0.320

FIELD BLANK

Determination		HCl
Field blank concentration*	mg/m³	0.00
Field blank as a proportion of ELV	±%	0.0

*assuming same sample volume as for sample

Uncertainty Calculation Parameters

Standard uncertainty for gas volume measurement (U6)	2.9 %
Standard uncertainty for liquid volume measurement (U16)	1 %
Analytical uncertainty at X times LOD (U15)	5 %
X (U15)	10
Standard uncertainty for oxygen correction (U11)	0.95 %
Standard uncertainty for gas flow measurement (U14)	5.7 %

Uncertainty budget

Uncertainties		HCl
Sample gas volume measurement (m_{vol})	%	2.9
Solution volume measurement (m_{vol})	%	1.0
Analysis of washings (m_w)	%	84.2
Total for uncorrected measurement (U_c)	mg/m³	0.67
Correction to reference conditions (m_{corr})	mg/m³	0.00
Concentration at 95% confidence interval (U_{95})	mg/m³	0.800

Based on Procedure 55 and Uncertainty Policies 11 & 16
(in accordance with requirements of BS EN ISO 14956:2002 and ENV 13005 (GUM))

COMPLIANCE WITH STANDARD

Probe temperature is at least 150C (Clause 6.2)
Leak rate less than 2% of sample rate (Clause 1-6.2)
Sampling within 10% of isokinetic conditions (Clause 1-5.1.5)
Absorption efficiency not determined
Sample concentration is greater than 10 times field blank (3-4.2.1)
Field blank concentration is less than 10% of ELV (not normative)
Measurement uncertainty is less than 20% of ELV (not normative)

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SCIENTIFICS MONITORING REPORT FORM
Carbon Monoxide to BS EN 15058:2006

Company	City of London	Date	7-Jan-10
Site	Crematorium	Test Ref	crem 1 (b)
Sample point	Cremator 1, run 2	Time Start	11:43
Test carried out by	S Huntley & T Swannack	Time End	13:13

Measurements: 5 minutes' averaging period

Start	End	No. Readings	Maximum	Minimum	Average	Maximum	Minimum	Average
			ppm , dry			$mgCO/m^3$, ref. cond.		
11:43	11:48	20	<5	<5	<5	10	<5	6
11:48	11:53	20	<5	<5	<5	8	<5	<5
11:53	11:58	20	<5	<5	<5	10	<5	6
11:58	12:03	20	<5	<5	<5	9	<5	<5
12:03	12:08	20	<5	<5	<5	15	<5	7
12:08	12:13	20	<5	<5	<5	6	<5	<5
12:13	12:18	20	<5	<5	<5	5	<5	<5
12:18	12:23	20	<5	<5	<5	<5	<5	<5
12:23	12:28	20	<5	<5	<5	<5	<5	<5
12:28	12:33	20	<5	<5	<5	11	<5	<5
12:33	12:38	20	<5	<5	<5	8	<5	<5
12:38	12:43	20	10	<5	6	48	6	26
12:43	12:48	20	6	<5	<5	38	10	20
12:48	12:53	20	12	<5	6	52	12	33
12:53	12:58	20	<5	<5	<5	22	<5	11
12:58	13:03	20	<5	<5	<5	9	<5	6
13:03	13:08	20	<5	<5	<5	8	<5	5
13:08	13:13	20	<5	<5	<5	6	<5	<5
11:43	13:13	360	12	<5	<5	52	<5	8

Summary of measurements

Average concentration	8 $mgCO/m^3$
Uncertainty	8 $mgCO/m^3$
Discharge rate	0.0062 kgCO/h

Compliance with BS 15058:2006

No correction for drift applied (Clause 8.4.3)
Response time is within limit (Clause 7.2)
Uncertainty is within specified limit of 6% of ELV (Clause 7.3)

Calibration Checks

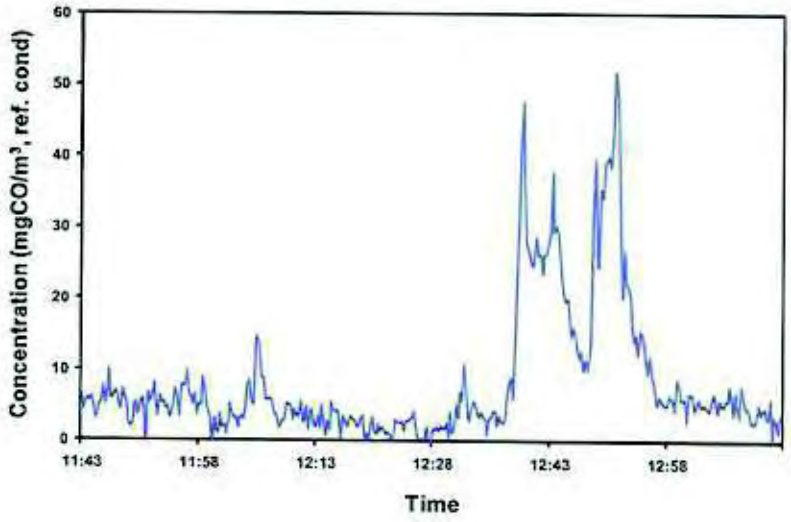
Type Horiba PG 250 **Range** 0 to 50 ppm
Equipment No. P1301
Measurement method Non-dispersive infra-red

Calibration		Zero	Span
Gas reference		CH49	DG2
Concentration	ppm	0.00	25.12
		Analyser response	
Gas into analyser before sampling	ppm	0.00	25.14
Gas into system before sampling	ppm	-0.20	25.12
Gas into system after sampling	ppm	-0.30	25.30
Drift	% span	0.40	0.72
Response time	s	26	

Uncertainty budget

Quantity		Variation		Value		Partial uncertainty (x_{conc})		x_{conc}^2
						ppm CO	mgCO/m³	
Lack of fit	$u(Corr_{lof})$	-		2.00	% range	0.58	0.72	0.52
Zero drift	$u(Corr_{zero})$	-		0.26	% range	0.08	0.09	0.01
Span drift	$u(Corr_{span})$	-		0.29	% range	0.08	0.10	0.01
Sample volume flow	$u(Corr_{vol})$	-		0.00	% range	0.00	0.00	0.00
Atmospheric pressure	$u(Corr_{atmos})$	0	kPa	0.00	% range/2kP	0.00	0.00	0.00
Ambient temperature	$u(Corr_{temp})$	2	K	0.50	% range/10K	0.01	0.02	0.00
Electric voltage	$u(Corr_{volt})$	40	V	0.00	% range/10V	0.00	0.00	0.00
Interferents	$u(Corr_{int})$	-		1.50	% range	0.45	0.56	0.33
Losses & leakage	$u(Corr_{loss})$	-		0.00	% range	0.00	0.00	0.00
Repeatability at zero	$u(Corr_{rep0})$	-		0.14	% range	0.04	0.05	0.00
Repeatability at span	$u(Corr_{repS})$	-		0.00	% range	0.00	0.00	0.00
Converter efficiency	$u(Corr_{conv})$	-		100.00	% reading	0.00	0.00	0.00
Response factor	$u(Corr_{resp})$	-		100.00	% reading	0.00	0.00	0.00
Calibration gas	$u(Corr_{gas})$	-		1.00	% value	0.40	0.50	0.25
Combined uncertainty	$u(C_{co})$							1.06
Expanded uncertainty	$U(C_{co})$							2.08
$U(C_{co})/ELV$ (%)								2.08

Measured concentration of Carbon Monoxide at Cremator 1, run 2



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SCIENTIFICS MONITORING REPORT FORM
Volatile Organic Compounds to BS EN 12619:1999 & BS EN 13526:2002

Company	City of London	Date	7-Jan-10
Site	Crematorium	Test Ref	crem 1 (b)
Sample point	Cremator 1, run 2	Time Start	11:40
Test carried out by	S Huntley & T Swannack	Time End	13:10

Measurements: 5 minutes' averaging period

Start	End	No. Readings	Maximum	Minimum	Average	Maximum	Minimum	Average
			ppm , wet			mgCarbon/m3, ref cond.		
11:40	11:45	10	<1	<1	<1	2.8	2.7	2.7
11:45	11:50	10	<1	<1	<1	2.8	2.7	2.7
11:50	11:55	10	<1	<1	<1	2.7	2.4	2.6
11:55	12:00	10	<1	<1	<1	2.9	2.5	2.7
12:00	12:05	10	<1	<1	<1	2.7	2.4	2.6
12:05	12:10	10	<1	<1	<1	2.8	2.4	2.6
12:10	12:15	10	<1	<1	<1	2.5	2.1	2.3
12:15	12:20	10	<1	<1	<1	2.4	2.1	2.3
12:20	12:25	10	<1	<1	<1	2.4	2.0	2.2
12:25	12:30	10	<1	<1	<1	2.2	1.8	2.0
12:30	12:35	10	<1	<1	<1	2.3	1.7	2.0
12:35	12:40	10	<1	<1	<1	2.1	1.8	2.0
12:40	12:45	10	<1	<1	<1	2.4	1.9	2.2
12:45	12:50	10	<1	<1	<1	2.5	1.9	2.2
12:50	12:55	10	<1	<1	<1	2.6	1.8	2.3
12:55	13:00	10	<1	<1	<1	2.4	2.2	2.3
13:00	13:05	10	<1	<1	<1	2.2	2.1	2.2
13:05	13:10	10	<1	<1	<1	2.0	1.9	1.9
11:40	13:10	180	<1	<1	<1	2.9	1.7	2.3

Summary of measurements

Average concentration	2.3 mgCarbon/m3
Uncertainty	2.3 mgCarbon/m3
Discharge rate	0.0018 kgCarbon/h

Compliance with BS EN 12619/BS EN 13526

Correction for drift applied to measurements (BS EN 14789, Clause 8.4.3)
Response time is within limit (BS EN 12619, Clause 6.1.1)
Uncertainty is within specified limit of 10% of ELV (BS EN 14789, Clause 1)

Calibration Checks

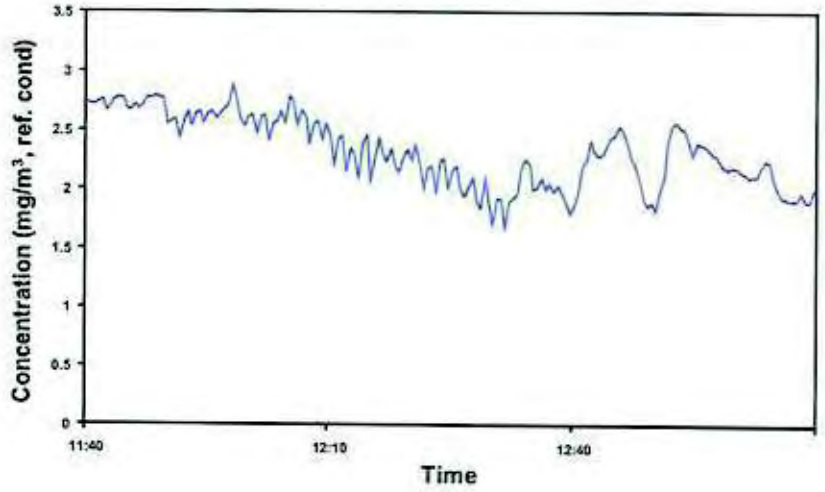
Type Bernath 3006 **Range** 0 to 10 ppm
Equipment No. P1366
Measurement method Flame ionisation detection

Calibration		Zero	Span
Gas reference		CH49	DG2
Concentration	ppm	0.00	8.92
		Analyser response	
Gas into analyser before sampling	ppm	-0.34	8.95
Gas into system before sampling	ppm	-0.54	8.86
Gas into system after sampling	ppm	-0.26	8.92
Drift	% span	3.14	0.68
Response time	s	9	

Uncertainty budget

Quantity		Variation		Value		Partial uncertainty (x_{mod})		x_{mod}^2
						ppm	mg/m³	
Lack of fit	$u(Corr_{lof})$	-		2.00	% range	0.12	0.19	0.03
Zero drift	$u(Corr_{z,d})$	-		2.00	% range	0.12	0.19	0.03
Span drift	$u(Corr_{s,d})$	-		2.00	% range	0.12	0.19	0.03
Sample volume flow	$u(Corr_{v,d})$	-		1.00	% range	0.06	0.09	0.01
Atmospheric pressure	$u(Corr_{atmos})$	0	kPa	0.50	% range/2kP	0.00	0.00	0.00
Ambient temperature	$u(Corr_{temp})$	2	K	2.00	% range/10K	0.01	0.02	0.00
Electric voltage	$u(Corr_{volt})$	40	V	2.00	% range/10V	0.23	0.37	0.14
Interferents	$u(Corr_{int})$	-		3.50	% range	0.20	0.32	0.11
Losses & leakage	$u(Corr_{loss})$	-		0.60	% range	0.03	0.05	0.00
Repeatability at zero	$u(Corr_{r,zer})$	-		1.00	% range	0.06	0.09	0.01
Repeatability at span	$u(Corr_{r,spa})$	-		2.00	% range	0.12	0.19	0.03
Converter efficiency	$u(Corr_{conv})$	-		100.00	% reading	0.00	0.00	0.00
Response factor	$u(Corr_{resp})$	-		100.00	% reading	0.00	0.00	0.00
Calibration gas	$u(Corr_{cal})$	-		1.00	% value	0.06	0.10	0.01
Combined uncertainty	$u(C_{VOC})$							0.53
Expanded uncertainty	$U(C_{VOC})$							1.24
$U(C_{VOC})$/ELV (%)								6.22

Measured concentration of Volatile Organic Compounds at Cremator 1, run 2



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SCIENTIFICS MONITORING REPORT FORM
Oxygen to BS EN 14789:2005

Company	City of London	Date	7-Jan-10
Site	Crematorium	Test Ref	crem 1 (b)
Sample point	Cremator 1, run 2	Time Start	11:43
Test carried out by	S Huntley & T Swannack	Time End	13:13

Measurements: 5 minutes' averaging period

Start	End	No. Readings	Maximum	Minimum	Average	Maximum	Minimum	Average
			% dry			% dry		
11:43	11:48	20	18.9	18.4	18.8	18.9	18.4	18.8
11:48	11:53	20	18.7	18.2	18.5	18.7	18.2	18.5
11:53	11:58	20	19.1	18.3	18.7	19.1	18.3	18.7
11:58	12:03	20	18.8	18.2	18.5	18.8	18.2	18.5
12:03	12:08	20	18.7	18.1	18.4	18.7	18.1	18.4
12:08	12:13	20	18.3	17.9	18.1	18.3	17.9	18.1
12:13	12:18	20	18.4	17.8	18.1	18.4	17.8	18.1
12:18	12:23	20	18.3	17.8	18.1	18.3	17.8	18.1
12:23	12:28	20	18.3	17.5	17.9	18.3	17.5	17.9
12:28	12:33	20	19.3	17.7	18.2	19.3	17.7	18.2
12:33	12:38	20	18.7	17.7	18.0	18.7	17.7	18.0
12:38	12:43	20	19.4	17.5	18.3	19.4	17.5	18.3
12:43	12:48	20	18.9	17.3	18.0	18.9	17.3	18.0
12:48	12:53	20	19.2	17.1	18.4	19.2	17.1	18.4
12:53	12:58	20	18.8	17.9	18.3	18.8	17.9	18.3
12:58	13:03	20	18.3	17.8	18.1	18.3	17.8	18.1
13:03	13:08	20	18.6	17.8	18.2	18.6	17.8	18.2
13:08	13:13	20	18.2	17.9	18.1	18.2	17.9	18.1
11:43	13:13	360	19.4	17.1	18.3	19.4	17.1	18.3

Summary of measurements

Average concentration	18.3 $\%O_2$, dry
Uncertainty	0.6 $\%O_2$, dry

Compliance with BS 15058:2006

No correction for drift applied (Clause 8.4.3)
Response time is within limit (Clause 7.2)
Uncertainty is within specified limit of 6% of measured concentration (Clause 1)

Calibration Checks

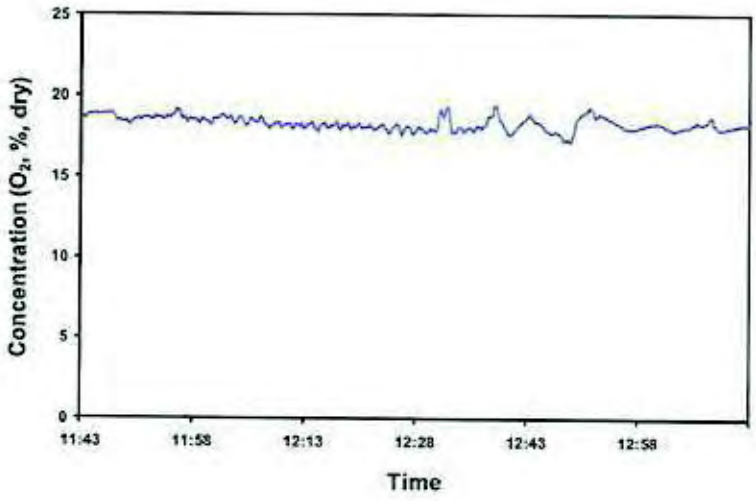
Type Horiba PG 250 **Range** 0 to 25 %
Equipment No. P1301
Measurement method Zirconium cell

Calibration		Zero	Span
Gas reference		CH49	DG2
Concentration	%	0.00	13.10
		Analyser response	
Gas into analyser before sampling	%	0.00	13.05
Gas into system before sampling	%	0.00	13.08
Gas into system after sampling	%	0.10	13.15
Drift	% span	0.76	0.54
Response time	s	22	

Uncertainty budget

Quantity		Variation		Value		Partial uncertainty (x_{max})	x_{max}^2
						$\%O_2$	
Lack of fit	$u(Corr_{lof})$	-		2.00	% range	0.29	0.08
Zero drift	$u(Corr_{z,d})$	-		0.11	% range	0.02	0.00
Span drift	$u(Corr_{s,d})$	-		0.24	% range	0.03	0.00
Sample volume flow	$u(Corr_{s,vf})$	-		0.00	% range	0.00	0.00
Atmospheric pressure	$u(Corr_{atmos})$	0	kPa	0.00	% range/2kPa	0.00	0.00
Ambient temperature	$u(Corr_{temp})$	2	K	0.40	% range/10K	0.01	0.00
Electric voltage	$u(Corr_{mv})$	40	V	0.00	% range/10V	0.00	0.00
Interferents	$u(Corr_{int})$	-		0.00	% range	0.00	0.00
Losses & leakage	$u(Corr_{leak})$	-		0.08	% range	0.01	0.00
Repeatability at zero	$u(Corr_{r,zero})$	-		0.00	% range	0.00	0.00
Repeatability at span	$u(Corr_{r,span})$	-		0.00	% range	0.00	0.00
Converter efficiency	$u(Corr_{conv})$	-		100.00	% reading	0.00	0.00
Response factor	$u(Corr_{resp})$	-		100.00	% reading	0.00	0.00
Calibration gas	$u(Corr_{gas})$	-		1.00	% value	0.13	0.02
Combined uncertainty	$u(C_{O2})$						0.32
Expanded uncertainty	$U(C_{O2})$						0.62
$U(C_{O2})/C_{O2}(\%)$							3.40

Measured concentration of Oxygen at Cremator 1, run 2



SCIENTIFICS MONITORING REPORT FORM
Carbon Dioxide to ISO 12039:2001

Company	City of London	Date	7-Jan-10
Site	Crematorium	Test Ref	crem 1 (b)
Sample point	Cremator 1, run 2	Time Start	11:43
Test carried out by	S Huntley & T Swannack	Time End	13:13

Measurements: 5 minutes' averaging period

Start	End	No. Readings	Maximum	Minimum	Average	Maximum	Minimum	Average
			%, dry			$\%CO_2$, ref. cond.		
11:43	11:48	20	1.4	1.1	1.2	5.7	5.3	5.5
11:48	11:53	20	1.6	1.2	1.3	5.6	5.3	5.5
11:53	11:58	20	1.4	0.9	1.2	5.4	5.1	5.3
11:58	12:03	20	1.5	1.1	1.3	5.5	5.1	5.3
12:03	12:08	20	1.5	1.1	1.3	5.4	5.2	5.3
12:08	12:13	20	1.7	1.4	1.5	5.5	5.3	5.4
12:13	12:18	20	1.7	1.3	1.5	5.5	5.3	5.4
12:18	12:23	20	1.7	1.4	1.5	5.4	5.3	5.4
12:23	12:28	20	1.9	1.4	1.6	5.5	5.3	5.4
12:28	12:33	20	1.8	0.8	1.4	5.5	4.9	5.3
12:33	12:38	20	1.8	1.2	1.6	5.7	5.2	5.5
12:38	12:43	20	2.8	0.7	1.9	8.3	4.7	7.2
12:43	12:48	20	3.1	1.6	2.3	8.4	7.2	7.8
12:48	12:53	20	3.2	1.1	1.9	8.6	6.1	7.2
12:53	12:58	20	2.1	1.3	1.8	7.1	6.2	6.6
12:58	13:03	20	2.2	1.8	2.0	7.1	6.9	7.0
13:03	13:08	20	2.2	1.5	2.0	7.3	6.7	7.1
13:08	13:13	20	2.0	1.8	1.9	6.7	6.5	6.6
11:43	13:13	360	3.2	0.7	1.6	8.6	4.7	6.0

Summary of measurements

Average concentration	6.0 $\%CO_2$
Uncertainty	1.2 $\%CO_2$

Compliance with BS 14792:2005

No correction for drift applied (BS EN 14789, Clause 8.4.3)
Response time is within limit (ISO 12039, Clause A.2)
Uncertainty is above specified limit of 6% of measured concentration (BS EN 14789, Clause 1) - non compliance

Calibration Checks

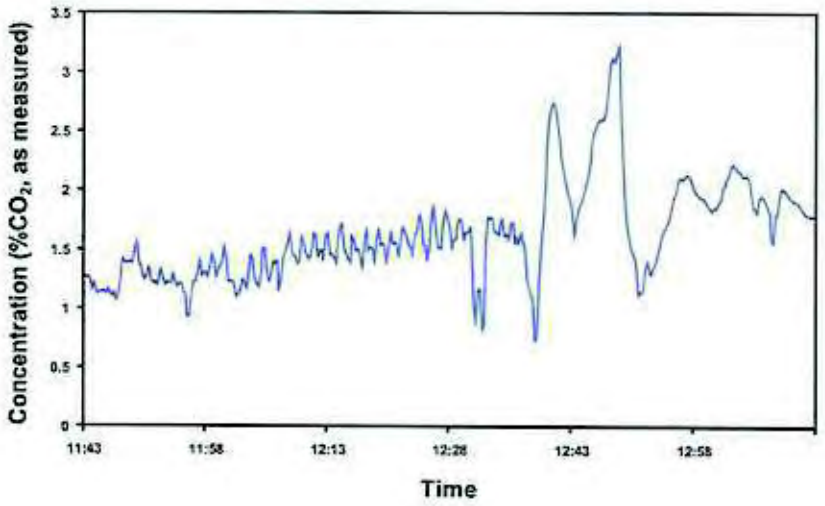
Type	Horiba PG 250	**Range**	0 to 10 %
Equipment No.	P1301		
Measurement method	Non-dispersive infra-red		

Calibration		Zero	Span
Gas reference		CH49	DG2
Concentration	%	0.00	5.08
		Analyser response	
Gas into analyser before sampling	%	0.00	5.09
Gas into system before sampling	%	0.05	5.10
Gas into system after sampling	%	0.12	5.20
Drift	% span	1.36	1.96
Response time	s	27	

Uncertainty budget

Quantity		Variation		Value		Partial uncertainty ($x_{i,max}$)	$x_{i,max}^2$
						%CO_2	
Lack of fit	$u(Corr_{lof})$	-		2.00	% range	0.12	0.01
Zero drift	$u(Corr_{z,d})$	-		0.26	% range	0.02	0.00
Span drift	$u(Corr_{s,d})$	-		0.29	% range	0.02	0.00
Sample volume flow	$u(Corr_{v,s})$	-		0.00	% range	0.00	0.00
Atmospheric pressure	$u(Corr_{atmos})$	0	kPa	0.00	% range/2kPa	0.00	0.00
Ambient temperature	$u(Corr_{temp})$	2	K	0.50	% range/10K	0.00	0.00
Electric voltage	$u(Corr_{el})$	40	V	0.00	% range/10V	0.00	0.00
Interferents	$u(Corr_{int})$	-		1.60	% range	0.09	0.01
Losses & leakage	$u(Corr_{loss})$	-		0.00	% range	0.00	0.00
Repeatability at zero	$u(Corr_{r,zero})$	-		0.14	% range	0.01	0.00
Repeatability at span	$u(Corr_{r,span})$	-		0.00	% range	0.00	0.00
Converter efficiency	$u(Corr_{conv})$	-		100.00	% reading	0.00	0.00
Response factor	$u(Corr_{resp})$	-		100.00	% reading	0.00	0.00
Calibration gas	$u(Corr_{cal})$	-		1.00	% value	0.05	0.00
Combined uncertainty	$u(C_{corr})$						0.16
Expanded uncertainty	$U(C_{corr})$						0.31
$U(C_{corr})/C_{corr}$(%)							19.07

Measured concentration of Carbon Dioxide at Cremator 1, run 2



SCIENTIFICS MONITORING REPORT FORM
WATER VAPOUR DETERMINATION to BS EN 14790:2005

Company	City of London	Test Ref	crem 1 (b)
Site	Crematorium	Date	07-Jan-10
Sample point	Cremator 1 run 2	Time start	11:40
Test carried out by	S Huntley & T Swannack	Time End	13:10
		Duration (min)	90
		Data from	crem 1 (b)

Collection of water from gas

Collection Stage (s)	Initial Mass(Mc,i) g	Final Mass (Mc,i) g	Mass gain (Mc) g
Container 1	784.96	803.11	14.15
Container 2	909.47	913.89	4.42
Container 3	617.17	619.74	2.57
Container 4	897.53	902.36	4.83
Total (M)	3113.13	3139.1	25.97

Calculation of dry gas sample volume at STP (SV_{STP})

SV_{STP} = $SV_m \times (273/(273 + T_m)) \times (P_m/101.3)$

Volume of dry gas sampled at STP (SV_{STP})	m^3	0.8331

Calculation of water vapour content (H_2O_{sat})

H_2O_{sat} = $100 \times [M \times MV_{STP}/MW_{H2O}]/[SV_{STP} + (M \times MV_{STP}/MW_{H2O})]$

where: MV_{STP} molecular volume at STP (22.412 m^3/kgmole)

MW_{H2O} molecular weight of water (18 kg/kgmole)

Water vapour content (H_2O_{sat})	%	3.74	± 0.19

Compliance with BS 14790

Uncertainty less than 20% of measured value (Clause 7.3)

Temperature is greater than 4oC based on calculated water dew point (Clause 6.4.3) - outside standard

Leak rate is no more than 2% of sample flow rate

Sampling duration is within minimum of 30 minutes (Clause 6.1)

Sampling volume is within minimum of 501 (Clause 6.1)

Residual water content at outlet is below 1.25%(Clause 5.8)

Sampling temperature was within minimum of 120oC during sampling (Clause 5.2)

Uncertainty Budget (based on BS 14790 and Uncertainty Policy U25)

Volume of sampled gas	V	0.835 m^3
Average temperature of gas at meter	T	15.4 °C
Average barometric pressure at meter	P	996 mb
Sampling line leakage		0.000175 m^3/min
Duration of sampling	t	90 min
Total mass weighed	M	3139.1 g

Source of uncertainty		Value		Value of standard uncertainty		Relative standard uncertainty (%)	
Measurement of sample gas volume	$u_r V_m$	2.0 %	u_r	$u_r V_m = \frac{u_r}{\sqrt{3}}$	0.0096 m^3	$u_r V_m$	1.15
Measurement of sample gas temperature	$u_r T_m$	1.0 %	u_r	$u_r T_m = \frac{u_r (T+273)}{\sqrt{3}}$	1.6884 K	$u_r T_m$	0.58
Measurement of absolute pressure	$u_r P_m$	1.0 %	u_r	$u_r P_m = \frac{u_r}{\sqrt{3}}$	5.7159 mb	$u_r P_m$	0.58
Leakage in sampling line	$u_r L$	1.0 %	u_r	$u_r L = \frac{u_r}{\sqrt{3}}$	0.0091 m^3	$u_r L$	1.09
Measurement of weight - balance uncertainty	$u_r W_m$	0.01 %	u_{rm}	$u_r W_m = \frac{u_{rm}}{\sqrt{3}}$	0.1812 g		-
Measurement of weight - balance repeatability	$u_r W_r$	0.211 g	u_{rr}	$u_r W_r = u_{rr}$	0.0110 g		-
Total measurement of weight	$u_r W$	-	-	$u_r W =$	0.1922 g	$u_r W$	0.74

Total standard relative uncertainty	$u_c = \sqrt{u_r V_m^2 + u_r T_m^2 + u_r P_m^2 + u_r L^2 + u_r W^2} \times Corr$	2.65 %
Total relative uncertainty	$U = 1.96 u_c$	5.19 %

SCIENTIFICS MONITORING REPORT FORM
TOTAL PARTICULATE MATTER to BS EN 13284-1/BS ISO 9096

Company	City of London	Test Ref	crem 1 (c)
Site	Crematorium		
Sample point	Cremator 1 run 3		
Test carried out by	S Huntley & T Swannack		

SAMPLING TIMES

Determination		tpm
Date		07-Jan-10
Time Start		13:41
Time End		15:21
Duration (t)	min	100

Sampling plane

Dimension traversed by sampling probe (D)	m	0.42
Cross sectional area of sampling plane (A)	m^2	0.18

Duct gas conditions

Determination		tpm
Ambient temperature (T_{Amb})	°C	7.0
Average duct gas temperature (T_{duct})	°C	340.0
Duct static gas pressure (P_{Static})	kPa	-0.05
Barometric pressure (P_{Baro})	kPa	99.00
Volume flow rate @ ref. conditions (Q_{Ref})	m^3/s	0.19
Gas compressibility correction (c)		0.995
Wet gas density (ρ_w)		0.55
Exhaust gas conditions measurements		crem 1 (c)

Reference conditions

Determination		tpm
Actual Duct Flow Conditions		
Average temperature (T_{duct})	°C	340.0
Total pressure (P_{duct})	kPa	98.95
Oxygen (O_{2duct})	% vol,dry	18.40
Water vapour (H_2O_{duct})	% vol	3.22
Reference Conditions		
Temperature (T_{Ref})	°C	0
Pressure (P_{Ref})	kPa	101.3
Oxygen (O_{2Ref})	% vol, dry	11
Water vapour (H_2O_{Ref})	% vol	0

Sampling conditions

Determination				tpm
Nozzle diameter (d)	TI 24	Titanium	mm	6.280
Initial gas meter reading			m^3	631.397
Final gas meter reading			m^3	632.401
Sampled volume (SV_M)			m^3	1.004

Calculation of sample gas volume at reference conditions, SV_{Ref}

$$SV_{Ref} = SV_{Meter} \times Y \times [273 + T_{Ref}]/[273 + T_{Meter}] \times P_{Meter}/P_{Ref} \times [100-H_2O_{Meter}]/[100-H_2O_{Ref}] \times [20.9-O_{2Duct}]/[20.9-O_{2Ref}]$$

Corrections
Temperature
Pressure
Water vapour
Oxygen

Determination		tpm
Sampled volume @ ref. conditions (SV_{Ref})	m^3	0.213

SAMPLING DATA tpint Test Ref crem 1 (c)

Initial gas meter reading: 631237 Start Time: 13:41

Distance from Duct Wall Position of D	Port	Time of Day h:m:s	Run time min	Gas meter reading l	Pitot Reading (h) mm w.g.	Orifice Plate w.g. Desired (ΔH_d) $= h \times K_f \times Cp^2$	Orifice Plate w.g. Actual (ΔH_a)	Isokinetic difference ($\Delta H_d/\Delta H_a$) %	Gas (T_{duct}) °C	Probe (T_p) °C	Filter (T_f) °C	Meter (T_m) Inlet °C	Meter (T_m) Outlet °C	Impinger (T_{imp}) °C	Oxygen Content % v/v, dry
0.500	A	13:41	5	631287	2.6	7.47	8	107	340	150	157	23.0		7	
		13:46	5	631434	4.8	10.54	11.3	107	336	151	158	22.8		8	
		13:51	10	631468	2.4	5.27	5.7	108	349	150	156	23.0		9	
		13:56	15	631526	2.1	4.61	5	108	348	150	160	22.9		10	
		14:01	20	631571	2.2	4.83	5.2	108	347	150	158	22.0		11	
		14:06	25	631611	2.1	4.61	5	108	346	150	159	23.0		12	
		14:11	30	631651	2.1	4.61	5	108	345	151	161	23.0		14	
		14:16	35	631691	2.6	5.71	6.1	107	344	151	161	23.0		14	
		14:21	40	631736	2.3	5.05	5.4	107	346	151	158	23.0		15	
		14:26	45	631777	2.8	6.15	6.6	107	343	151	160	23.0		15	
		14:31	50	631822	1.6	3.51	3.8	108	341	150	160	23.0		16	
		14:36	55	631863	1.4	3.08	3.3	107	338	150	160	22.0		16	
		14:41	60	631894	1.4	3.08	3.3	107	335	151	160	22.8		17	
		14:46	65	631937	8.5	18.01	19.2	107	340	150	160	22.0		18	
		14:51	70	631985	4.8	10.54	11.3	107	333	150	160	23.0		18	
		14:56	75	632054	13.2	28.09	31.1	107	335	150	160	22.0		19	
		15:01	80	632135	11	24.16	26	108	335	150	160	22.8		7	
		15:06	85	632238	9.5	20.87	22.4	107	338	150	160	22.0		8	
		15:11	90	632363	7.8	17.13	18.4	107	339	151	161	23.0		9	
		15:16	95	632371	3.5	7.83	7.5	107	334	151	161	23.0		11	
		15:21	100	632401											
	Averages								340.8	150.3	159.8	22.1		12.7	n.m

Final gas meter reading: 632401 End Time: 15:21

Equipment used

Item	Ric No.
Control box	P1382
Meter coefficient (y)	0.928
K factor (K, independent of C_p)	3.113
Orifice plate pressure units	mm w.g.
Pitot differential pressure units	mm w.g.
Pitot	S
Pitot coefficient (C_p)	0.84
Probe liner thermocouple Titanium	P1667
Duct gas thermocouple	P1611
Oven thermocouple	P1395
Impinger exit thermocouple	P1333
Timer	P1187

Leak check

		Start	End
Start Time		13:36	15:23
End Time		13:38	15:25
Initial meter reading	m^3	631.2965	632.4013
Final meter reading	m^3	631.3960	632.4014
Duration of leak test	min	2	2
Pump vacuum	"Hg	-15	-15
Leak rate	l/min	0.2	0.15
Less than 2% of normal sampling rate?		Yes	Yes

Approach to isokinetic sampling

Average gas velocity (V_{duct})	9.8 m/s
Nozzle diameter (D_n)	6.288 mm
Sampling time (t)	100 min
Theoretical isokinetic sample volume SV	1627.81 l
Actual sample volume (SV_a)	1595.68 l
Approach to isokinetic sampling (V)	109.3 %

where Vduct is the average duct velocity based on the above measurements

$V_{duct} = C_p \times [1 + 4] \times \sqrt{2\Delta p_a \times h}$ (Reference BS 1042:Section 2.1:1983 (ISO 3966), pages 8&9)

SV, is the theoretical isokinetic sample volume based on V_{duct} & D_n

$SV_t = V_{duct} \times \pi \times [D_n/2000]^2 \times t \times 60 \times 1000$

SV_a is the sample volume at duct conditions

$SV_a = SV_m \times y \times [273 + T_{duct}/273 + T_m] \times (P_{duct}/P_{met}) \times [100 - H_2O_{duct}]/100 - H_2O_{duct}]$

Determination of exhaust gas flow rate

based on measurements at sample points only

Flow rate at duct conditions (Q_{duct})	1.72 m³/s
Flow rate at STP (Q_{STP})	0.75 m³/s
Flow rate at reference conditions (Q_{ref})	0.15 m³/s

where

$Q_{duct} = V_{duct} \times A$

$Q_{STP} = Q_{duct} \times [[T_{ref} + 273]/[T_{duct} + 273]] \times [P_{duct}/P_{ref}]$

$Q_{ref} = Q_{STP} \times [[20.9 - O_{2ref}]/[20.9 - O_{2meas}]] \times [[100 - H_2O_{ref}]/[100 - H_2O_{ref}]]$

PARTICULATE WEIGHINGS

Test Ref crem 1 (c)

Filters

Determination		Method Blank	Field Blank	tpm
Filter No.		0	012376	012451
Pre-sampling conditioning temperature (±5°C)	°C	180	180	180
Post-sampling conditioning temperature (±5°C)	°C	160	160	160
Diameter	mm	110	110	110
Material		Quartz	Quartz	Quartz
Pre-sampling weights				
after 1 min	g		0.7427	0.8400
after 2 min	g		0.7429	0.8400
after 3 min	g		0.7429	0.8400
Weight extrapolated to zero time (M_{fo})	g		0.7426	0.8400
Post-sampling weights				
after 1 min	g		0.7448	0.8399
after 2 min	g		0.7448	0.8400
after 3 min	g		0.7448	0.8400
Weight extrapolated to zero time (M_{ft})	g		0.7448	0.8399

Rinsings

Pre-sampling conditioning temperature (±5°C)	°C	180	180	180
Post-sampling conditioning temperature (±5°C)	°C	160	160	160
Pre-sampling weights (container only)				
after 1 min	g		74.2573	67.8624
after 2 min	g		74.2573	67.8624
after 3 min	g		74.2572	67.8623
Weight extrapolated to zero time (M_{rio})	g		74.2574	67.8625
Post-sampling weights (container and evaporated rinsings)				
after 1 min	g		74.2573	67.8650
after 2 min	g		74.2573	67.8648
after 3 min	g		74.2573	67.8647
Weight extrapolated to zero time (M_{rto})	g		74.2573	67.8651

Summary

Determination		Method Blank (M_{mb})	Field Blank	tpm
Mass collected on filter ($M_f = (M_{ft} - M_{fo} - M_{fmb})$)	g	0.0000	0.0022	-0.0001
Mass collected in rinsings ($M_r = (M_{rto} - M_{rio} - M_{rmb})$)	g	0.0000	-0.0001	0.0027
Total mass collected ($M = M_f + M_r$)	g	0.0000	0.0021	0.0025

Uncertainty Calculation Parameters

Standard uncertainty for gas volume measurement (U6)	2.9 %
Standard uncertainty for filter weighing (U17)	0.57 mg
Standard uncertainty for washings weighing (U17)	0.50 mg
Limit of detection for filter weighing (U17)	0.50 mg
Limit of detecion for washings weighing (U17)	0.50 mg
Standard uncertainty for oxygen correction (U11)	0.95 %
Standard uncertainty for gas flow measurement (U14)	5.7 %

Emission Limit Value

Emission limit value (ELV) at reference conditions	80 mg/m³

SUMMARY OF MEASUREMENTS

Test Ref crem 1 (c)

Calculation of Particulate Concentration and Discharge Rate

Particulate concentration (C), mg/m^3 = M x 1000/ SV_{Ref}

Discharge rate, kg/h = C x Q_{Ref} x 0.0036

Determination		Field Blank	tpm
Particulate concentration at reference conditions	mg/m^3	9.86	11.90
Uncertainty	mg/m^3	9.86	11.90
Particulate concentration at duct conditions (raw)	mg/m^3	1.05	1.27
Particulate discharge rate	kg/h	0.01	0.01
Uncertainty	kg/h	0.00	0.00

Note: Field blank results based on average sampling conditions

Uncertainty budget

Uncertainties		Field Blank	tpm
Volume measurement (m_{vol})	mg	0.06	0.07
Filter weighings (m_f)	mg	1.58	-0.13
Rinsings weighings (m_w)	mg	-0.07	1.62
Total for uncorrected measurement (U_u)	mg	1.58	1.63
Correction to reference conditions (m_{corr})	mg	0.00	0.00
Total for corrected measurement (U_c)	mg	1.58	1.63
Concentration at 95% confidence interval (U_{95c})	mg/m^3	9.86	11.90

Based on Procedure 55 and Uncertainty Policies 11 & 17
(in accordance with requirements of BS EN ISO 14956:2002 and ENV 13005 (GUM))

$U_u = \sqrt{m_{vol}^2 + m_f^2 + m_w^2}$

$U_c = \sqrt{U_u^2 + m_{corr}^2}$

$U_{95c} = 1.96 \times U_c / SV_{Ref}$

COMPLIANCE WITH BS EN 13284-1:2002/BS ISO 9096 CONDITIONS

Flow conditions (BS EN 13284-1, 5.2 & BS ISO 9096, 5.3)

Standard	EN 13284-1
Angle of gas flow less than 15°	Yes
No local negative gas flow	Yes
Minimum differential pressure greater than 5 Pa	Yes
Ratio of highest to lowest local gas velocites less than 3:1	No

Compliance with BS EN 13284-1

Blank value is greater than 10% of ELV - measurement invalid (Clause 4f)
Nozzle diameter greater than 6 mm (Clause 6.2.4)
Average sampling rate was within -5% and +15% of isokinetic conditions (Clause 8.4)
Leak rate is within 2% of sample rate (Clause 8.4)

SCIENTIFICS MONITORING REPORT FORM
Hydrogen chloride to BS EN 1911

Company	City of London	Test Ref	HCl
Site	Crematorium	Date	07-Jan-10
Sample point	Cremator 1 run 3	Time start	13:41
Test carried out by	S Hundley & T Swannack	Time End	15:21
Determinand	Hydrogen chloride to BS EN 1911	Duration (min)	100
		Sampling conditions	crem 1 (c)

ANALYSIS OF COLLECTED SOLUTIONS

Determination		HCl
Volume of sampling solution in first stage (Vs1)	ml	650
Volume of sampling solution in field blank (Vsb)	ml	100
Chloride detection limit in sampling solution (qd)	mg/l	0.10
Chloride in first stage sampling solution (qs1)	mg/l	10.30
Chloride in field blank sampling solution (qcb)	mg/l	0.00
Emission limit value (ELV, daily)	mg/m³	250

Calculation of hydrogen chloride concentration in duct gas, Cg

$$C_g\ (mg/m^3) = [(V_{s1} \times q_{s1}) + (V_{sb} \times q_{cb})] \times MW_c / (V_{std} \times MW_{cl} \times N_a)$$

where MWc is the molecular weight of hydrogen chloride (i.e. 36.5 kg/kgmole)
MWcl is the molecular weight of the chloride ion (i.e. 35.5 kg/kgmole)
Na is the number of chloride ions in hydrogen chloride (i.e. 1)

Calculation of hydrogen chloride discharge rate, Dg

$$D_g = C_g \times Q_{std} \times 0.0036$$

MEASUREMENTS OF HYDROGEN CHLORIDE

Determination		HCl
Concentration at reference conditions (C_g)	mg/m³	35.79
Uncertainty (95% confidence limit)	mg/m³	4.12
Uncertainty as a proportion of ELV	%	2.56
Discharge rate (D_g)	kg/h	0.024
Uncertainty (95% confidence limit)	kg/h	0.004
Detection limit	mg/m³	0.326

FIELD BLANK

Determination		HCl
Field blank concentration*	mg/m³	0.00
Field blank as a proportion of ELV	%	0.0

*assuming same sample volume as for sample

Determination		HCl
Chloride in first stage absorber (m1)	mg	7.41
Chloride in final stage absorber (m2)	mg	0.00
Absorption efficiency	%	n.d.

Uncertainty Calculation Parameters

Standard uncertainty for gas volume measurement (U6)	2.9 %
Standard uncertainty for liquid volume measurement (U16)	1 %
Analytical uncertainty at X times LOD (U15)	5 %
X (U15)	10
Standard uncertainty for oxygen correction (U11)	0.95 %
Standard uncertainty for gas flow measurement (U14)	5.7 %

Uncertainty budget

Uncertainties		HCl
Sample gas volume measurement ($m_{v_{std}}$)	%	2.9
Solution volume measurement (m_{vol})	%	1.0
Analysis of washings (m_w)	%	5.0
Total for uncorrected measurement (U_c)	mg/m³	2.10
Correction to reference conditions (m_{corr})	mg/m³	0.00
Concentration at 95% confidence interval (U_{sc})	mg/m³	4.115

Based on Procedure 55 and Uncertainty Policies 11 & 16
(in accordance with requirements of BS EN ISO 14956:2002 and ENV 13005 (GUM))

COMPLIANCE WITH STANDARD

Probe temperature is at least 150C (Clause 6.2)
Leak rate less than 2% of sample rate (Clause 1-6.2)
Sampling within 10% of isokinetic conditions (Clause 1-5.1.5)
Absorption efficiency not determined
Sample concentration is greater than 10 times field blank (3-4.2.1)
Field blank concentration is less than 10% of ELV (not normative)
Measurement uncertainty is less than 20% of ELV (not normative)

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SCIENTIFICS MONITORING REPORT FORM
Carbon Monoxide to BS EN 15058:2006

Company	City of London	Date	7-Jan-10
Site	Crematorium	Test Ref	crem 1 (c)
Sample point	Cremator 1, run 3	Time Start	13:43
Test carried out by	S Huntley & T Swannack	Time End	15:23

Measurements: 5 minutes' averaging period

Start	End	No. Readings	Maximum	Minimum	Average	Maximum	Minimum	Average
			ppm , dry			$mgCO/m^3$, ref. cond.		
13:43	13:48	20	<5	<5	<5	9	<5	<5
13:48	13:53	20	<5	<5	<5	5	<5	<5
13:53	13:58	20	<5	<5	<5	5	<5	<5
13:58	14:03	20	<5	<5	<5	6	<5	<5
14:03	14:08	20	<5	<5	<5	6	<5	<5
14:08	14:13	20	<5	<5	<5	6	<5	<5
14:13	14:18	20	<5	<5	<5	6	<5	<5
14:18	14:23	20	<5	<5	<5	8	<5	5
14:23	14:28	20	<5	<5	<5	9	<5	6
14:28	14:33	20	<5	<5	<5	18	<5	9
14:33	14:38	20	<5	<5	<5	9	<5	6
14:38	14:43	20	<5	<5	<5	7	<5	5
14:43	14:48	20	5	<5	<5	26	<5	14
14:48	14:53	20	205	<5	37	597	<5	112
14:53	14:58	20	256	7	62	744	43	232
14:58	15:03	20	7	<5	5	41	25	33
15:03	15:08	20	<5	<5	<5	26	18	21
15:08	15:13	20	115	<5	12	387	<5	47
15:13	15:18	20	227	<5	102	769	30	354
15:18	15:23	20	<5	<5	<5	39	9	20
13:43	15:23	400	256	<5	12	769	<5	44

Summary of measurements

Average concentration	44 $mgCO/m^3$
Uncertainty	6 $mgCO/m^3$
Discharge rate	0.030 kgCO/h

Compliance with BS 15058:2006

No correction for drift applied (Clause 8.4.3)
Response time is within limit (Clause 7.2)
Uncertainty is within specified limit of 6% of ELV (Clause 7.3)

Calibration Checks

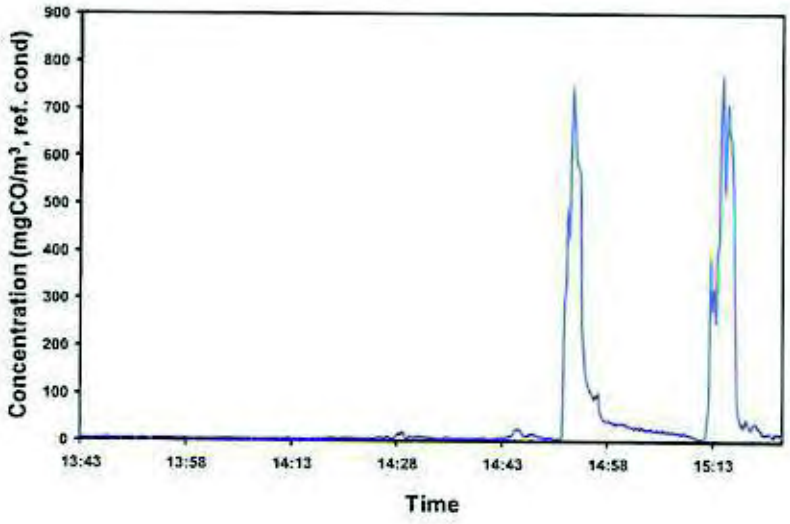
Type Horiba PG 250 **Range** 0 to 50 ppm
Equipment No. P1301
Measurement method Non-dispersive infra-red

Calibration		Zero	Span
Gas reference		CH49	DG2
Concentration	ppm	0.00	25.12
		Analyser response	
Gas into analyser before sampling	ppm	0.00	25.14
Gas into system before sampling	ppm	-0.20	25.12
Gas into system after sampling	ppm	-0.30	25.30
Drift	% span	0.40	0.72
Response time	s	26	

Uncertainty budget

Quantity		Variation		Value		Partial uncertainty (x_{conc})		x_{conc}^2
						ppm CO	mgCO/m³	
Lack of fit	$u(Corr_{lof})$	-		2.00	% range	0.58	0.72	0.52
Zero drift	$u(Corr_{zd})$	-		0.26	% range	0.08	0.09	0.01
Span drift	$u(Corr_{sd})$	-		0.29	% range	0.08	0.10	0.01
Sample volume flow	$u(Corr_{vf})$	-		0.00	% range	0.00	0.00	0.00
Atmospheric pressure	$u(Corr_{atmos})$	0	kPa	0.00	% range/2kP	0.00	0.00	0.00
Ambient temperature	$u(Corr_{amb})$	2	K	0.50	% range/10K	0.01	0.02	0.00
Electric voltage	$u(Corr_{ev})$	40	V	0.00	% range/10V	0.00	0.00	0.00
Interferents	$u(Corr_{int})$	-		1.60	% range	0.46	0.58	0.33
Losses & leakage	$u(Corr_{leak})$	-		0.00	% range	0.00	0.00	0.00
Repeatability at zero	$u(Corr_{r,zero})$	-		0.14	% range	0.04	0.05	0.00
Repeatability at span	$u(Corr_{r,sp})$	-		0.00	% range	0.00	0.00	0.00
Converter efficiency	$u(Corr_{conv})$	-		100.00	% reading	0.00	0.00	0.00
Response factor	$u(Corr_{resp})$	-		100.00	% reading	0.00	0.00	0.00
Calibration gas	$u(Corr_{cal})$	-		1.00	% value	0.40	0.50	0.25
Combined uncertainty	$u(C_{conc})$							1.06
Expanded uncertainty	$U(C_{conc})$							2.08
$U(C_{conc})$/ELV (%)								2.08

Measured concentration of Carbon Monoxide at Cremator 1, run 3



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SCIENTIFICS MONITORING REPORT FORM
Volatile Organic Compounds to BS EN 12619:1999 & BS EN 13526:2002

Company	City of London	Date	7-Jan-10
Site	Crematorium	Test Ref	crem 1 (c)
Sample point	Cremator 1, run 3	Time Start	13:41
Test carried out by	S Huntley & T Swannack	Time End	15:21

Measurements: 5 minutes' averaging period

Start	End	No. Readings	Maximum	Minimum	Average	Maximum	Minimum	Average
			ppm , wet			mgCarbon/m3, ref cond.		
13:41	13:46	10	<1	<1	<1	1.9	1.7	1.8
13:46	13:51	10	<1	<1	<1	1.8	1.6	1.7
13:51	13:56	10	<1	<1	<1	1.7	1.4	1.6
13:56	14:01	10	<1	<1	<1	1.4	1.3	1.3
14:01	14:06	10	<1	<1	<1	1.4	1.2	1.3
14:06	14:11	10	<1	<1	<1	1.3	1.2	1.2
14:11	14:16	10	<1	<1	<1	1.4	1.2	1.2
14:16	14:21	10	<1	<1	<1	1.2	1.1	1.1
14:21	14:26	10	<1	<1	<1	1.3	1.2	1.2
14:26	14:31	10	<1	<1	<1	1.3	1.0	1.2
14:31	14:36	10	<1	<1	<1	1.3	1.1	1.1
14:36	14:41	10	<1	<1	<1	1.3	1.0	1.1
14:41	14:46	10	<1	<1	<1	1.2	<1	1.0
14:46	14:51	10	<1	<1	<1	1.3	<1	1.1
14:51	14:56	10	10.3	<1	3.8	67.9	<1	25.2
14:56	15:01	10	9.9	<1	1.9	64.8	2.9	12.6
15:01	15:06	10	<1	<1	<1	2.8	1.8	2.3
15:06	15:11	10	<1	<1	<1	1.9	1.5	1.7
15:11	15:16	10	1.1	<1	<1	7.4	<1	2.2
15:16	15:21	10	4.0	<1	1.1	26.2	1.5	7.4
13:41	15:21	200	10	<1	<1	68	<1	3

Summary of measurements

Average concentration	3.5 mgCarbon/m3
Uncertainty	3.5 mgCarbon/m3
Discharge rate	0.002 kgCarbon/h

Compliance with BS EN 12619/BS EN 13526

Correction for drift applied to measurements (BS EN 14789, Clause 8.4.3)
Response time is within limit (BS EN 12619, Clause 6.1.1)
Uncertainty is within specified limit of 10% of ELV (BS EN 14789, Clause 1)

Calibration Checks

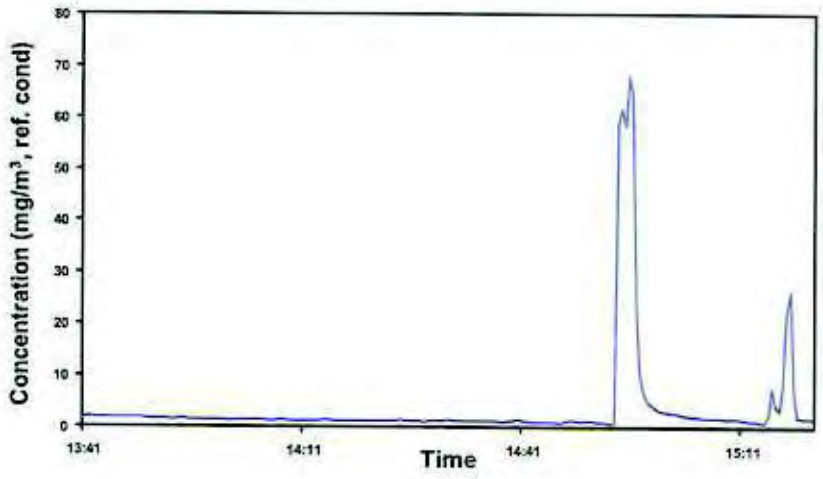
Type Bernath 3006 **Range** 0 to 10 ppm
Equipment No. P1368
Measurement method Flame ionisation detection

Calibration		Zero	Span
Gas reference		CH49	DG2
Concentration	ppm	0.00	8.92
		Analyser response	
Gas into analyser before sampling	ppm	-0.34	8.95
Gas into system before sampling	ppm	-0.26	8.92
Gas into system after sampling	ppm	0.03	8.78
Drift	% span	3.25	1.57
Response time	s	9	

Uncertainty budget

Quantity		Variation		Value		Partial uncertainty (x_{conc})		x_{conc}^2
						ppm	mg/m³	
Lack of fit	$u(Corr_{fit})$	-		2.00	% range	0.12	0.19	0.03
Zero drift	$u(Corr_{z,d})$	-		2.00	% range	0.12	0.19	0.03
Span drift	$u(Corr_{s,d})$	-		2.00	% range	0.12	0.19	0.03
Sample volume flow	$u(Corr_{v,f})$	-		1.00	% range	0.06	0.09	0.01
Atmospheric pressure	$u(Corr_{atmos})$	0	kPa	0.50	% range/2kPa	0.00	0.00	0.00
Ambient temperature	$u(Corr_{amb})$	2	K	2.00	% range/10K	0.01	0.02	0.00
Electric voltage	$u(Corr_{volt})$	40	V	2.00	% range/10V	0.23	0.37	0.14
Interferents	$u(Corr_{int})$	-		3.50	% range	0.20	0.32	0.11
Losses & leakage	$u(Corr_{loss})$	-		0.00	% range	0.00	0.00	0.00
Repeatability at zero	$u(Corr_{r,zero})$	-		1.00	% range	0.06	0.09	0.01
Repeatability at span	$u(Corr_{r,span})$	-		2.00	% range	0.12	0.19	0.03
Converter efficiency	$u(Corr_{conv})$	-		100.00	% reading	0.00	0.00	0.00
Response factor	$u(Corr_{resp})$	-		100.00	% reading	0.00	0.00	0.00
Calibration gas	$u(Corr_{cal})$	-		1.00	% value	0.06	0.10	0.01
Combined uncertainty	$u(C_{conc})$							0.63
Expanded uncertainty	$U(C_{conc})$							1.24
$U(C_{conc})$/ELV (%)								6.19

Measured concentration of Volatile Organic Compounds at Cremator 1, run 3



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SCIENTIFICS MONITORING REPORT FORM
Oxygen to BS EN 14789:2005

Company	City of London
Site	Crematorium
Sample point	Cremator 1, run 3
Test carried out by	S Huntley & T Swannack

Date	7-Jan-10
Test Ref	crem 1 (c)
Time Start	13:43
Time End	15:23

Measurements: 5 minutes' averaging period

Start	End	No. Readings	Maximum	Minimum	Average	Maximum	Minimum	Average
			% dry			% dry		
13:43	13:48	20	18.8	18.3	18.4	18.8	18.3	18.4
13:48	13:53	20	18.6	17.7	18.2	18.6	17.7	18.2
13:53	13:58	20	18.0	17.8	17.9	18.0	17.8	17.9
13:58	14:03	20	18.6	17.9	18.1	18.6	17.9	18.1
14:03	14:08	20	18.2	17.9	18.0	18.2	17.9	18.0
14:08	14:13	20	18.6	18.0	18.2	18.6	18.0	18.2
14:13	14:18	20	18.3	18.0	18.1	18.3	18.0	18.1
14:18	14:23	20	18.7	18.0	18.3	18.7	18.0	18.3
14:23	14:28	20	19.2	18.0	18.3	19.2	18.0	18.3
14:28	14:33	20	19.6	18.4	18.8	19.6	18.4	18.8
14:33	14:38	20	18.7	18.6	18.7	18.7	18.6	18.7
14:38	14:43	20	18.8	18.7	18.7	18.8	18.7	18.7
14:43	14:48	20	19.6	18.0	18.5	19.6	18.0	18.5
14:48	14:53	20	18.2	16.6	17.7	18.2	16.6	17.7
14:53	14:58	20	19.2	16.7	18.5	19.2	16.7	18.5
14:58	15:03	20	19.3	18.9	19.0	19.3	18.9	19.0
15:03	15:08	20	19.1	19.0	19.0	19.1	19.0	19.0
15:08	15:13	20	19.0	17.2	18.2	19.0	17.2	18.2
15:13	15:18	20	19.7	17.1	17.9	19.7	17.1	17.9
15:18	15:23	20	19.6	19.2	19.4	19.6	19.2	19.4
13:43	15:23	400	19.7	16.6	18.4	19.7	16.6	18.4

Summary of measurements

Average concentration	18.4 $\%O_2$, dry
Uncertainty	0.6 $\%O_2$, dry

Compliance with BS 15058:2006

No correction for drift applied (Clause 8.4.3)
Response time is within limit (Clause 7.2)
Uncertainty is within specified limit of 6% of measured concentration (Clause 1)

Calibration Checks

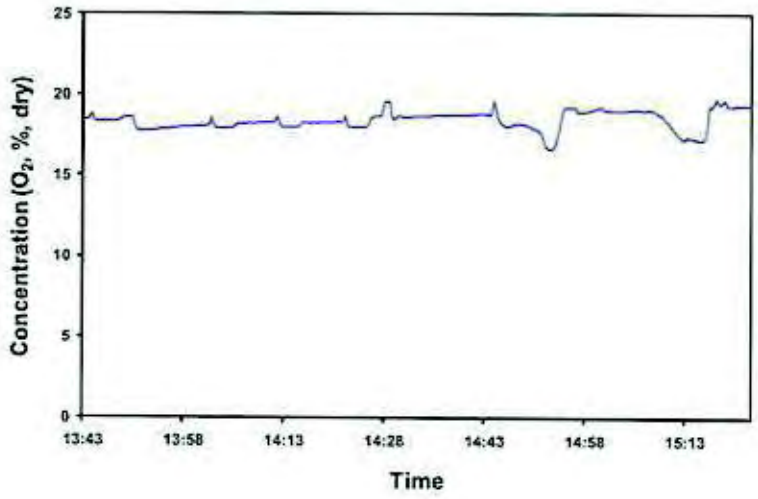
Type	Horiba PG 250	**Range**	0 to 25 %
Equipment No.	P1301		
Measurement method	Zirconium cell		

Calibration		Zero	Span
Gas reference		CH49	OG2
Concentration	%	0.00	13.10
		Analyser response	
Gas into analyser before sampling	%	0.00	13.05
Gas into system before sampling	%	0.00	13.08
Gas into system after sampling	%	0.10	13.15
Drift	% span	0.76	0.54
Response time	s	22	

Uncertainty budget

Quantity		Variation		Value		Partial uncertainty (x_{unc})	x_{unc}^2
						$\%O_2$	
Lack of fit	$u(Corr_{lof})$	-		2.00	% range	0.29	0.08
Zero drift	$u(Corr_{drift})$	-		0.11	% range	0.02	0.00
Span drift	$u(Corr_{s,dr})$	-		0.24	% range	0.03	0.00
Sample volume flow	$u(Corr_{v,s})$	-		0.00	% range	0.00	0.00
Atmospheric pressure	$u(Corr_{atmos})$	0	kPa	0.00	% range/2kPa	0.00	0.00
Ambient temperature	$u(Corr_{temp})$	2	K	0.40	% range/10K	0.01	0.00
Electric voltage	$u(Corr_{volt})$	40	V	0.00	% range/10V	0.00	0.00
Interferents	$u(Corr_{int})$	-		0.00	% range	0.00	0.00
Losses & leakage	$u(Corr_{loss})$	-		0.08	% range	0.01	0.00
Repeatability at zero	$u(Corr_{r,zero})$	-		0.00	% range	0.00	0.00
Repeatability at span	$u(Corr_{r,span})$	-		0.00	% range	0.00	0.00
Converter efficiency	$u(Corr_{conv})$	-		100.00	% reading	0.00	0.00
Response factor	$u(Corr_{resp})$	-		100.00	% reading	0.00	0.00
Calibration gas	$u(Corr_{gc})$	-		1.00	% value	0.13	0.02
Combined uncertainty	$u(C_{co})$						0.32
Expanded uncertainty	$U(C_{co})$						0.62
$U(C_{co})/C_{co}(\%)$							3.38

Measured concentration of Oxygen at Cremator 1, run 3



SCIENTIFICS MONITORING REPORT FORM
Carbon Dioxide to ISO 12039:2001

Company	City of London	Date	7-Jan-10
Site	Crematorium	Test Ref	crem 1 (c)
Sample point	Cremator 1, run 3	Time Start	13:43
Test carried out by	S Huntley & T Swannack	Time End	15:23

Measurements: 5 minutes' averaging period

Start	End	No. Readings	Maximum	Minimum	Average	Maximum	Minimum	Average
			% , dry			$\%CO_2$ ref. cond.		
13:43	13:48	20	1.4	1.2	1.4	5.6	5.4	5.5
13:48	13:53	20	1.8	1.3	1.5	5.7	5.4	5.5
13:53	13:58	20	1.8	1.6	1.7	5.6	5.5	5.6
13:58	14:03	20	1.6	1.2	1.6	5.5	5.2	5.4
14:03	14:08	20	1.7	1.4	1.6	5.4	5.3	5.4
14:08	14:13	20	1.6	1.2	1.4	5.4	5.1	5.3
14:13	14:18	20	1.6	1.4	1.5	5.4	5.3	5.3
14:18	14:23	20	1.5	1.1	1.4	5.3	5.1	5.3
14:23	14:28	20	1.6	0.8	1.4	5.3	4.7	5.2
14:28	14:33	20	1.3	0.6	1.1	5.3	4.7	5.2
14:33	14:38	20	1.2	1.1	1.1	5.2	5.1	5.1
14:38	14:43	20	1.1	1.1	1.1	5.1	5.0	5.0
14:43	14:48	20	2.5	0.6	1.8	8.4	4.4	7.1
14:48	14:53	20	3.5	2.3	2.8	8.7	8.2	8.4
14:53	14:58	20	3.5	1.2	1.8	8.5	6.9	7.5
14:58	15:03	20	1.4	1.1	1.2	6.9	6.2	6.5
15:03	15:08	20	1.2	1.2	1.2	6.4	6.2	6.3
15:08	15:13	20	2.8	1.2	1.9	7.5	6.3	6.9
15:13	15:18	20	2.9	0.8	2.2	7.8	6.2	7.3
15:18	15:23	20	1.0	0.8	0.9	6.0	5.6	5.8
13:43	15:23	400	3.5	0.6	1.5	8.7	4.4	6.0

Summary of measurements

Average concentration	6.0 $\%CO_2$
Uncertainty	1.2 $\%CO_2$

Compliance with BS 14792:2005

No correction for drift applied (BS EN 14789, Clause 8.4.3)
Response time is within limit (ISO 12039, Clause A.2)
Uncertainty is above specified limit of 6% of measured concentration (BS EN 14789, Clause 1) - non compliance

Calibration Checks

Type Horiba PG 250 **Range** 0 to 10 %
Equipment No. P1301
Measurement method Non-dispersive infra-red

Calibration		Zero	Span
Gas reference		CH49	OG2
Concentration	%	0.00	5.08
		Analyser response	
Gas into analyser before sampling	%	0.00	5.09
Gas into system before sampling	%	0.05	5.10
Gas into system after sampling	%	0.12	5.20
Drift	% span	1.38	1.96
Response time	s	27	

D14

Stack Emission Monitoring Report

City of London Crematorium
Manor Park, London E12

January 2010

1981

Part 1 Executive Summary

Operator	City of London Crematorium
Site	Aldersbrook Road Manor Park London E12 5DQ
Plant	Cremators 1, 6, 7 and 8
Monitoring Dates	5th to 13th January 2010
Project Number	091121
Written By	Adrian Moss
MCERTS Number	MM 02 041
MCERTS Accreditation	Level 2, TE1, TE2, TE3, TE4
Position	Consultant (team leader)
Signed	[redacted]
Approved By	Mike Davies
MCERTS Number	MM 02 087
MCERTS Accreditation	Level 2, TE1, TE2, TE3 & TE4
Position	Operations Manager
Signed	
Monitoring Organisation	Scientifics Ltd Unit 13/1 Acacia Building Vantage Point Business Village Mitcheldean, Gloucestershire GL17 0DD
Report Ref	091121
Issue Date	24th February 2010

MCERTS

UKAS TESTING 1015

Contents

1 Introduction

The Corporation of London operates the City of London Crematorium at Manor Park, London E12 5DQ. It is equipped with five gas-fired cremators. One is a newly-installed model numbered 1 and the others are numbered 5 to 8. All of the cremators are FT III models and are manufactured by Facultatieve Technologies, who took over Evans Universal in 1998. Cremator number 5 was non-operational while the test team were on site.

In order to check compliance with authorised limits Scientifics Ltd were contracted by the Corporation of London to quantify the emissions from the cremators.

The work was carried out on 5th – 13th January 2010 by the following site team:

Team Leader:	Steve Huntley MCERTs Level 2, TEs 1, 2, 3 & 4 MCERTs number MM 02 081,
Assistant:	Tom Swannack MCERTs Level 1, TEs 1, 2, 3 & 4 MCERTs number MM 05 663.

2 Monitoring Objectives

The following table details the determinands required to be monitored for each cremator and the monitoring actually undertaken. The schedule called for dioxins & furans to be monitored on one cremator only, and number 8 had had the longest interval since previous monitoring.

Determinand	Cremator 1	Cremators 5 and 7	Cremators 6 and 8
Total particulates	Required and completed	Required but not completed	Required and completed
O_2	Required and completed	Required but not completed	Required and completed
CO	Required and completed	Required but not completed	Required and completed
CO_2	Required and completed	Required but not completed	Required and completed
VOCs	Required and completed	Required but not completed	Required and completed
Dioxins & furans	Required and completed	Not required	Not required

The schedule called for dioxins & furans to be monitored on one cremator only. Number 1 was selected for testing as it had not been tested before.

Cremator 7 was found to be faulty and was shut down after the second cremation, so testing was incomplete. Cremator 5 was not operational during the visit to site.

3 Summary of Results

The following tables are a summary of the results of the monitoring exercise. The site data record sheets are given in Part 2 of this report.

3.1 Cremator 1 run 1, 7th January 2010

Cremation number 251327, medium female

Pollutant Parameters

Determinand	Reported as	Time Start	Time End	Concentration	Discharge rate(g/h)	ELV
Total particulate matter	TPM	0950	1105	43 ± 17 mg/m^3	57	80 mg/m^3 120 g/h
Carbon monoxide	CO	0954	1103	14 ± 14 mg/m^3	19	100 mg/m^3 150 g/h
Total VOCs	C	0950	1105	<1 ± 1 mg/m^3	<1.4	20 mg/m^3 30 g/h
Hydrogen chloride	HCl	0950	1105	53 ± 6 mg/m^3	72	200 mg/m^3 300 g/h

Emission concentrations are expressed at reference conditions of 273K temperature and 101.3kPa pressure (Standard Temperature and Pressure (STP)) in a dry gas containing 11% oxygen.

Non-pollutant Parameters

Parameter	Result
Oxygen, %, dry gas	17.1
Carbon dioxide, %, dry gas	2.4
Water, %	3.5
Gas Velocity, m s^{-1}	13.6
Volumetric Flow @ Reference Conditions, m^3 s^{-1}	0.37
Stack Gas Temperature, °C	344

3.2 Cremator 1 run 2, 7th January 2010

Cremation number 251330, medium male

Pollutant Parameters

Determinand	Reported as	Time Start	Time End	Concentration	Discharge rate(g/h)	ELV
Total particulate matter	TPM	1140	1310	24 ± 9 mg/m^3	18	80 mg/m^3 120 g/h
Carbon monoxide	CO	1143	1313	8 ± 8 mg/m^3	6.2	100 mg/m^3 150 g/h
Total VOCs	C	1140	1310	2.3 ± 2.3 mg/m^3	1.8	20 mg/m^3 30 g/h
Hydrogen chloride	HCl	1140	1310	0.8 ± 0.8 mg/m^3	0.6	200 mg/m^3 300 g/h

Emission concentrations are expressed at reference conditions of 273K temperature and 101.3kPa pressure (Standard Temperature and Pressure (STP)) in a dry gas containing 11% oxygen.

Non-pollutant Parameters

Parameter	Result
Oxygen, %, dry gas	18.3
Carbon dioxide, %, dry gas	1.6
Water, %	3.7
Gas Velocity, m s^{-1}	11.0
Volumetric Flow @ Reference Conditions, m^3 s^{-1}	0.21
Stack Gas Temperature, °C	346

3.3 Cremator 1 run 3, 7th January 2010

Cremation number 251329, medium male

Pollutant Parameters

Determinand	Reported as	Time Start	Time End	Concentration	Discharge rate(g/h)	ELV
Total particulate matter	TPM	1341	1521	12 ± 12 mg/m^3	8	80 mg/m^3 120 g/h
Carbon monoxide	CO	1343	1521	44 ± 6 mg/m^3	30	100 mg/m^3 150 g/h
Total VOCs	C	1341	1523	3.5 ± 3.5 mg/m^3	2.3	20 mg/m^3 30 g/h
Hydrogen chloride	HCl	1341	1521	36 ± 4 mg/m^3	24	200 mg/m^3 300 g/h

Emission concentrations are expressed at reference conditions of 273K temperature and 101.3kPa pressure (Standard Temperature and Pressure (STP)) in a dry gas containing 11% oxygen.

Non-pollutant Parameters

Parameter	Result
Oxygen, %, dry gas	18.4
Carbon dioxide, %, dry gas	1.5
Water, %	3.2
Gas Velocity, m s^{-1}	9.8
Volumetric Flow @ Reference Conditions, m^3 s^{-1}	0.19
Stack Gas Temperature, °C	340

3.4 Cremator 1 dioxins & furans sampling, 12th January 2010

Cremation numbers 251368, heavy female, 251367 heavy female
251372 heavy male and 251374 heavy male

Pollutant Parameters

Determinand	Reported as	Time Start	Time End	Concentration	Discharge rate(ng/h)	ELV
PCDDs & PCDFs	I-TEQ	0902	1609	0.008 ± 0.008 ng/m^3	12	None set

Emission concentrations are expressed at reference conditions of 273K temperature and 101.3kPa pressure (Standard Temperature and Pressure (STP)) in a dry gas containing 11% oxygen.

The total sampling time was 375 minutes.

Non-pollutant Parameters

Parameter	Result
Oxygen, %, dry gas	18.0
Water, %	3.5
Gas Velocity, m s^{-1}	10.2
Volumetric Flow @ Reference Conditions, m^3 s^{-1}	0.41
Stack Gas Temperature, °C	56

The quoted oxygen and moisture contents are the average figures for the first three sampled cremations on this unit.

The fairly low temperature of the flue gas was noted but the operators were happy with the operation of the cremator during the tests.

3.5 Cremator 6 run 1, 13th January 2010

Cremation number 251380, heavy female

Pollutant Parameters

Determinand	Reported as	Time Start	Time End	Concentration	Discharge rate(g/h)	ELV
Total particulate matter	TPM	0922	1042	70 ± 27 mg/m^3	76	80 mg/m^3 120 g/h
Carbon monoxide	CO	0930	1049	19 ± 6 mg/m^3	21	100 mg/m^3 150 g/h
Total VOCs	C	0924	1048	1.4 ± 1.4 mg/m^3	1.5	20 mg/m^3 30 g/h
Hydrogen chloride	HCl	0922	1042	9.5 ± 1.1 mg/m^3	10.4	200 mg/m^3 300 g/h

Emission concentrations are expressed at reference conditions of 273K temperature and 101.3kPa pressure (Standard Temperature and Pressure (STP)) in a dry gas containing 11% oxygen.

Non-pollutant Parameters

Parameter	Result
Oxygen, %, dry gas	17.0
Carbon dioxide, %, dry gas	3.0
Water, %	2.2
Gas Velocity, m s^{-1}	10.8
Volumetric Flow @ Reference Conditions, m^3 s^{-1}	0.30
Stack Gas Temperature, °C	368

3.6 Cremator 6 run 2, 13th January 2010

Cremation number 251379, medium male

Pollutant Parameters

Determinand	Reported as	Time Start	Time End	Concentration	Discharge rate(g/h)	ELV
Total particulate matter	TPM	1112	1227	195 ± 76 mg/m^3	165	80 mg/m^3 120 g/h
Carbon monoxide	CO	1114	1229	22 ± 6 mg/m^3	18.6	100 mg/m^3 150 g/h
Total VOCs	C	1113	1227	<1 ± 1 mg/m^3	<0.9	20 mg/m^3 30 g/h
Hydrogen chloride	HCl	1112	1227	58 ± 7 mg/m^3	49	200 mg/m^3 300 g/h

Emission concentrations are expressed at reference conditions of 273K temperature and 101.3kPa pressure (Standard Temperature and Pressure (STP)) in a dry gas containing 11% oxygen.

Non-pollutant Parameters

Parameter	Result
Oxygen, %, dry gas	17.4
Carbon dioxide, %, dry gas	2.7
Water, %	2.8
Gas Velocity, m s^{-1}	9.1
Volumetric Flow @ Reference Conditions, m^3 s^{-1}	0.24
Stack Gas Temperature, °C	354

3.7 Cremator 6 run 3, 13th January 2010

Cremation number 251387, small female

Pollutant Parameters

Determinand	Reported as	Time Start	Time End	Concentration	Discharge rate(g/h)	ELV
Total particulate matter	TPM	1418	1523	106 ± 41 mg/m^3	66	80 mg/m^3 120 g/h
Carbon monoxide	CO	1424	1524	27 ± 8 mg/m^3	16.9	100 mg/m^3 150 g/h
Total VOCs	C	1420	1524	<1 ± 1 mg/m^3	<0.7	20 mg/m^3 30 g/h
Hydrogen chloride	HCl	1418	1523	36 ± 4 mg/m^3	22	200 mg/m^3 300 g/h

Emission concentrations are expressed at reference conditions of 273K temperature and 101.3kPa pressure (Standard Temperature and Pressure (STP)) in a dry gas containing 11% oxygen.

Non-pollutant Parameters

Parameter	Result
Oxygen, %, dry gas	18.4
Carbon dioxide, %, dry gas	1.9
Water, %	3.0
Gas Velocity, m s^{-1}	9.5
Volumetric Flow @ Reference Conditions, m^3 s^{-1}	0.17
Stack Gas Temperature, °C	354

3.8 Cremator 7 run 1, 5th January 2010

Cremation number 251314, medium male

Pollutant Parameters

Determinand	Reported as	Time Start	Time End	Concentration	Discharge rate(g/h)	ELV
Total particulate matter	TPM	1200	1340	230 ± 90 mg/m^3	174	80 mg/m^3 120 g/h
Carbon monoxide	CO	1206	1346	47 ± 7 mg/m^3	35	100 mg/m^3 150 g/h
Total VOCs	C	-	-	n/m ± - mg/m^3	-	20 mg/m^3 30 g/h
Hydrogen chloride	HCl	1200	1340	89 ± 10 mg/m^3	67	200 mg/m^3 300 g/h

Emission concentrations are expressed at reference conditions of 273K temperature and 101.3kPa pressure (Standard Temperature and Pressure (STP)) in a dry gas containing 11% oxygen. Due to a fault with the logger no VOC measurements were recorded during this cremation.

Non-pollutant Parameters

Parameter	Result
Oxygen, %, dry gas	18.1
Carbon dioxide, %, dry gas	2.1
Water, %	4.9
Gas Velocity, m s^{-1}	9.9
Volumetric Flow @ Reference Conditions, m^3 s^{-1}	0.21
Stack Gas Temperature, °C	324

3.9 Cremator 7 run 2, 5th January 2010

Cremation number 251315, medium female

Pollutant Parameters

Determinand	Reported as	Time Start	Time End	Concentration	Discharge rate(g/h)	ELV
Total particulate matter	TPM	1420	1555	176 ± 69 mg/m^3	127	80 mg/m^3 120 g/h
Carbon monoxide	CO	1420	1554	21 ± 21 mg/m^3	15.4	100 mg/m^3 150 g/h
Total VOCs	C	1420	1555	64 ± 48 mg/m^3	46	20 mg/m^3 30 g/h
Hydrogen chloride	HCl	1420	1555	113 ± 13 mg/m^3	81	200 mg/m^3 300 g/h

Emission concentrations are expressed at reference conditions of 273K temperature and 101.3kPa pressure (Standard Temperature and Pressure (STP)) in a dry gas containing 11% oxygen.

Non-pollutant Parameters

Parameter	Result
Oxygen, %, dry gas	18.2
Carbon dioxide, %, dry gas	2.1
Water, %	5.8
Gas Velocity, m s^{-1}	10.0
Volumetric Flow @ Reference Conditions, m^3 s^{-1}	0.20
Stack Gas Temperature, °C	327

3.10 Cremator 8 run 1, 6th January 2010

Cremation number 251317, medium female

Pollutant Parameters

Determinand	Reported as	Time Start	Time End	Concentration	Discharge rate(g/h)	ELV
Total particulate matter	TPM	0854	1034	144 ± 56 mg/m^3	200	80 mg/m^3 120 g/h
Carbon monoxide	CO	0858	1037	<5 ± 5 mg/m^3	<7	100 mg/m^3 150 g/h
Total VOCs	C	0854	1034	<1 ± 1 mg/m^3	<1.4	20 mg/m^3 30 g/h
Hydrogen chloride	HCl	0854	1034	46 ± 5 mg/m^3	64	200 mg/m^3 300 g/h

Emission concentrations are expressed at reference conditions of 273K temperature and 101.3kPa pressure (Standard Temperature and Pressure (STP)) in a dry gas containing 11% oxygen.

Non-pollutant Parameters

Parameter	Result
Oxygen, %, dry gas	17.2
Carbon dioxide, %, dry gas	2.5
Water, %	3.3
Gas Velocity, m s^{-1}	14.1
Volumetric Flow @ Reference Conditions, m^3 s^{-1}	0.39
Stack Gas Temperature, °C	347

3.11 Cremator 8 run 2, 6th January 2010

Cremation number 251320, medium male

Pollutant Parameters

Determinand	Reported as	Time Start	Time End	Concentration	Discharge rate(g/h)	ELV
Total particulate matter	TPM	1114	1254	108 ± 42 mg/m^3	110	80 mg/m^3 120 g/h
Carbon monoxide	CO	1121	1256	<5 ± 5 mg/m^3	<5	100 mg/m^3 150 g/h
Total VOCs	C	1114	1254	<1 ± 1 mg/m^3	<1.1	20 mg/m^3 30 g/h
Hydrogen chloride	HCl	1114	1254	48 ± 5 mg/m^3	49	200 mg/m^3 300 g/h

Emission concentrations are expressed at reference conditions of 273K temperature and 101.3kPa pressure (Standard Temperature and Pressure (STP)) in a dry gas containing 11% oxygen.

Non-pollutant Parameters

Parameter	Result
Oxygen, %, dry gas	17.5
Carbon dioxide, %, dry gas	2.2
Water, %	4.0
Gas Velocity, m s^{-1}	11.3
Volumetric Flow @ Reference Conditions, m^3 s^{-1}	0.28
Stack Gas Temperature, °C	347

3.12 Cremator 8 run 3, 6th January 2010

Cremation number 251322, medium female

Pollutant Parameters

Determinand	Reported as	Time Start	Time End	Concentration	Discharge rate(g/h)	ELV
Total particulate matter	TPM	1315	1455	129 ± 50 mg/m^3	118	80 mg/m^3 120 g/h
Carbon monoxide	CO	1318	1457	<5 ± 5 mg/m^3	<5	100 mg/m^3 150 g/h
Total VOCs	C	1315	1455	<1 ± 1 mg/m^3	<1	20 mg/m^3 30 g/h
Hydrogen chloride	HCl	1315	1455	52 ± 6 mg/m^3	48	200 mg/m^3 300 g/h

Emission concentrations are expressed at reference conditions of 273K temperature and 101.3kPa pressure (Standard Temperature and Pressure (STP)) in a dry gas containing 11% oxygen.

Non-pollutant Parameters

Parameter	Result
Oxygen, %, dry gas	17.7
Carbon dioxide, %, dry gas	2.2
Water, %	4.5
Gas Velocity, m s^{-1}	10.9
Volumetric Flow @ Reference Conditions, m^3 s^{-1}	0.25
Stack Gas Temperature, °C	348

4 Monitoring Methods & Accreditation

Monitoring was undertaken using the following sampling and analytical methods.

Parameter	Method	Technical Procedure	Accreditation	
			Sampling	Analysis
VOCs	BS EN 12619	IEM002	1015	1015
CO	BS EN 15058	IEM002	1015	1015
CO_2	ISO 12039	IEM002	1015	1015
HCl	BS EN 1911:1998	IEM011	1015	1015
PCDDs & PCDFs	BS EN 1948-1:2006	IEM009	1015	1015
Total particulates	BS ISO 9096	AE104	1015	1015
O_2	BS EN 14789	IEM002	1015	1015
H_2O	BS EN 14790	AE105	1015	1015

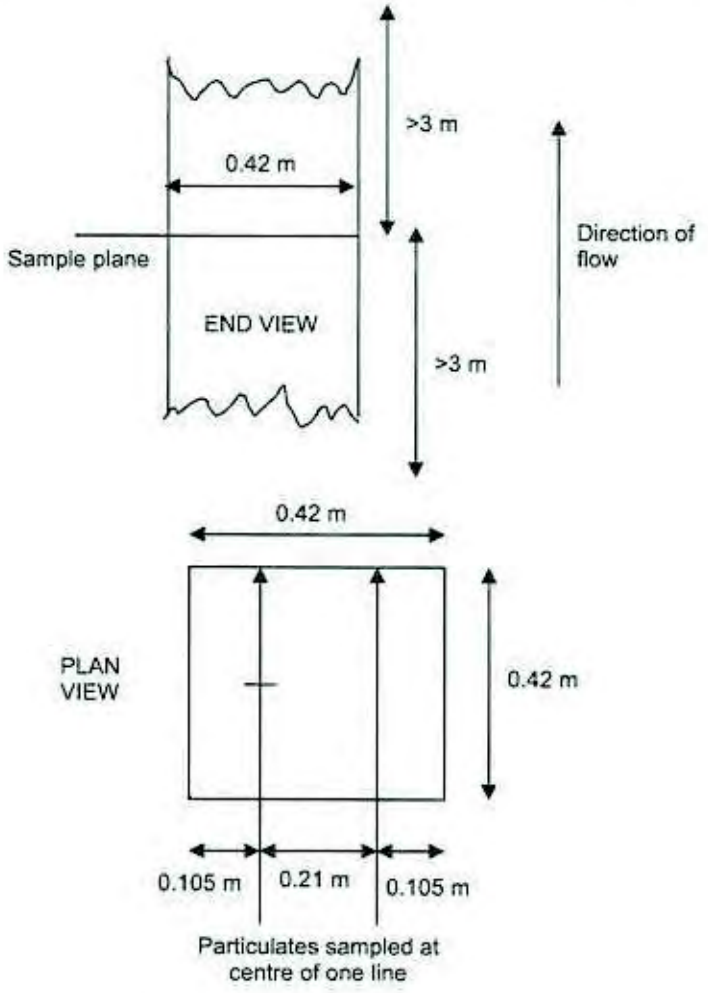
A measurement is determined to comply with the requirements of MCERTs where the laboratories involved have UKAS accreditation to the MCERTs performance standard for the methods employed. If either of the sampling or analysis tasks is not accredited then the entire measurement is outside the scope of accreditation.

All measurements undertaken are UKAS accredited to the MCERTs performance standard.

5 Sampling Location and Process Details

Details of the sample plane on each cremator are shown in the table below. The locations appeared to satisfy the positional requirements of BS ISO 9096 and the gas flows were found to be reasonably uniform, though substantial variations in velocity occurred during each cremation. A group of three sample ports had been fitted, of which at least two were accessible on each cremator, giving two horizontal sample lines.

Configuration	Square, Vertical
Diameter / Dimensions (m)	0.42 x 0.42
Area (m^2)	0.18
No. of Sample Lines	2
Sample Points per Line	All pollutants sampled simultaneously at the mid-point of one line.



Drawing of sample plane and points

Pollutant data were measured during separate complete cremations on each unit, in each case omitting the first two minutes and the final ash recovery. The exception was the dioxins and furans sample from cremator 1, which was obtained cumulatively over four consecutive cremations.

Cremator 7 was faulty and was shut down after only two cremations out of three had been tested. Otherwise no unusual feature of any coffin or cremation was reported.

6 Monitoring Deviations

In this section the compliance of the measurements with the requirements of the relevant standards is discussed, along with any issues affecting the representativeness of the measurements made.

Particulate sampling was confined to one line instead of two in order to sample continuously for the duration of each cremation. In addition the restricted access to the sample locations meant that it was only possible to sample from a single point. As a result the minimum measurement uncertainty for total particulates has been increased to ±39%. A similar sampling strategy had to be adopted for the dioxins and furans sampling on cremator 1, also leading to an increased uncertainty.

A requirement of particulate sampling to BS ISO 9096 is that the sampling rate is maintained at between 90 and 110% isokinetic. The particulate sampling records in Part 2 imply that this was not always the case. The gas velocity during a cremation is subject to frequent large fluctuations as the controlling software alters the air flows. The sampling rate was adjusted to match these fluctuations and the calculated isokinetic rate was therefore subject to increased uncertainty. The true average isokinetic rate is unlikely to have been significantly outside the specified range.

The blank result for particulate sampling on some runs was more than would comply with the requirements of BS ISO 9096. This is a result of the unusually large adjustment required in order to correct the figures to 11% oxygen and does not reflect unusual contamination of the sample train.

It is not considered that the noted non-compliances had a significant impact on the representativeness of the measurements made. In all cases uncertainties have been adjusted, where appropriate, to take into account deviations from the requirements of the standard methods.

7 Comments

The third particulate sample on cremator 6 and the second and third on cremator 8 gave emission concentrations slightly above the limit value of 80 mg m^{-3}. However, taking into account the uncertainty in the reported results, it cannot be stated unequivocally that the limit had been exceeded in either case. In fact the limit applies to 95% of all cremations, and a higher figure is appropriate for all cremations. In all three cases the calculated emission rate was below the limit value of 120 g h^{-1}.

The second particulate sample on cremator 6, both completed samples on cremator 7 and the first on cremator 8 gave concentrations significantly above the limit. In these cases the emission rate was also above the limit.

VOCs concentrations during the second cremation on cremator 7 exceeded the limit value of 20 mg m^{-3}.

No other exceedences of authorised limits were observed.

Part 2 Supporting Information

Operator	City of London Crematorium
Site	Aldersbrook Road Manor Park London E12 5DQ
Plant	Cremators 1, 6, 7 and 8
Monitoring Dates	5th to 13th January 2010
Project Number	091121
Written By **MCERTS Number** **MCERTS Accreditation** **Position**	Adrian Moss MM 02 041 Level 2, TE1, TE2, TE3, TE4 Consultant (team leader)
Signed	[redacted]
Approved By **MCERTS Number** **MCERTS Accreditation** **Position**	Mike Davies MM 02 087 Level 2, TE1, TE2, TE3 & TE4 Operations Manager
Signed	
Monitoring Organisation	Scientifics Ltd Unit 13/1 Acacia Building Vantage Point Business Village Mitcheldean, Gloucestershire GL17 0DD
Report Ref	091121
Issue Date	24th February 2010

MONITORING REPORT FORMS

Cremator 6

Cremator 7

Cremator 8

ANALYTICAL REPORTS

SCIENTIFICS MONITORING REPORT FORM
PITOT TRAVERSE (BS EN 13284-1)

Company	City of London	Date	07-Jan-10
Site	Crematorium	Test Ref	crem 1 flow
Sample point	Cremator 1	Time Start	08:46
Test carried out by	S Huntley & T Swannack	Time End	08:56

SAMPLING PLANE GEOMETRY

Geometry of duct		Rectangular
Dimension traversed by sampling probe (D)	m	0.42
Other dimension (if applicable)	m	0.4200
Cross sectional area of sampling plane (A)	m^2	0.1764

MOLECULAR WEIGHT & DENSITY DETERMINATION

Duct gas conditions

Ambient temperature (T_a)	°C	7.00
Duct static gas pressure	kPa	-0.05
Average duct gas temperature (T_{duct})	°C	344.45
Barometric pressure (P_m)	kPa	99.00

Calculation of molecular weight from assumed gas composition

Gas	Vol% Dry gas	Vol% Wet gas	Dry Mol Wt g/gmole	Wet Mol Wt g/gmole
CO_2	2.70	2.60	1.19	1.15
O_2	17.10	16.48	5.47	5.28
CO	0.00	0.00	0.00	0.00
N_2	80.20	77.31	22.46	21.65
H_2O	———	3.60	———	0.65
		Total	29.12	28.72

Calculation of dry and wet gas density from molecular weight results

Dry density	kg/m^3	1.30	At STP
Wet density	kg/m^3	1.28	(0°C & 101.3 kPa)
Dry density	kg/m^3	0.56	At Duct Conditions
Wet density (ρ_a)	kg/m^3	0.55	(see above)
Wet specific gravity (sg)		0.99	

CALCULATION OF NOZZLE SIZE & K FACTOR

Exhaust & sample gas conditions

Desired sampling rate at orifice (SR_o)	10 l/min	0.353 ft^3/min
Expected meter outlet temperature (T_m)	20 °C	

(guide is a sampling rate of 0.75 ft^3/min or 21.2 l/min at the orifice)

Conditions at nozzle		Conditions at orifice/meter	
Sampling rate (SR_n)	21.87 l/min	Sampling rate (SR_o)	10.00 l/min
Temperature (T_{duct})	344.45 °C	Temperature (T_o)	20.00 °C
Pressure (P_{duct})	98.95 kPa	Pressure (P_m)	99.00 kPa
Water vapour (H_2O_{duct})	3.60 %	Water vapour (H_2O_m)	0 %
Molecular weight (M_{duct})	28.72	Molecular weight (M_m)	29.12

Orifice Parameters

Orifice plate coefficient ($\Delta H_@$)	2.1935	" w.g.

Determination of nozzle diameter

based on isokinetic sampling and the average gas velocity

$D_{rr} = 2000 \times \sqrt{[SR_n / V_{duct} \times \pi \times 60000]}$

where D_{rr} is the recommended nozzle diameter (mm)

Recommended nozzle diameter (D_{rr}	=	6.672	mm
Diameter of nozzle selected (D_n)	=	6.28	mm

Determination of K Factor

based on preliminary exhaust gas conditions

K Factor is a proportionality factor relating the pressure drop measured with the Pitot tube in the duct (h) with the corresponding pressure drop at the orifice (ΔH), i.e.

$\Delta H = K * h$

$K = 8.038 \times 10^{-5} \times C_p^2 \times \Delta H_@ \times D_n^4 \times (M_m/M_{duct}) \times [(100-H_2O_{duct})/(100-H_2O_m)]^2 \cdot (T_m+273/T_{duct}+273) \cdot (P_{duct}/P_m)$

where $\Delta H_@$ is the orifice plate coefficient (mm w.g.)

K Factor	=	3.1129
K Factor$_1$ (independent of C_p)	=	3.1129

SCIENTIFICS MONITORING REPORT FORM
TOTAL PARTICULATE MATTER to BS EN 13284-1/BS ISO 9096

Company	City of London	Test Ref	crem 1
Site	Crematorium		
Sample point	Cremator 1 run 1		
Test carried out by	S Huntley & T Swannack		

SAMPLING TIMES

Determination		tpm
Date		07-Jan-10
Time Start		9:50
Time End		11:05
Duration (t)	min	75

Sampling plane

Dimension traversed by sampling probe (D)	m	0.42
Cross sectional area of sampling plane (A)	m^2	0.18

Duct gas conditions

Determination		tpm
Ambient temperature (T_{Amb})	°C	7.0
Average duct gas temperature (T_{duct})	°C	343.7
Duct static gas pressure (P_{Static})	kPa	-0.05
Barometric pressure (P_{Baro})	kPa	99.00
Volume flow rate @ ref. conditions (Q_{Ref})	m^3/s	0.37
Gas compressibility correction (z)		0.995
Wet gas density (ρ_w)		0.55
Exhaust gas conditions measurements		crem 1

Reference conditions

Determination		tpm
Actual Duct Flow Conditions		
Average temperature (T_{duct})	°C	343.7
Total pressure (P_{duct})	kPa	98.95
Oxygen (O_{2duct})	% vol,dry	17.20
Water vapour (H_2O_{duct})	% vol	3.53
Reference Conditions		
Temperature (T_{Ref})	°C	0
Pressure (P_{Ref})	kPa	101.3
Oxygen (O_{2Ref})	% vol, dry	11
Water vapour (H_2O_{Ref})	% vol	0

Sampling conditions

Determination				tpm
Nozzle diameter (d)	TI24	Titanium	mm	6.280
Initial gas meter reading			m^3	629.057
Final gas meter reading			m^3	630.077
Sampled volume (SV_M)			m^3	1.020

Calculation of sample gas volume at reference conditions, SV_{Ref}

$$SV_{Ref} = SV_{Meter} \times Y \times \frac{[273 + T_{Ref}]}{[273 + T_{Meter}]} \times \frac{P_{Baro}}{P_{Ref}} \times \frac{[100 - H_2O_{Meter}]}{[100 - H_2O_{Ref}]} \times \frac{[20.9 - O_{2Duct}]}{[20.9 - O_{2Ref}]}$$

Corrections
Temperature
Pressure
Water vapour
Oxygen

Determination		tpm
Sampled volume @ ref. conditions (SV_{Ref})	m^3	0.325

SAMPLING DATA tpm

Test Ref: crem 1

Initial gas meter reading: 629057 | Start Time: 9:50

Distance from Dust Wall Fraction of D	Port	Time of Day h:mm	Run time min	Gas meter reading l	Pitot Reading (h) mm w.g.	Orifice Vmin w.g. Desired (Hr)	Orifice Vmin w.g. Actual (Hr)	Isokinetic difference (ΔI/VI) %	Temperatures: Gas (T_{duct}) °C	Probe (T_p) °C	Pitot (T_s) °C	Meter (T_m) Inlet °C	Meter (T_m) Outlet °C	Impinger (T_{imp}) °C	Oxygen Content % v/v, dry
0.599	A	9:50	0	629057	4	8.79	9.4	107	337	159	155	17.0		2	
		09:55	5	629111	4.1	9.01	9.7	108	340	158	156	17.0		4	
		10:00	10	629166	3.9	8.57	9.2	107	346	160	160	17.0		7	
		10:05	15	629219	4.2	9.23	9.9	107	347	160	160	17.0		8	
		10:10	20	629272	3.9	8.57	9.2	107	346	160	160	17.0		8	
		10:13	23	629328	3.9	8.57	9.2	107	347	160	160	17.0		9	
		10:20	30	629383	4	8.79	9.4	107	352	160	160	17.0		11	
		10:25	35	629434	3.5	7.69	8.3	108	354	160	160	17.0		11	
		10:30	40	629492	3.8	17.13	18.4	107	354	161	160	17.0		12	
		10:35	45	629550	12.2	26.80	28.8	107	347	160	160	17.0		12	
		10:40	50	629605	15.4	33.83	36.3	107	341	159	160	17.0		12	
		10:45	55	629739	12.9	27.69	29.7	107	334	160	160	17.0		12	
		10:50	60	629825	13.4	29.43	31.6	107	332	160	160	17.0		14	
		10:55	65	629917	14.3	31.85	34	107	347	160	160	16.9		15	
		11:00	70	630015	15.2	33.39	35.8	107	331	160	160	16.9		15	
		11:05	75	630077											
	Averages								343.7	159.7	159.4	17.1		10.1	n/m

Final gas meter reading: 630077 | End Time: 11:05

Equipment used

Item	Fin No.
Control box	P1580
Meter coefficient (k)	0.926
K factor (K, independent of C_p)	3.113
Orifice plate pressure units	mm w.g.
Pitot differential pressure units	mm w.g.
Pitot	S
Pitot coefficient (C_p)	0.84
Probe liner thermocouple Titanium	P1087
Duct gas thermocouple	P1511
Oven thermocouple	P1395
Impinger exit thermocouple	P1333
Timer	P1187

Approach to Isokinetic sampling

Average gas velocity (V_{duct})	13.6 m/s
Nozzle diameter (D_n)	6.280 mm
Sampling time (t)	75 min
Theoretical isokinetic sample volume SV_i	1885.83 l
Actual sample volume (SV_a)	2082.37 l
Approach to isokinetic sampling (I)	109.9 %

where: Vduct is the average duct velocity based on the above measurements

$V_{duct} = C_p \times (1-r) \times \sqrt{2\rho_s \times h}$ (Reference ISO 10042 Section 2.1.1985 (ISO 3966), pages 555)

SVi is the theoretical isokinetic sample volume based on V_{duct} & D_n

$SV_i = V_{duct} \times \pi \times (D_n/2000)^2 \times t \times 60 \times 1000$

SV_a is the sample volume at duct conditions

$SV_a = SV_m \times \gamma \times [273 + T_{duct}]/[273 + T_m] \times (P_{atm}/P_{duct}) \times (100 - H_2O_{duct})/(100-H_2O_{duct})$

Leak check

		Start	End
Start Time		09:27	11:07
End Time		09:29	11:09
Initial meter reading	m^3	629.8066	630.0772
Final meter reading	m^3	629.8068	630.0777
Duration of leak test	min	2	2
Pump vacuum	"Hg	-15	-15
Leak rate	l/min	0.15	0.2
Less than 2% of normal sampling rate?		Yes	Yes

Determination of exhaust gas flow rate
based on measurements at sample points only

Flow rate at duct conditions (Q_{duct})	2.48 m³/s
Flow rate at STP (Q_{STP})	1.64 m³/s
Flow rate at reference conditions (Q_{ref})	0.37 m³/s

where

$Q_{duct} = V_{duct} \times A$

$Q_{STP} = Q_{duct} \times [(T_{duct} + 273)/(T_{duct} + 273)] \times (P_{duct}/P_{std})$

$Q_{ref} = Q_{STP} \times [(20.9 - O_{2std})/(20.9 - O_{2duct})] \times [(100-H_2O_{duct})/(100-H_2O_{std})]$

PARTICULATE WEIGHINGS

Test Ref crem 1

Filters

Determination		Method Blank	Field Blank	tpm
Filter No.		0	012376	012454
Pre-sampling conditioning temperature (±5°C)	°C	180	180	180
Post-sampling conditioning temperature (±5°C)	°C	160	160	160
Diameter	mm	110	110	110
Material		Quartz	Quartz	Quartz
Pre-sampling weights				
after 1 min	g		0.7427	0.8426
after 2 min	g		0.7429	0.8426
after 3 min	g		0.7429	0.8427
Weight extrapolated to zero time (M_{e0})	g		0.7426	0.8425
Post-sampling weights				
after 1 min	g		0.7448	0.8499
after 2 min	g		0.7448	0.8499
after 3 min	g		0.7448	0.8499
Weight extrapolated to zero time (M_{e0})	g		0.7448	0.8499

Rinsings

Pre-sampling conditioning temperature (±5°C)	°C	180	180	180
Post-sampling conditioning temperature (±5°C)	°C	160	160	160
Pre-sampling weights (container only)				
after 1 min	g		74.2573	70.2705
after 2 min	g		74.2573	70.2704
after 3 min	g		74.2572	70.2703
Weight extrapolated to zero time (M_{r10})	g		74.2574	70.2706
Post-sampling weights (container and evaporated rinsings)				
after 1 min	g		74.2573	70.2770
after 2 min	g		74.2573	70.2770
after 3 min	g		74.2573	70.2769
Weight extrapolated to zero time (M_{r0})	g		74.2573	70.2771

Summary

Determination		Method Blank (M_{wb})	Field Blank	tpm
Mass collected on filter ($M_f = (M_{e0} - M_{e0} - M_{fwb})$)	g	0.0000	0.0022	0.0074
Mass collected in rinsings ($M_r = (M_{r10}-M_{r10}-M_{rwb})$)	g	0.0000	-0.0001	0.0065
Total mass collected ($M = M_f + M_r$)	g	0.0000	0.0021	0.0138

Uncertainty Calculation Parameters

Standard uncertainty for gas volume measurement (U6)	2.9 %
Standard uncertainty for filter weighing (U17)	0.57 mg
Standard uncertainty for washings weighing (U17)	0.50 mg
Limit of detection for filter weighing (U17)	0.50 mg
Limit of detecion for washings weighing (U17)	0.50 mg
Standard uncertainty for oxygen correction (U11)	0.95 %
Standard uncertainty for gas flow measurement (U14)	5.7 %

Emission Limit Value

Emission limit value (ELV) at reference conditions	80 mg/m³

SUMMARY OF MEASUREMENTS

Test Ref crem 1

Calculation of Particulate Concentration and Discharge Rate

Particulate concentration (C), mg/m^3 = M x 1000/ SV_{Ref}

Discharge rate, kg/h = C x Q_{Ref} x 0.0036

Determination		Field Blank	tpm
Particulate concentration at reference conditions	mg/m^3	6.46	42.54
Uncertainty	mg/m^3	6.46	5.17
Particulate concentration at duct conditions (raw)	mg/m^3	1.01	6.64
Particulate discharge rate	kg/h	0.01	0.06
Uncertainty	kg/h	0.00	0.01

Note: Field blank results based on average sampling conditions

Uncertainty budget

Uncertainties		Field Blank	tpm
Volume measurement (m_{vol})	mg	0.06	0.40
Filter weighings (m_f)	mg	1.58	0.57
Rinsings weighings (m_w)	mg	-0.07	0.50
Total for uncorrected measurement (U_u)	mg	1.58	0.86
Correction to reference conditions (m_{corr})	mg	0.00	0.00
Total for corrected measurement (U_c)	mg	1.58	0.86
Concentration at 95% confidence interval (U_{95c})	mg/m^3	6.46	5.17

Based on Procedure 55 and Uncertainty Policies 11 & 17
(in accordance with requirements of BS EN ISO 14956:2002 and ENV 13005 (GUM))

$U_u = \sqrt{m_{vol}^2 + m_f^2 + m_w^2}$

$U_c = \sqrt{U_u^2 + m_{corr}^2}$

$U_{95c} = 1.96 \times U_c / SV_{Ref}$

COMPLIANCE WITH BS EN 13284-1:2002/BS ISO 9096 CONDITIONS

Flow conditions (BS EN 13284-1, 5.2 & BS ISO 9096, 5.3)

Standard	EN 13284-1
Angle of gas flow less than 15°	Yes
No local negative gas flow	Yes
Minimum differential pressure greater than 5 Pa	Yes
Ratio of highest to lowest local gas velocites less than 3:1	No

Compliance with BS EN 13284-1

Blank value is less than 10% of ELV (Clause 4f)
Nozzle diameter greater than 6 mm (Clause 6.2.4)
Average sampling rate was within -5% and +15% of isokinetic conditions (Clause 8.4)
Leak rate is within 2% of sample rate (Clause 8.4)

SCIENTIFICS MONITORING REPORT FORM
Hydrogen chloride to BS EN 1911

Company	City of London	Test Ref	HCl1
Site	Crematorium	Date	07-Jan-10
Sample point	Cremator 1 run 1	Time start	9:50
Test carried out by	S Huntley & T Swannack	Time End	11:05
Determinand	Hydrogen chloride to BS EN 1911	Duration (min)	75
		Sampling conditions	crem 1

ANALYSIS OF COLLECTED SOLUTIONS

Determination		HCl
Volume of sampling solution in first stage (Vs1)	ml	568
Volume of sampling solution in field blank (Vsb)	ml	100
Chloride detection limit in sampling solution (qd)	mg/l	0.10
Chloride in first stage sampling solution (qs1)	mg/l	25.60
Chloride in field blank sampling solution (qcb)	mg/l	0.00
Emission limit value (ELV, daily)	mg/m³	200

Calculation of hydrogen chloride concentration in duct gas, Cg

C_g (mg/m³) = {([V_{s1} x q_{s1}]+[V_{sb} x q_{cb}])} x MW_c / (V_{mstd} x MW_{cl} x N_a)

where MWc is the molecular weight of hydrogen chloride (i.e. 36.5 kg/kgmole)
MWcl is the molecular weight of the chloride ion (i.e. 35.5 kg/kgmole)
Na is the number of chloride ions in hydrogen chloride (i.e. 1)

Calculation of hydrogen chloride discharge rate, Dg

$D_g = C_g \times Q_{sv} \times 0.0036$

MEASUREMENTS OF HYDROGEN CHLORIDE

Determination		HCl
Concentration at reference conditions (C_g)	mg/m³	53.16
Uncertainty (95% confidence limit)	mg/m³	6.11
Uncertainty as a proportion of ELV	%	3.06
Discharge rate (D_g)	kg/h	0.072
Uncertainty (95% confidence limit)	kg/h	0.011
Detection limit	mg/m³	0.180

FIELD BLANK

Determination		HCl
Field blank concentration*	mg/m³	0.00
Field blank as a proportion of ELV	±%	0.0

*assuming same sample volume as for sample

Uncertainty Calculation Parameters

Standard uncertainty for gas volume measurement (U6)	2.9 %
Standard uncertainty for liquid volume measurement (U16)	1 %
Analytical uncertainty at X times LOD (U15)	5 %
X (U15)	10
Standard uncertainty for oxygen correction (U11)	0.95 %
Standard uncertainty for gas flow measurement (U14)	5.7 %

Uncertainty budget

Uncertainties		HCl
Sample gas volume measurement (m_{vol})	%	2.9
Solution volume measurement (m_{sol})	%	1.0
Analysis of washings (m_w)	%	5.0
Total for uncorrected measurement (U_c)	mg/m³	3.12
Correction to reference conditions (m_{corr})	mg/m³	0.00
Concentration at 95% confidence interval (U_{exp})	mg/m³	6.112

Based on Procedure 55 and Uncertainty Policies 11 & 16
(In accordance with requirements of BS EN ISO 14956:2002 and ENV 13005 (GUM))

COMPLIANCE WITH STANDARD

Probe temperature is at least 150C (Clause 6.2)
Leak rate less than 2% of sample rate (Clause 1-8.2)
Sampling within 10% of isokinetic conditions (Clause 1-6.1.5)
Absorption efficiency not determined
Sample concentration is greater than 10 times field blank (3-6.2.1)
Field blank concentration is less than 10% of ELV (not normative)
Measurement uncertainty is less than 20% of ELV (not normative)

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SCIENTIFICS MONITORING REPORT FORM
Carbon Monoxide to BS EN 15058:2006

Company	City of London	Date	7-Jan-10
Site	Crematorium	Test Ref	crem 1 (a)
Sample point	Cremator 1, run 1	Time Start	09:54
Test carried out by	S Huntley & T Swannack	Time End	11:03

Measurements: 5 minutes' averaging period

Start	End	No. Readings	Maximum	Minimum	Average	Maximum	Minimum	Average
			ppm , dry			mgCO/m^3, ref. cond.		
09:54	09:58	20	8	<5	<5	22	<5	10
09:59	10:03	20	<5	<5	<5	10	<5	7
10:04	10:08	20	<5	<5	<5	8	<5	6
10:09	10:13	20	<5	<5	<5	6	<5	<5
10:14	10:18	20	<5	<5	<5	6	<5	<5
10:19	10:23	20	<5	<5	<5	5	<5	<5
10:24	10:28	20	<5	<5	<5	5	<5	<5
10:29	10:33	20	18	<5	7	78	<5	28
10:34	10:38	20	17	6	9	74	22	37
10:39	10:43	20	13	7	10	48	24	35
10:44	10:48	20	10	<5	6	35	15	22
10:49	10:53	20	<5	<5	<5	17	10	13
10:54	10:58	20	<5	<5	<5	14	8	11
10:59	11:03	20	<5	<5	<5	13	6	10
09:54	11:03	280	18	<5	<5	78	<5	14

Summary of measurements

Average concentration	14 mgCO/m^3
Uncertainty	14 mgCO/m^3
Discharge rate	0.019 kgCO/h

Compliance with BS 15058:2006

No correction for drift applied (Clause 8.4.3)
Response time is within limit (Clause 7.2)
Uncertainty is within specified limit of 6% of ELV (Clause 7.3)

Calibration Checks

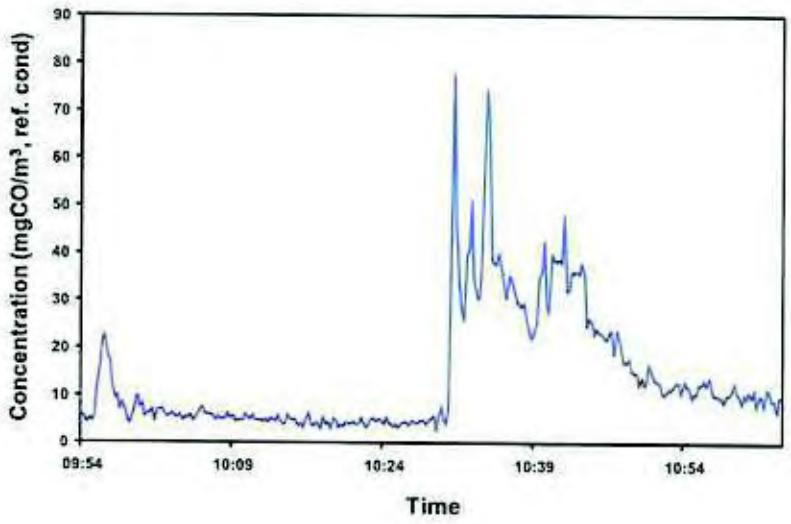
Type Horiba PG 250 **Range** 0 to 50 ppm
Equipment No. P1301
Measurement method Non-dispersive infra-red

Calibration		Zero	Span
Gas reference		CH49	DG2
Concentration	ppm	0.00	25.12
		Analyser response	
Gas into analyser before sampling	ppm	0.00	25.14
Gas into system before sampling	ppm	-0.20	25.12
Gas into system after sampling	ppm	-0.30	25.30
Drift	% span	0.40	0.72
Response time	s	26	

Uncertainty budget

Quantity		Variation		Value		Partial uncertainty (x_{unc})		x_{unc}^2
						ppm CO	mgCO/m³	
Lack of fit	$u(Corr_{fit})$	-		2.00	% range	0.58	0.72	0.52
Zero drift	$u(Corr_{z,d})$	-		0.26	% range	0.08	0.09	0.01
Span drift	$u(Corr_{s,d})$	-		0.28	% range	0.08	0.10	0.01
Sample volume flow	$u(Corr_{v,s})$	-		0.00	% range	0.00	0.00	0.00
Atmospheric pressure	$u(Corr_{atmos})$	0	kPa	0.00	% range/2xP	0.00	0.00	0.00
Ambient temperature	$u(Corr_{amb})$	1	K	0.50	% range/10K	0.01	0.01	0.00
Electric voltage	$u(Corr_{el})$	40	V	0.00	% range/10V	0.00	0.00	0.00
Interferents	$u(Corr_{int})$	-		1.60	% range	0.46	0.59	0.33
Losses & leakage	$u(Corr_{leak})$	-		0.00	% range	0.00	0.00	0.00
Repeatability at zero	$u(Corr_{r,z})$	-		0.14	% range	0.04	0.05	0.00
Repeatability at span	$u(Corr_{r,s})$	-		0.00	% range	0.00	0.00	0.00
Converter efficiency	$u(Corr_{conv})$	-		100.00	% reading	0.00	0.00	0.00
Response factor	$u(Corr_{resp})$	-		100.00	% reading	0.00	0.00	0.00
Calibration gas	$u(Corr_{cal})$	-		1.00	% value	0.40	0.50	0.25
Combined uncertainty	$u(C_{CO})$							1.06
Expanded uncertainty	$U(C_{CO})$							2.09
$U(C_{CO})/ELV$ (%)								2.09

Measured concentration of Carbon Monoxide at Cremator 1, run 1



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SCIENTIFICS MONITORING REPORT FORM
Volatile Organic Compounds to BS EN 12619:1999 & BS EN 13526:2002

Company	City of London	Date	7-Jan-10
Site	Crematorium	Test Ref	crem 1 (a)
Sample point	Cremator 1, run 1	Time Start	09:50
Test carried out by	S Huntley & T Swannack	Time End	11:05

Measurements: 5 minutes' averaging period

Start	End	No. Readings	Maximum	Minimum	Average	Maximum	Minimum	Average
			ppm , wet			mgCarbon/m3, ref cond.		
09:50	09:55	10	<1	<1	<1	3.5	<1	1.3
09:55	10:00	10	<1	<1	<1	1.8	<1	<1
10:00	10:05	10	<1	<1	<1	<1	<1	<1
10:05	10:10	10	<1	<1	<1	<1	<1	<1
10:10	10:15	10	<1	<1	<1	<1	<1	<1
10:15	10:20	10	<1	<1	<1	<1	<1	<1
10:20	10:25	10	<1	<1	<1	<1	<1	<1
10:25	10:30	10	<1	<1	<1	<1	<1	<1
10:30	10:35	10	<1	<1	<1	<1	<1	<1
10:35	10:40	10	<1	<1	<1	<1	<1	<1
10:40	10:45	10	<1	<1	<1	<1	<1	<1
10:45	10:50	10	<1	<1	<1	<1	<1	<1
10:50	10:55	10	<1	<1	<1	<1	<1	<1
10:55	11:00	10	<1	<1	<1	<1	<1	<1
11:00	11:05	10	<1	<1	<1	<1	<1	<1
09:50	11:05	150	<1	<1	<1	3.5	<1	<1

Summary of measurements

Average concentration	<1 mgCarbon/m3
Uncertainty	1 mgCarbon/m3
Discharge rate	<0.00134928 kgCarbon/h

Compliance with BS EN 12619/BS EN 13526

Correction for drift applied to measurements (BS EN 14789, Clause 8.4.3)
Response time is within limit (BS EN 12619, Clause 6.1.1)
Uncertainty is within specified limit of 10% of ELV (BS EN 14789, Clause 1)

Calibration Checks

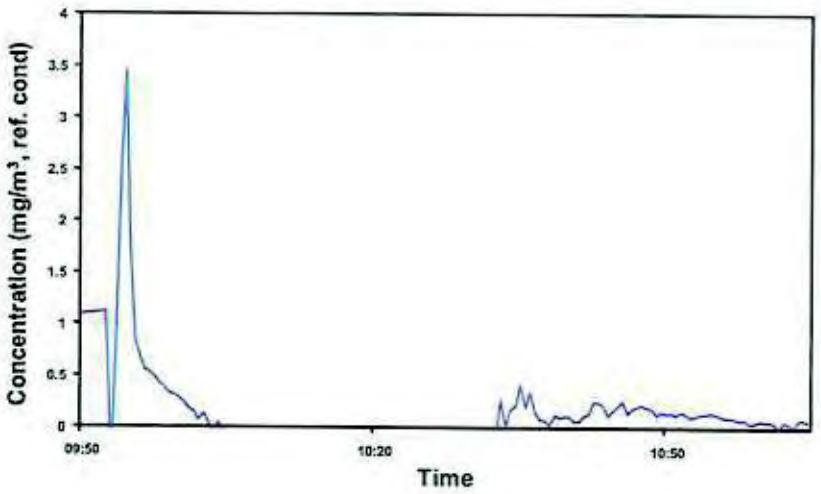
Type Bernath 3006 **Range** 0 to 10 ppm
Equipment No. P1266
Measurement method Flame ionisation detection

Calibration		Zero	Span
Gas reference		CH49	DG2
Concentration	ppm	0.00	8.92
		Analyser response	
Gas into analyser before sampling	ppm	-0.34	8.95
Gas into system before sampling	ppm	-0.35	8.92
Gas into system after sampling	ppm	-0.54	8.86
Drift	% span	2.13	0.67
Response time	s	9	

Uncertainty budget

Quantity		Variation		Value		Partial uncertainty (x_{meas})		x_{meas}^2
						ppm	mg/m³	
Lack of fit	$u(Corr_{fit})$	-		2.00	% range	0.12	0.19	0.03
Zero drift	$u(Corr_{zero})$	-		2.00	% range	0.12	0.19	0.03
Span drift	$u(Corr_{span})$	-		2.00	% range	0.12	0.19	0.03
Sample volume flow	$u(Corr_{vol})$	-		1.00	% range	0.06	0.09	0.01
Atmospheric pressure	$u(Corr_{atmos})$	0	kPa	0.50	% range/2kP	0.00	0.00	0.00
Ambient temperature	$u(Corr_{amb})$	1	K	2.00	% range/10K	0.01	0.01	0.00
Electric voltage	$u(Corr_{elec})$	40	V	2.00	% range/10V	0.23	0.37	0.14
Interferents	$u(Corr_{int})$	-		3.50	% range	0.20	0.32	0.11
Losses & leakage	$u(Corr_{leak})$	-		0.00	% range	0.00	0.00	0.00
Repeatability at zero	$u(Corr_{r,zero})$	-		1.00	% range	0.06	0.09	0.01
Repeatability at span	$u(Corr_{r,span})$	-		2.00	% range	0.12	0.19	0.03
Converter efficiency	$u(Corr_{conv})$	-		100.00	% reading	0.00	0.00	0.00
Response factor	$u(Corr_{resp})$	-		100.00	% reading	0.00	0.00	0.00
Calibration gas	$u(Corr_{cal})$	-		1.00	% value	0.06	0.10	0.01
Combined uncertainty	$u(C_{voc})$							0.63
Expanded uncertainty	$U(C_{voc})$							1.24
$U(C_{voc})/ELV(\%)$								6.19

Measured concentration of Volatile Organic Compounds at Cremator 1, run 1



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SCIENTIFICS MONITORING REPORT FORM
Oxygen to BS EN 14789:2005

Company	City of London	Date	7-Jan-10
Site	Crematorium	Test Ref	crem 1 (a)
Sample point	Cremator 1, run 1	Time Start	09:54
Test carried out by	S Huntley & T Swannack	Time End	11:03

Measurements: 5 minutes' averaging period

Start	End	No. Readings	Maximum	Minimum	Average	Maximum	Minimum	Average
			% dry			% dry		
09:54	09:58	20	16.8	16.3	16.5	16.8	16.3	16.5
09:59	10:03	20	16.7	16.4	16.5	16.7	16.4	16.5
10:04	10:08	20	16.8	16.4	16.5	16.8	16.4	16.5
10:09	10:13	20	16.8	16.4	16.6	16.8	16.4	16.6
10:14	10:18	20	16.8	16.4	16.5	16.8	16.4	16.5
10:19	10:23	20	16.8	16.3	16.5	16.8	16.3	16.5
10:24	10:28	20	17.0	16.4	16.5	17.0	16.4	16.5
10:29	10:33	20	18.3	16.9	17.6	18.3	16.9	17.6
10:34	10:38	20	18.1	17.4	17.8	18.1	17.4	17.8
10:39	10:43	20	17.5	16.8	17.3	17.5	16.8	17.3
10:44	10:48	20	17.7	17.3	17.5	17.7	17.3	17.5
10:49	10:53	20	17.9	17.6	17.7	17.9	17.6	17.7
10:54	10:58	20	18.0	17.8	17.8	18.0	17.8	17.8
10:59	11:03	20	18.3	17.9	18.1	18.3	17.9	18.1
09:54	11:03	280	18.3	16.3	17.1	18.3	16.3	17.1

Summary of measurements

Average concentration	17.1 $\%O_2$, dry
Uncertainty	0.6 $\%O_2$, dry

Compliance with BS 15058:2006

No correction for drift applied (Clause 8.4.3)
Response time is within limit (Clause 7.2)
Uncertainty is within specified limit of 6% of measured concentration (Clause 1)

Calibration Checks

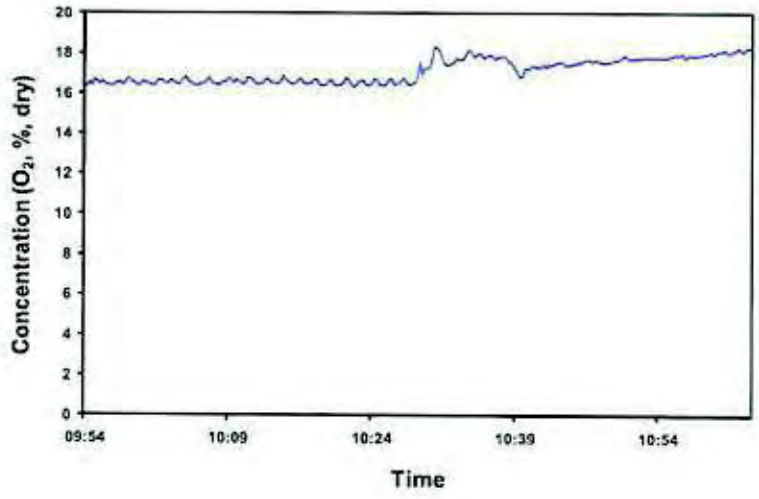
Type Horiba PG 250 **Range** 0 to 25 %
Equipment No. P1301
Measurement method Zirconium cell

Calibration		Zero	Span
Gas reference		CH49	DG2
Concentration	%	0.00	13.10
		Analyser response	
Gas into analyser before sampling	%	0.00	13.05
Gas into system before sampling	%	0.00	13.08
Gas into system after sampling	%	0.10	13.15
Drift	% span	0.76	0.54
Response time	s	22	

Uncertainty budget

Quantity		Variation		Value		Partial uncertainty (x_{max})	x_{max}^2
						%O_2	
Lack of fit	$u(Corr_{lof})$	-		2.00	% range	0.29	0.08
Zero drift	$u(Corr_{z,dr})$	-		0.11	% range	0.02	0.00
Span drift	$u(Corr_{s,dr})$	-		0.24	% range	0.03	0.00
Sample volume flow	$u(Corr_{v,s})$	-		0.00	% range	0.00	0.00
Atmospheric pressure	$u(Corr_{atmos})$	0	kPa	0.00	% range/2kP	0.00	0.00
Ambient temperature	$u(Corr_{amb})$	1	K	0.40	% range/10K	0.00	0.00
Electric voltage	$u(Corr_{el})$	40	V	0.00	% range/10V	0.00	0.00
Interferents	$u(Corr_{int})$	-		0.00	% range	0.00	0.00
Losses & leakage	$u(Corr_{loss})$	-		0.05	% range	0.01	0.00
Repeatability at zero	$u(Corr_{r,zer})$	-		0.00	% range	0.00	0.00
Repeatability at span	$u(Corr_{r,spa})$	-		0.00	% range	0.00	0.00
Converter efficiency	$u(Corr_{conv})$	-		100.00	% reading	0.00	0.00
Response factor	$u(Corr_{resp})$	-		100.00	% reading	0.00	0.00
Calibration gas	$u(Corr_{cal})$	-		1.00	% value	0.13	0.02
Combined uncertainty	$u(C_{max})$						0.32
Expanded uncertainty	$U(C_{max})$						0.62
$U(C_{max})/C_{max}$ [%]							3.63

Measured concentration of Oxygen at Cremator 1, run 1



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SCIENTIFICS MONITORING REPORT FORM
Carbon Dioxide to ISO 12039:2001

Company	City of London	Date	7-Jan-10
Site	Crematorium	Test Ref	crem 1 (a)
Sample point	Cremator 1, run 1	Time Start	09:54
Test carried out by	S Huntley & T Swannack	Time End	11:03

Measurements: 5 minutes' averaging period

Start	End	No. Readings	Maximum	Minimum	Average	Maximum	Minimum	Average
			%, dry			$\%CO_2$ ref. cond.		
09:54	09:58	20	2.6	2.3	2.5	5.6	5.6	5.6
09:59	10:03	20	2.6	2.4	2.5	5.6	5.6	5.6
10:04	10:08	20	2.6	2.3	2.5	5.6	5.6	5.6
10:09	10:13	20	2.5	2.3	2.4	5.6	5.6	5.6
10:14	10:18	20	2.6	2.3	2.5	5.6	5.6	5.6
10:19	10:23	20	2.6	2.3	2.5	5.6	5.6	5.6
10:24	10:28	20	2.6	2.2	2.5	5.6	5.5	5.6
10:29	10:33	20	2.8	1.4	2.2	8.0	5.4	6.6
10:34	10:38	20	2.6	2.1	2.2	7.5	6.9	7.1
10:39	10:43	20	3.4	2.5	2.9	8.2	7.2	7.7
10:44	10:48	20	2.6	2.3	2.4	7.2	6.9	7.1
10:49	10:53	20	2.4	2.1	2.3	7.2	6.9	7.1
10:54	10:58	20	2.3	2.1	2.2	7.2	6.9	7.1
10:59	11:03	20	2.1	1.8	2.0	7.1	6.8	7.0
09:54	11:03	280	3.4	1.4	2.4	8.2	5.4	6.4

Summary of measurements

Average concentration	6.4 $\%CO_2$
Uncertainty	0.8 $\%CO_2$

Compliance with BS 14792:2005

No correction for drift applied (BS EN 14789, Clause 8.4.3)
Response time is within limit (ISO 12039, Clause A.2)
Uncertainty is above specified limit of 6% of measured concentration (BS EN 14789, Clause 1) - non compliance

Calibration Checks

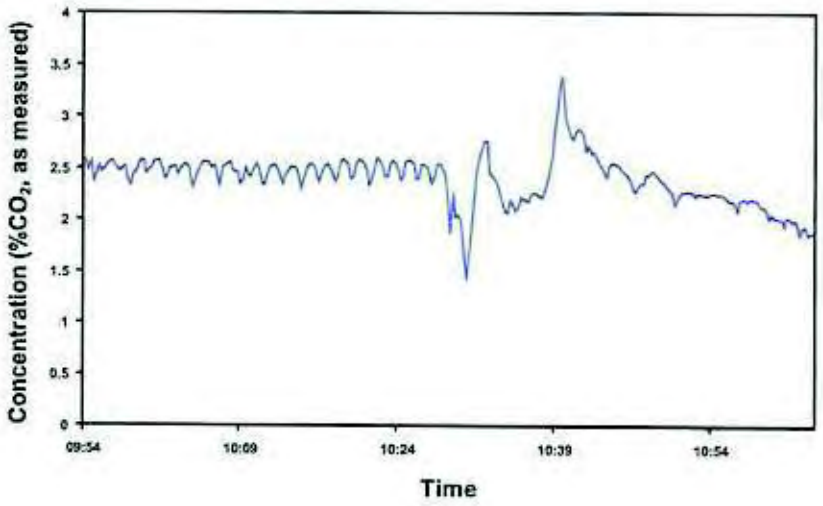
Type Horiba PG 250 **Range** 0 to 10 %
Equipment No. P1301
Measurement method Non-dispersive infra-red

Calibration		Zero	Span
Gas reference		CH49	DG2
Concentration	%	0.00	5.08
		Analyser response	
Gas into analyser before sampling	%	0.00	5.09
Gas into system before sampling	%	0.05	5.10
Gas into system after sampling	%	0.12	5.20
Drift	% span	1.38	1.96
Response time	s	27	

Uncertainty budget

Quantity		Variation		Value		Partial uncertainty (x_{CO_2})	$x_{CO_2}^2$
						%CO_2	
Lack of fit	$u(Corr_{fit})$	-		2.00	% range	0.12	0.01
Zero drift	$u(Corr_{z,d})$	-		0.26	% range	0.02	0.00
Span drift	$u(Corr_{s,d})$	-		0.29	% range	0.02	0.00
Sample volume flow	$u(Corr_{v,s})$	-		0.00	% range	0.00	0.00
Atmospheric pressure	$u(Corr_{atmos})$	0	kPa	0.00	% range/2kPa	0.00	0.00
Ambient temperature	$u(Corr_{amb})$	1	K	0.50	% range/10K	0.00	0.00
Electric voltage	$u(Corr_{elec})$	40	V	0.00	% range/10V	0.00	0.00
Interferents	$u(Corr_{int})$	-		1.50	% range	0.09	0.01
Losses & leakage	$u(Corr_{loss})$	-		0.00	% range	0.00	0.00
Repeatability at zero	$u(Corr_{r,zero})$	-		0.14	% range	0.01	0.00
Repeatability at span	$u(Corr_{r,span})$	-		0.00	% range	0.00	0.00
Converter efficiency	$u(Corr_{conv})$	-		100.00	% reading	0.00	0.00
Response factor	$u(Corr_{resp})$	-		100.00	% reading	0.00	0.00
Calibration gas	$u(Corr_{gas})$	-		1.00	% value	0.05	0.00
Combined uncertainty	$u(C_{CO2})$						0.16
Expanded uncertainty	$U(C_{CO2})$						0.31
$U(C_{CO2})/C_{CO2}(\%)$							12.84

Measured concentration of Carbon Dioxide at Cremator 1, run 1



SCIENTIFICS MONITORING REPORT FORM
WATER VAPOUR DETERMINATION to BS EN 14790:2005

Company	City of London	Test Ref	cremt 1 (a)
Site	Crematorium	Date	07-Jan-10
Sample point	Cremator 1 run 1	Time start	9:50
Test carried out by	S Huntley & T Swannack	Time End	11:05
		Duration (min)	75
		Data from	cremt 1

Collection of water from gas

Collection Stage (ci)	Initial Mass(Mci) g	Final Mass (Mci) g	Mass gain (Mci) g
Container 1	788.90	804.80	15.92
Container 2	809.47	815.27	5.8
Container 3	617.17	617.50	0.33
Container 4	897.53	900.68	3.15
Total (Mi)	3113.13	3138.69	25.56

Calculation of dry gas sample volume at STP (SV_{STP})

Volume of dry gas sampled at STP (SV_{STP})	m^3	0.8687

Calculation of water vapour content (H_2O_{mea})

H_2O_{mea} = $100 \times [M \times MV_{STP}/MW_{H2O}]/[SV_{STP} + (M \times MV_{STP}/MW_{H2O})]$

where MV_{STP} = molecular volume at STP (22.412 m³/kgmole)

MW_{H2O} = molecular weight of water (18 kg/kgmole)

Water vapour content (H_2O_{mea})	%	3.53	±	0.16

Compliance with BS 14790

Uncertainty less than 20% of measured value (Clause 7.3)
Temperature at outlet is less than 4oC based on calculated dew point (Clause 6.4.2)
Leak rate is no more than 2% of sample flow rate
Sampling duration is within minimum of 30 minutes (Clause 6.1)
Sampling volume is within minimum of 501 (Clause 6.1)
Residual water content at outlet is below 1.25% (Clause 5.8)
Sampling temperature was within minimum of +20oC during sampling (Clause 5.2)

Uncertainty Budget (based on BS 14790 and Uncertainty Policy U05)

Volume of sampled gas	V	0.869 m^3
Average temperature of gas at meter	T	17.1 °C
Average barometric pressure at meter	P	990 mb
Sampling line leakage		0.098175 m^3/min
Duration of sampling	t	75 min
Total mass weighed	M	3138.69 g

Source of uncertainty		Value		Value of standard uncertainty		Relative standard uncertainty (%)
Measurement of sample gas volume	u_rV_m	2.0 %	u_V	$u_rV_m = \frac{u_V}{V}$	0.0100 m^3	u_rV_m 1.15
Measurement of sample gas temperature	u_rT_m	1.0 %	u_T	$u_rT_m = \frac{u_T}{T+273.15}$	1.6751 K	u_rT_m 0.58
Measurement of abolsute pressure	u_rP_m	1.0 %	u_P	$u_rP_m = \frac{u_P}{P}$	9.7158 mb	u_rP_m 0.58
Leakage in sampling line	u_rL	1.3 %	u_L	$u_rL = \frac{u_L}{L}$	0.0076 m^3	u_rL 0.87
Measurement of weight - balance uncertainty	u_rW_m	0.01 %	u_{bal}	$u_rW_m = \frac{u_{bal}}{W}$	0.1812 g	-
Measurement of weight - balance repeatability	u_rW_r	0.011 g	u_{br}	$u_rW_r = \frac{u_{br}}{W}$	0.0110 g	-
Total measurement of weight	u_rW	-	-	u_rW =	0.1922 g	u_rW 0.75

Total standard relative uncertainty	$u_r = \sqrt{u_rV_m^2 + u_rT_m^2 + u_rP_m^2 + u_rL^2 + u_rW^2 + Corr_{xy}}$	2.27 %
Total relative uncertainty	$U_r = 1.96u_r$	4.46 %

SCIENTIFICS MONITORING REPORT FORM
TOTAL PARTICULATE MATTER to BS EN 13284-1/BS ISO 9096

Company	City of London	Test Ref	crem 1 (b)
Site	Crematorium		
Sample point	Cremator 1 run 2		
Test carried out by	S Huntley & T Swannack		

SAMPLING TIMES

Determination		TPM
Date		07-Jan-10
Time Start		11:40
Time End		13:10
Duration (t)	min	90

Sampling plane

Dimension traversed by sampling probe (D)	m	0.42
Cross sectional area of sampling plane (A)	m^2	0.18

Duct gas conditions

Determination		TPM
Ambient temperature (T_{Amb})	°C	7.0
Average duct gas temperature (T_{duct})	°C	345.9
Duct static gas pressure (P_{Static})	kPa	-0.05
Barometric pressure (P_{Baro})	kPa	99.00
Volume flow rate @ ref. conditions (Q_{Ref})	m^3/s	0.21
Gas compressibility correction (z)		0.995
Wet gas density (ρ_s)		0.55
Exhaust gas conditions measurements		crem 1 (b)

Reference conditions

Determination		TPM
Actual Duct Flow Conditions		
Average temperature (T_{duct})	°C	345.9
Total pressure (P_{duct})	kPa	98.95
Oxygen (O_{2duct})	% vol,dry	18.30
Water vapour (H_2O_{duct})	% vol	3.74
Reference Conditions		
Temperature (T_{Ref})	°C	0
Pressure (P_{Ref})	kPa	101.3
Oxygen (O_{2Ref})	% vol, dry	11
Water vapour (H_2O_{Ref})	% vol	0

Sampling conditions

Determination				TPM
Nozzle diameter (d)	T124	Titanium	mm	6.280
Initial gas meter reading			m^3	630.168
Final gas meter reading			m^3	631.154
Sampled volume (SV_M)			m^3	0.986

Calculation of sample gas volume at reference conditions, SV_{Ref}

$$SV_{Ref} = SV_{Meter} \times \gamma \times \frac{[273 + T_{Ref}]}{[273 + T_{Meter}]} \times \frac{P_{Stat}}{P_{Ref}} \times \frac{[100-H_2O_{Meter}]}{[100-H_2O_{Ref}]} \times \frac{[20.9-O_{2Duct}]}{[20.9-O_{2Ref}]}$$

Corrections
Temperature
Pressure
Water vapour
Oxygen

Determination		TPM
Sampled volume @ ref. conditions (SV_{Ref})	m^3	0.219

SAMPLING DATA TPM

Test Ref: crem 1 (b)

Initial gas meter reading: 630158 Start Time: 11:40

Distance from Duct Wall Fraction of D	Port	Time of Day hr:min	Run time min	Gas meter reading l	Pitot Reading (h) mm w.g.	Orifice Vacuum mm w.g. Desired (ΔH_d) $H_d \times B_a \times Ca^2$	Orifice Vacuum mm w.g. Actual (ΔH_a)	Isokinetic difference $[\Delta H_a/\Delta H_d]$ %	Temperatures Gas (T_{duct}) °C	Probe (T_p) °C	Filter (T_f) °C	Water (T_w) Inlet °C	Water (T_w) Outlet °C	Impinger (T_{imp}) °C	Oxygen Content % v/v, dry
0.500	A	11:40	0	630158	4.6	10.10	10.0	100	347	159	157	13.8		8	
		11:45	5	630227	7.2	15.81	17	107	346	159	159	14.0		8	
		11:50	10	630292	7.1	15.60	16.7	107	345	160	160	14.0		9	
		11:55	15	630361	3.6	8.35	9	108	344	160	160	13.8		11	
		12:00	20	630417	3.1	6.13	6.7	107	353	160	160	13.8		12	
		12:05	25	630480	5.4	11.42	12.3	108	347	160	160	13.8		12	
		12:10	30	630535	2.2	4.63	5.2	108	365	160	160	13.8		14	
		12:15	35	630594	3.3	7.25	7.8	108	366	161	160	13.8		14	
		12:20	40	630612	2.4	5.27	5.7	108	360	161	160	13.8		13	
		12:25	45	630655	2.8	6.15	6.6	107	351	161	160	13.8		16	
		12:30	50	630701	3.5	7.69	8.3	108	346	160	160	29.8		11	
		12:35	55	630752	3.1	6.81	7.3	107	347	160	160	29.8		10	
		12:40	60	630802	3.3	7.25	7.8	108	335	161	160	29.8		19	
		12:45	65	630851	6.8	14.94	16	107	338	160	160	29.8		7	
		12:50	70	630915	13.9	30.53	33	108	333	160	160	29.8		8	
		12:55	75	631009	7.6	17.13	18.4	107	332	160	160	21.8		9	
		13:00	80	631062	7.9	16.82	17.9	107	334	160	160	21.8		11	
		13:05	85	631117	4.6	10.54	11.3	107	338	160	160	21.8		11	
		13:10	90	631154											
	Averages								345.8	160.0	159.7	19.4		12.2	n/m

Final gas meter reading: 631154 l End Time: 13:10

Equipment used

Item	Fle No.
Control box	P1302
Meter coefficient (y)	0.936
K factor (K, independent of C_p)	3.113
Orifice plate pressure units	mm w.g.
Pitot differential pressure units	mm w.g.
Pitot	S
Pitot coefficient (C_p)	0.84
Probe liner thermocouple Titanium	P1097
Duct gas thermocouple	P1511
Oven thermocouple	P1385
Impinger exit thermocouple	P1333
Timer	P1187

Leak check

		Start	End
Start Time		11:04	13:12
End Time		11:06	13:14
Initial meter reading	m^3	630.618	631.1538
Final meter reading	m^3	630.6185	631.1542
Duration of leak test	min	2	2
Pump vacuum	"Hg	-13	-15
Leak rate	l/min	0.15	0.2
Less than 2% of normal sampling rate?		Yes	Yes

Approach to isokinetic sampling

Average gas velocity (V_{duct})	11.0 m/s
Nozzle diameter (D_n)	6.250 mm
Sampling time (t)	90 min
Theoretical isokinetic sample volume SV_t	1835.16 l
Actual sample volume (SV_a)	2066.63 l
Approach to isokinetic sampling (I)	109.5 %

where: V(duct) is the average duct velocity based on the dynamic measurements

$V_{duct} = C_p \times (1-x) \times \sqrt{(2\Delta p_a \times h / \rho)}$ (Reference BS 1042 Section 2.1:1983 (ISO 3966), pages 8&9)

SV_t is the theoretical isokinetic sample volume based on V_{duct} & D_n

$SV_t = V_{duct} \times \pi \times [D_n/2000]^2 \times t \times 60 \times 1000$

SV_a is the sample volume at duct conditions

$SV_a = SV_{STP} \times y \times [(273 + T_{duct})/273 + T_{amb}] \times (P_{amb}/P_{duct}) \times (100 - H_2O_{duct})/(100-H_2O_{duct})$

Determination of exhaust gas flow rate

based on measurements at sample points only

Flow rate at duct conditions (Q_{duct})	1.94 m³/s
Flow rate at STP (Q_{STP})	6.83 m³/s
Flow rate at reference conditions (Q_{ref})	8.21 m³/s

where:

$Q_{duct} = V_{duct} \times A$

$Q_{STP} = Q_{duct} \times [T_{duct} + 273)/(T_{duct} = 273)] \times (P_{duct}/P_{std})$

$Q_{ref} = Q_{STP} \times [(20.9-O_{ref})/(20.9-O_{duct})] \times [(100-H_2O_{duct})/(100-H_2O_{std})]$

PARTICULATE WEIGHINGS

Test Ref crem 1 (b)

Filters

Determination		Method Blank	Field Blank	TPM
Filter No.		0	012376	012448
Pre-sampling conditioning temperature (±5°C)	°C	180	180	180
Post-sampling conditioning temperature (±5°C)	°C	160	160	160
Diameter	mm	110	110	110
Material		Quartz	Quartz	Quartz
Pre-sampling weights				
after 1 min	g		0.7427	0.8245
after 2 min	g		0.7429	0.8245
after 3 min	g		0.7429	0.8245
Weight extrapolated to zero time (M_{f0})	g		0.7426	0.8245
Post-sampling weights				
after 1 min	g		0.7448	0.8243
after 2 min	g		0.7448	0.8243
after 3 min	g		0.7448	0.8244
Weight extrapolated to zero time (M_{f0})	g		0.7448	0.8242

Rinsings

Pre-sampling conditioning temperature (±5°C)	°C	180	180	180
Post-sampling conditioning temperature (±5°C)	°C	160	160	160
Pre-sampling weights (container only)				
after 1 min	g		74.2573	72.6034
after 2 min	g		74.2573	72.6033
after 3 min	g		74.2572	72.6033
Weight extrapolated to zero time (M_{r10})	g		74.2574	72.6034
Post-sampling weights (container and evaporated rinsings)				
after 1 min	g		74.2573	72.6088
after 2 min	g		74.2573	72.6087
after 3 min	g		74.2573	72.6085
Weight extrapolated to zero time (M_{r2})	g		74.2573	72.6090

Summary

Determination		Method Blank (M_{mb})	Field Blank	TPM
Mass collected on filter ($M_f = (M_{f0} - M_{f10} - M_{fmb})$)	g	0.0000	0.0022	-0.0003
Mass collected in rinsings ($M_r = (M_{r10} - M_{r10} - M_{rmb})$)	g	0.0000	-0.0001	0.0055
Total mass collected ($M = M_f + M_r$)	g	0.0000	0.0021	0.0053

Uncertainty Calculation Parameters

Standard uncertainty for gas volume measurement (U6)	2.9 %
Standard uncertainty for filter weighing (U17)	0.57 mg
Standard uncertainty for washings weighing (U17)	0.50 mg
Limit of detection for filter weighing (U17)	0.50 mg
Limit of detecion for washings weighing (U17)	0.50 mg
Standard uncertainty for oxygen correction (U11)	0.95 %
Standard uncertainty for gas flow measurement (U14)	5.7 %

Emission Limit Value

Emission limit value (ELV) at reference conditions	50 mg/m³

SUMMARY OF MEASUREMENTS

Test Ref crem 1 (b)

Calculation of Particulate Concentration and Discharge Rate

Particulate concentration (C), mg/m^3 = M x 1000/ SV_{Ref}

Discharge rate, kg/h = C x Q_{Ref} x 0.0036

Determination		Field Blank	TPM
Particulate concentration at reference conditions	mg/m^3	9.57	24.00
Uncertainty	mg/m^3	9.57	5.24
Particulate concentration at duct conditions (raw)	mg/m^3	1.05	2.62
Particulate discharge rate	kg/h	0.01	0.02
Uncertainty	kg/h	0.00	0.00

Note: Field blank results based on average sampling conditions

Uncertainty budget

Uncertainties		Field Blank	TPM
Volume measurement (m_{vol})	mg	0.06	0.15
Filter weighings (m_f)	mg	1.58	-0.27
Rinsings weighings (m_w)	mg	-0.07	0.50
Total for uncorrected measurement (U_u)	mg	1.58	0.59
Correction to reference conditions (m_{corr})	mg	0.00	0.00
Total for corrected measurement (U_c)	mg	1.58	0.59
Concentration at 95% confidence interval (U_{95c})	mg/m^3	9.57	5.24

Based on Procedure 55 and Uncertainty Policies 11 & 17
(in accordance with requirements of BS EN ISO 14956:2002 and ENV 13005 (GUM))

$U_u = \sqrt{m_{vol}^2 + m_f^2 + m_w^2}$

$U_c = \sqrt{U_u^2 + m_{corr}^2}$

$U_{95c} = 1.96 \times U_c / SV_{Ref}$

COMPLIANCE WITH BS EN 13284-1:2002/BS ISO 9096 CONDITIONS

Flow conditions (BS EN 13284-1, 5.2 & BS ISO 9096, 5.3)

Standard	EN 13284-1
Angle of gas flow less than 15°	Yes
No local negative gas flow	Yes
Minimum differential pressure greater than 5 Pa	Yes
Ratio of highest to lowest local gas velocites less than 3:1	No

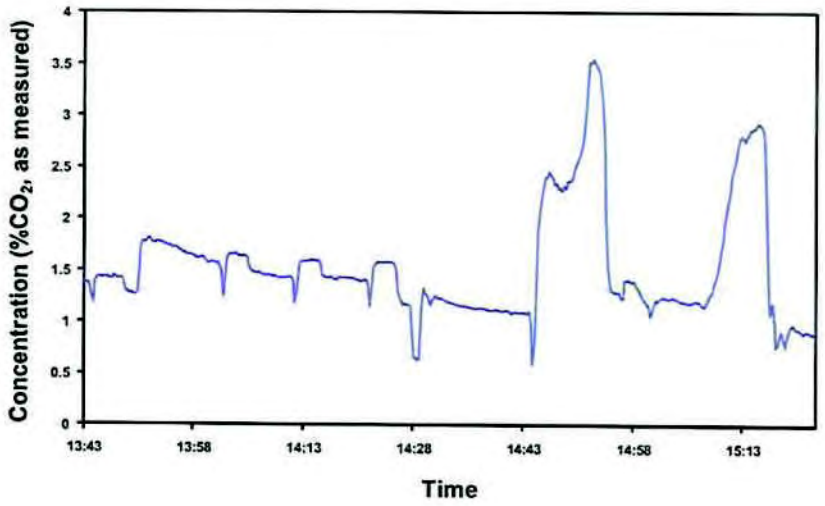
Compliance with BS EN 13284-1

Blank value is greater than 10% of ELV - measurement invalid (Clause 4f)
Nozzle diameter greater than 6 mm (Clause 6.2.4)
Average sampling rate was within -5% and +15% of isokinetic conditions (Clause 8.4)
Leak rate is within 2% of sample rate (Clause 8.4)

Uncertainty budget

Quantity		Variation		Value		Partial uncertainty (x_{imax})	x_{imax}^2
						$\%CO_2$	
Lack of fit	$u(Corr_{fit})$	-		2.00	% range	0.12	0.01
Zero drift	$u(Corr_{0,dr})$	-		0.26	% range	0.02	0.00
Span drift	$u(Corr_{s,dr})$	-		0.29	% range	0.02	0.00
Sample volume flow	$u(Corr_{s,vf})$	-		0.00	% range	0.00	0.00
Atmospheric pressure	$u(Corr_{atmpres})$	0	kPa	0.00	% range/2kP	0.00	0.00
Ambient temperature	$u(Corr_{temp})$	2	K	0.50	% range/10K	0.00	0.00
Electric voltage	$u(Corr_{volt})$	40	V	0.00	% range/10V	0.00	0.00
Interferents	$u(Corr_{int})$	-		1.60	% range	0.09	0.01
Losses & leakage	$u(Corr_{loss})$	-		0.00	% range	0.00	0.00
Repeatability at zero	$u(Corr_{r,zer})$	-		0.14	% range	0.01	0.00
Repeatability at span	$u(Corr_{r,spn})$	-		0.00	% range	0.00	0.00
Converter efficiency	$u(Corr_{conv})$	-		100.00	% reading	0.00	0.00
Response factor	$u(Corr_{resp})$	-		100.00	% reading	0.00	0.00
Calibration gas	$u(Corr_{gas})$	-		1.00	% value	0.05	0.00
Combined uncertainty	$u(C_{CO2})$						0.16
Expanded uncertainty	$U(C_{CO2})$						0.31
$U(C_{CO2}):C_{CO2}(\%)$							20.15

Measured concentration of Carbon Dioxide at Cremator 1, run 3



SCIENTIFICS MONITORING REPORT FORM
WATER VAPOUR DETERMINATION to BS EN 14790:2005

Company	City of London	Test Ref	crem 1 (c)
Site	Crematorium	Date	07-Jan-10
Sample point	Cremator 1 run 3	Time start	13:41
Test carried out by	S Huntley & T Swannack	Time End	15:21
		Duration (min)	100
		Data from	crem 1 (c)

Collection of water from gas

Collection Stage (ci)	Initial Mass(Mci,) g	Final Mass (Mci,) g	Mass gain (Mci) g
Container 1	788.96	800.54	11.58
Container 2	809.47	818.32	8.85
Container 3	617.17	617.38	0.21
Container 4	897.53	899.34	1.81
Total (M)	3113.13	3135.58	22.45

Calculation of dry gas sample volume at STP (SV_{STP})

Volume of dry gas sampled at STP (SV_{STP})	m^3	0.8406

Calculation of water vapour content (H_2O_{dwcl})

H_2O_{dwcl} = $100 \times (M \times MV_{STP}/MW_{H2O})/[SV_{STP} + (M \times MV_{STP}/MW_{H2O})]$

where:
MV_{STP} molecular volume at STP (22.412 m^3/kgmole)
MW_{H2O} molecular weight of water (18 kg/kgmole)

Water vapour content (H_2O_{dwcl})	%	3.22	±	0.15

Compliance with BS 14790

Uncertainty less than 20% of measured value (Clause 7.3)
Temperature at outlet is less than 4oC based on calculated dew point (Clause 6.4.2)
Leak rate is no more than 2% of sample flow rate
Sampling duration is within minimum of 30 minutes (Clause 6.1)
Sampling volume is within minimum of 50l (Clause 6.1)
Residual water content at outlet is below 1.25% (Clause 5.8)
Sampling temperature was within minimum of 120oC during sampling (Clause 5.2)

Uncertainty Budget (based on BS 14790 and Uncertainty Policy U25)

Volume of sampled gas	V	0.841 m^3
Average temperature of gas at meter	T	22.1 °C
Average barometric pressure at meter	P	998 mb
Sampling line leakage		0.000175 m^3/min
Duration of sampling	t	100 min
Total mass weighed	M	3135.58 g

Source of uncertainty		Value		Value of standard uncertainty		Relative standard uncertainty (%)	
Measurement of sample gas volume	$u_i V_m$	2.0 %	u_v	$u_v V_m = \frac{u_v V}{\sqrt{3}}$	0.0097 m^3	$u_r V_m$	1.15
Measurement of sample gas temperature	$u_i T_m$	1.0 %	u_t	$u_t T_m = \frac{u_t (T+273)}{\sqrt{3}}$	1.7036 K	$u_r T_m$	0.58
Measurement of absolute pressure	$u_i P_m$	1.0 %	u_p	$u_p P_m = \frac{u_p P}{\sqrt{3}}$	5.7156 mb	$u_r P_m$	0.58
Leakage in sampling line	$u_i L$	2.1 %	u_l	$u_l L = \frac{u_l V}{\sqrt{3}}$	0.0101 m^3	$u_r L$	1.20
Measurement of weight - balance uncertainty	$u_i W_m$	0.01 %	u_{bw}	$u_{bw} W_m = \frac{u_{bw} M}{\sqrt{3}}$	0.1810 g		-
Measurement of weight - balance repeatability	$u_i W_r$	0.011 g	u_{br}	$u_{br} W_r =$	0.0110 g		-
Total measurement of weight	$u_i W$	-	-	$u_m W =$	0.1820 g	$u_r W$	0.86

Total standard relative uncertainty	$u_r = \sqrt{u_r V_m^2 + u_r T_m^2 + u_r P_m^2 + u_r L^2 + u_r W^2 + Corr_r}$	2.31 %
Total relative uncertainty	$U_r = 1.96 u_r$	4.53 %

SCIENTIFICS MONITORING REPORT FORM
PITOT TRAVERSE (BS EN 13284-1)

Company	City of London	Date	12-Jan-10
Site	Crematorium	Test Ref	crem 1 flow
Sample point	Cremator 1	Time Start	x
Test carried out by	S Huntley & T Swannack	Time End	x

SAMPLING PLANE GEOMETRY

Geometry of duct		Rectangular
Dimension traversed by sampling probe (D)	m	0.42
Other dimension (if applicable)	m	0.4200
Cross sectional area of sampling plane (A)	m^2	0.1764

MOLECULAR WEIGHT & DENSITY DETERMINATION

Duct gas conditions

Ambient temperature (T_a)	°C	8.00
Duct static gas pressure	kPa	-0.05
Average duct gas temperature (T_{duct})	°C	75.00
Barometric pressure (P_m)	kPa	98.90

Calculation of molecular weight from assumed gas composition

Gas	Vol% Dry gas	Vol% Wet gas	Dry Mol Wt g/gmole	Wet Mol Wt g/gmole
CO_2	2.00	1.93	0.88	0.85
O_2	18.00	17.37	5.76	5.56
CO	0.00	0.00	0.00	0.00
N_2	80.00	77.20	22.40	21.62
H_2O	-------	3.50	-------	0.63
		Total	29.04	28.65

Calculation of dry and wet gas density from molecular weight results

Dry density	kg/m^3	1.30	At STP
Wet density	kg/m^3	1.28	(0°C & 101.3 kPa)
Dry density	kg/m^3	0.99	At Duct Conditions
Wet density (ρ_a)	kg/m^3	0.98	(see above)
Wet specific gravity (sg)		0.99	

CALCULATION OF NOZZLE SIZE & K FACTOR

Exhaust & sample gas conditions

Desired sampling rate at orifice (SR_o)	10 l/min	0.353 ft^3/min
Expected meter outlet temperature (T_m)	20 °C	

(guide is a sampling rate of 0.75 ft^3/min or 21.2 l/min at the orifice)

Conditions at nozzle		Conditions at orifice/meter	
Sampling rate (SR_n)	12.31 l/min	Sampling rate (SR_o)	10.00 l/min
Temperature (T_{duct})	75.00 °C	Temperature (T_m)	20.00 °C
Pressure (P_{duct})	98.85 kPa	Pressure (P_m)	98.90 kPa
Water vapour (H_2O_{duct}	3.50 %	Water vapour (H_2O_m)	0 %
Molecular weight (M_{duct})	28.65	Molecular weight (M_m)	29.04

Orifice Parameters

Orifice plate coefficient ($\Delta H_{@}$)	2.1935	" w.g.

Determination of nozzle diameter

based on isokinetic sampling and the average gas velocity

$D_{nr} = 2000 \times \sqrt{[SR_n / V_{duct} \times \pi \times 60000]}$

where D_{nr} is the recommended nozzle diameter (mm)

Recommended nozzle diameter (D_{nr}	=	5.775	mm
Diameter of nozzle selected (D_n)	=	6.28	mm

Determination of K Factor

based on preliminary exhaust gas conditions

K Factor is a proportionality factor relating the pressure drop measured with the Pitot tube in the duct (h) with the corresponding pressure drop at the orifice (ΔH), i.e.

$\Delta H = K * h$

$K = 8.038 \times 10^{-5} \times C_p^2 \times \Delta H_{@} \times D_n^4 \times (M_m/M_{duct}) \times [(100-H_2O_{duct})/(100-H_2O_m)]^2 . (T_m+273/T_{duct}+273).(P_{duct}/P_m)$

where $\Delta H_{@}$ is the orifice plate coefficient (mm w.g.)

K Factor	=	5.5322
K Factor$_1$ (independent of C_p)	=	5.5322

SCIENTIFICS MONITORING REPORT FORM
TRACE HYDROCARBONS TO BS EN 1948:2006 (Filter/Condenser Method)

Company	City of London	Test Ref	Dioxin 1
Site	Crematorium		
Sample point	Cremator 1		
Test carried out by	S Huntley & T Swannack		

SAMPLING TIMES

Determination		THC 1
Date		12-Jan-10
Time Start		09:02
Time End		16:09
Duration (t)	min	375

Sampling plane

Dimension traversed by sampling probe (D)	m	0.42
Cross sectional area of sampling plane (A)	m^2	0.18

Duct gas conditions

Determination		THC 1
Ambient temperature (T_{Amb})	°C	8.0
Average duct gas temperature (T_{duct})	°C	55.8
Duct static gas pressure (P_{Static})	kPa	-0.05
Barometric pressure (P_{Baro})	kPa	98.90
Volume flow rate @ ref. conditions (Q_{Ref})	m^3/s	0.41
Gas compressibility correction (ε)		0.995
Wet gas density (ρ_s)		0.98
Exhaust gas conditions measurements		Dioxin 1

Reference conditions

Determination		THC 1
Actual Duct Flow Conditions		
Average temperature (T_{duct})	°C	55.8
Total pressure (P_{duct})	kPa	98.85
Oxygen (O_{2duct})	% vol,dry	18.00
Water vapour (H_2O_{duct})	% vol	3.50
Reference Conditions		
Temperature (T_{Ref})	°C	0
Pressure (P_{Ref})	kPa	101.3
Oxygen (O_{2Ref})	% vol, dry	11
Water vapour (H_2O_{Ref})	% vol	0

Sampling conditions

Determination				THC 1
Nozzle diameter (d)	TI 24	Titanium	mm	6.280
Initial gas meter reading			m^3	633.514
Final gas meter reading			m^3	640.055
Sampled volume (SV_M)			m^3	6.541

Calculation of sample gas volume at reference conditions, SV_{Ref}

$$SV_{Ref} = SV_{Meter} \times Y \times [273 + T_{Ref}]/[273 + T_{Meter}] \times P_{Baro}/P_{Ref} \times [100-H_2O_{Meter}]/[100-H_2O_{Ref}] \times [20.9-O_{2Duct}]/[20.9-O_{2Ref}]$$

Corrections
Temperature
Pressure
Water vapour
Oxygen

Determination		THC 1
Sampled volume @ ref. conditions (SV_{Ref})	m^3	1.600

SAMPLING DATA THC 1 Test Ref Dioxin 1

Initial gas meter reading 633514 l Start Time 09:02

Distance from Duct Wall Fraction of D	Port	Time of Day h:mm	Run time mm	Gas meter reading l	Pitot Reading (h) mm w.g.	Orifice ΔH mm w.g. Desired (ΔH$_d$) H$_d$ = K$_c$ x Cp^2	Orifice ΔH mm w.g. Actual (ΔH$_a$)	Isokinetic difference (ΔH$_a$/ΔH$_d$) %	Temperatures Gas (T$_{duct}$) °C	Probe (T$_p$) °C	Filter (T$_f$) °C	Meter (T$_m$) Inlet °C	Meter (T$_m$) Outlet °C	Condenser (T$_{cond}$) °C	Oxygen Content % v/v, dry
0.500	A(1)	09:02	0	633514	7.50	29.28	29	99	75	119	121	19.0		7	
		09:17	15	633722	7.80	30.45	30.5	100	74	122	123	21.0		9	
		09:32	30	633911	8.00	31.23	31.2	100	71	122	124	22.0		12	
		09:47	45	634275	8.20	32.01	32	100	69	123	123	23.6		15	
		10:02	60	634555	8.10	31.62	31.6	100	67	122	123	24.0		18	
		10:17	75	634831	8.00	31.23	31.2	100	66	121	123	24.0		8	
		10:32	90	635121	6.90	26.93	27	100	66	121	122	23.0		11	
	A(2)	0:47/10:5	105	635369	7.00	27.32	27.3	100	63	121	122	23.0		8	
		11:11	120	635628	8.00	31.23	31.2	100	61	120	122	23.8		12	
		11:26	135	635894	7.90	30.84	30.8	100	60	121	124	24.0		16	
		11:41	150	636160	8.10	31.62	31.6	100	59	123	122	24.0		7	
		11:56	165	636433	7.40	28.89	28.9	100	57	122	121	23.0		9	
	A(3)	2:11/12:5	180	636692	6.90	26.93	26.9	100	53	124	124	23.0		7	
		13:09	195	636962	7.10	27.72	27.7	100	52	121	123	23.0		10	
		13:24	210	637227	7.00	27.32	27.3	100	52	122	124	23.0		14	
		13:39	225	637487	7.40	28.89	28.9	100	49	123	123	24.0		16	
		13:54	240	637761	6.80	26.54	26.5	100	48	123	123	24.0		17	
		14:09	255	638024	7.40	28.89	28.9	100	48	122	123	24.6		19	
	A(4)	4:24/14:3	270	638279	8.00	31.23	31.2	100	46	121	122	24.0		8	
		14:45	285	638548	7.20	28.11	28.1	100	45	122	122	24.0		11	
		15:00	300	638818	7.8	30.45	30.5	100	44	123	124	24.6		14	
		15:15	315	639092	7.6	29.67	29.7	100	44	122	124	24.6		15	
		15:30	330	639368	6.7	26.15	26.2	100	42	123	124	24.6		17	
		15:45	345	639632	6.8	26.54	26.5	100	42	123	122	24.0		18	
		16:00	360	639894	6.7	26.15	26.2	100	41	124	124	24.6		19	
		16:09	375	640055											
	Averages								55.8	122.0	122.9	23.3		12.7	n.m

Final gas meter reading 640055 l End Time 16:09

Equipment used

Item	Ref No.
Control box	P1382
Meter coefficient (γ)	0.926
K factor, (K$_c$ independent of C$_p$)	5.532
Orifice plate pressure units	mm w.g.
Pitot differential pressure units	mm w.g.
Pitot	S
Pitot coefficient (C$_p$)	0.84
Probe liner thermocouple Titanium	P1807
Duct gas thermocouple	P1611
Oven thermocouple	P1395
Condenser thermocouple	P1333
Timer	P1187

Leak check

		Start	End		
Start Time		08:27	16:11		
End Time		08:29	16:13		
Initial meter reading	m^3	633.5141	640.0548		
Final meter reading	m^3	633.5144	640.0552		
Duration of leak test	min	2	2		
Pump vacuum	"Hg	-15	-15		
Leak rate	l/min	0.15	0.2		
Less than 2% of normal sampling rate?		Yes	Yes		

Approach to isokinetic sampling

Average gas velocity (V$_{duct}$)	16.2 m/s
Nozzle diameter (D$_n$)	6.288 mm
Sampling time (t)	375 min
Theoretical isokinetic sample volume SV$_t$	7113.65 l
Actual sample volume (SV$_a$)	6969.81 l
Approach to isokinetic sampling (ΔI)	98.0 %

where Vduct is the average duct velocity based on the above measurements

$V_{duct} = C_p \times (1-\varepsilon) \times \sqrt{2/\rho_s} \times \sqrt{h}$ (Reference BS 1042:Section 2.1:1983 (ISO 3966); pages 8&9)

SV$_t$ is the theoretical isokinetic sample volume based on V_{duct} & D$_n$

$SV_t = V_{duct} \times \pi \times [D_n/2000]^2 \times t \times 60 \times 1000$

SV$_a$ is the sample volume at duct conditions

$SV_a = SV_m \times \gamma \times [(273 + T_{duct})/(273 + T_m)] \times (P_{bar} - P_{duct}) \times (100 - H_2O_m)/(100 - H_2O_{duct})$

Determination of exhaust gas flow rate

based on measurements at sample points only

Flow rate at duct conditions (Q$_{duct}$)	1.80 m^3/s
Flow rate at STP (Q$_{STP}$)	1.46 m^3/s
Flow rate at reference conditions (Q$_{ref}$)	0.41 m^3/s

where:

$Q_{duct} = V_{duct} \times A$

$Q_{STP} = Q_{duct} \times [(T_{duct} - 273)/(T_{duct} + 273)] \times (P_{bar}/P_{ref})$

$Q_{ref} = Q_{STP} \times [(20.9 - O_{2ref})/(20.9 - O_{2meas})] \times [(100 - H_2O_{meas})/(100 - H_2O_{ref})]$

MEASUREMENT OF PCDD & PCDF CONCENTRATIONS

Test Ref Dioxin 1

Congener (i)	PCDD & PCDF Content (ng)			
	Field Blank 7721956,7721957,7721286		Sample 7721287,7721288,7721289	
	Content	Detection Limit	Content (q_i)	Detection Limit
Dioxin 2,3,7,8 Isomers				
2,3,7,8-TCDD	0.0000	0.0020	0.0000	0.0020
1,2,3,7,8-PeCDD	0.0000	0.0020	0.0030	0.0020
1,2,3,4,7,8-HxCDD	0.0000	0.0200	0.0000	0.0200
1,2,3,6,7,8-HxCDD	0.0000	0.0200	0.0000	0.0200
1,2,3,7,8,9-HxCDD	0.0000	0.0200	0.0000	0.0200
1,2,3,4,6,7,8-HpCDD	0.0000	0.0200	0.0000	0.0200
OCDD	0.0000	0.0200	0.0310	0.0200
Furan 2,3,7,8 Isomers				
2,3,7,8-TCDF	0.0000	0.0020	0.0073	0.0020
1,2,3,7,8-PeCDF	0.0000	0.0020	0.0160	0.0020
2,3,4,7,8-PeCDF	0.0000	0.0020	0.0025	0.0020
1,2,3,4,7,8-HxCDF	0.0000	0.0020	0.0000	0.0020
1,2,3,6,7,8-HxCDF	0.0000	0.0020	0.0000	0.0020
2,3,4,6,7,8-HxCDF	0.0000	0.0020	0.0000	0.0020
1,2,3,7,8,9-HxCDF	0.0000	0.0020	0.0000	0.0020
1,2,3,4,6,7,8-HpCDF	0.0000	0.0020	0.0000	0.0020
1,2,3,4,7,8,9-HpCDF	0.0000	0.0020	0.0000	0.0020
OCDF	0.0000	0.0020	0.0000	0.0020

In the case where congeners are not detected the regulatory authority will normally specify a proced generally assuming non-detects to be present at a proportion of their respective detection limit.
Specify below the proportion of the detection limit to be assumed for non-detects:

Proportion of detection limit to be assumed for non-detects (0-1)	1.0

Emission Limit value (ELV)	ng/m^3	0.1

Calculation of total dioxin & furan concentration in duct gas, C_g

$C_g\ (ng/m^3) = \sum q_i \,.\, TEF_i / SV_{Rel}$

where TEFi is the toxic equivalent factor for congener i

Calculation of dioxin & furan discharge rate, D_g

$D_g = C_g \,.\, Q_{Rel} \,.\, 0.0036$

Recovery of Spikes on Sample

Spike Recoveries - Sampling spike (added to adsorbent)

Recovery of $^{13}C_{12}$(%)	Field Blank	Sample	Limit
1,2,3,7,8-PeCDF	75	110	>50
1,2,3,7,8,9-HxCDF	88	87	>50
1,2,3,4,7,8,9-HpCDF	82	87	>50

Spike Recoveries - Spikes added during sample extraction

Recovery of $^{13}C_{12}$ Dioxins (%)	Field Blank	Sample	Limit
2,3,7,8-TCDD	71	76	50 - 130
1,2,3,7,8-PeCDD	70	59	50 - 130
1,2,3,4,7,8-HxCDD	79	56	50 - 130
1,2,3,6,7,8-HxCDD	84	90	50 - 130
1,2,3,4,6,7,8-HpCDD	61	83	40 - 130
OCDD	48	52	40 - 130
$^{13}C_{12}$ Furans			
2,3,7,8-TCDF	70	69	50 - 130
2,3,4,7,8-PeCDF	65	56	50 - 130
1,2,3,4,7,8-HxCDF	83	98	50 - 130
1,2,3,6,7,8-HxCDF	67	99	50 - 130
2,3,4,6,7,8-HxCDF	69	92	50 - 130
1,2,3,4,6,7,8-HpCDF	69	81	40 - 130
OCDF	52	54	40 - 130

Uncertainty Calculation Parameters

Standard uncertainty for gas volume measurement (U6	2.9 %
Analytical uncertainty at X times LOD (U15)	10 %
X (U15)	10
Standard uncertainty for oxygen correction (U11)	0.95 %
Standard uncertainty for gas flow measurement (U14)	5.7 %

SUMMARY OF MEASUREMENT OF PCDDs & PCDFs Test Ref Dioxin 1

Gas concentration ng/m³ at reference conditions	Upper Limit			Lower Limit	Field Blank
NATO/CCMS ITEQ	0.0083	±	0.0083	0.0027	0.0000
WHO 1997 Humans & mammals	0.0088	±	0.0088	0.0031	0.0000
WHO 1997 Fish	0.0117	±	0.0117	0.0034	0.0000
WHO 1997 Birds	0.0128	±	0.0128	0.0090	0.0000

Discharge rate ng/h	Upper Limit			Lower Limit	Field Blank
NATO/CCMS ITEQ	12	±	12	4	0
WHO 1997 Humans & mammals	13	±	13	5	0
WHO 1997 Fish	17	±	17	5	0
WHO 1997 Birds	19	±	19	13	0

Measured congener profile (upper limit values) 5 of 17 toxicologically significant congeners were detected

** indicates congener below limit of detection		PCDD & PCDF Content ng	PCDD & PCDF Concentration ng/m³, ref cond. NATO ITEQ	WHO Humans & mammals	WHO Fish	WHO Birds	% of total ITEQ
Dioxin 2,3,7,8 Isomers							
2,3,7,8-TCDD	*	0.0020	0.0012	0.0012	0.0000	0.0000	15.0
1,2,3,7,8-PeCDD		0.0038	0.0009	0.0019	0.0019	0.0019	11.2
1,2,3,4,7,8-HxCDD	*	0.0200	0.0012	0.0012	0.0000	0.0000	15.0
1,2,3,6,7,8-HxCDD	*	0.0200	0.0012	0.0012	0.0000	0.0000	15.0
1,2,3,7,8,9-HxCDD	*	0.0200	0.0012	0.0012	0.0000	0.0000	15.0
1,2,3,4,6,7,8-HpCDD	*	0.0200	0.0001	0.0001	0.0000	0.0000	1.5
OCDD		0.0310	0.0000	0.0000	0.0000	0.0000	0.2
Furan 2,3,7,8 Isomers							
2,3,7,8-TCDF		0.0073	0.0005	0.0005	0.0002	0.0046	5.5
1,2,3,7,8-PeCDF		0.0160	0.0005	0.0003	0.0005	0.0010	6.0
2,3,4,7,8-PeCDF		0.0025	0.0008	0.0005	0.0008	0.0016	9.4
1,2,3,4,7,8-HxCDF	*	0.0020	0.0001	0.0001	0.0000	0.0000	1.5
1,2,3,6,7,8-HxCDF	*	0.0020	0.0001	0.0001	0.0000	0.0000	1.5
2,3,4,6,7,8-HxCDF	*	0.0020	0.0001	0.0001	0.0000	0.0000	1.5
1,2,3,7,8,9-HxCDF	*	0.0020	0.0001	0.0001	0.0000	0.0000	1.5
1,2,3,4,6,7,8-HpCDF	*	0.0020	0.0000	0.0000	0.0000	0.0000	0.1
1,2,3,4,7,8,9-HpCDF	*	0.0020	0.0000	0.0000	0.0000	0.0000	0.1
OCDF	*	0.0020	0.0000	0.0000	0.0000	0.0000	0.0

COMPLIANCE WITH BS EN 1948-1,2,3:2006

Filter temperature was less than 125oC during sampling (Clause 1-5.1.2)
Condenser temperature was below 20oC during sampling (Clause 1-5.1.2)
Nozzle diameter is at least 6 mm (Clause 1-7.2)
Leak rate is less than 2% of sampling rate (MID 1948-1, 7.2)
Sampling rate is within required isokinetic range of 95-115% (Clause 1-7.2)
Sampling spike recoveries on sample are within specification (Clause 1-7.2)
Extraction spike recoveries on sample are within specification (Clause 3-8.3)
Sampling spike recoveries on field blank are within specification (Clause 1-7.2)
Extraction spike recoveries on field blank are within specification (Clause 3-8.3)
Field blank concentration is greater than 10% of the ELV (Clause 1-7.3) - outside standard
Sample concentration is greater than the field blank concentration
The limit of quantification for at least one congener is does not meet specification (Clause 1-7.2) - outside standard

Uncertainty budget

Uncertainties (basis ITEQ group)		
Sample gas volume measurement (m_{vol})	%	2.9
Sample analysis for group total (m_{an})	%	93.5
Total for uncorrected group measurement (Ut_u)	%	93.6
Correction to reference conditions (m_{corr})	%	0.0
Total for corrected group measurement (Ut_c)	%	93.6
Group concentration at 95% confidence interv	%	100.0

Based on Procedure 55 and Uncertainty Policy 8
(in accordance with requirements of BS EN ISO 14956:2002 and ENV 13005 (GUM))
for each component(i):

SCIENTIFICS MONITORING REPORT FORM
PITOT TRAVERSE (BS EN 13284-1)

Company	City of London	Date	13-Jan-10
Site	Crematorium	Test Ref	crem 6 flow
Sample point	Cremator 6	Time Start	08:00
Test carried out by	S Huntley & T Swannack	Time End	08:10

SAMPLING PLANE GEOMETRY

Geometry of duct		Rectangular
Dimension traversed by sampling probe (D)	m	0.42
Other dimension (if applicable)	m	0.4200
Cross sectional area of sampling plane (A)	m^2	0.1764

MOLECULAR WEIGHT & DENSITY DETERMINATION

Duct gas conditions

Ambient temperature (T_a)	°C	9.00
Duct static gas pressure	kPa	-0.05
Average duct gas temperature (T_{duct})	°C	378.50
Barometric pressure (P_m)	kPa	98.60

Calculation of molecular weight from assumed gas composition

Gas	Vol% Dry gas	Vol% Wet gas	Dry Mol Wt g/gmole	Wet Mol Wt g/gmole
CO_2	2.70	2.60	1.19	1.15
O_2	17.10	16.48	5.47	5.28
CO	0.00	0.00	0.00	0.00
N_2	80.20	77.31	22.46	21.65
H_2O	———	3.60	———	0.65
		Total	29.12	28.72

Calculation of dry and wet gas density from molecular weight results

Dry density	kg/m^3	1.30	At STP
Wet density	kg/m^3	1.28	(0°C & 101.3 kPa)
Dry density	kg/m^3	0.53	At Duct Conditions
Wet density (ρ_a)	kg/m^3	0.52	(see above)
Wet specific gravity (sg)		0.99	

CALCULATION OF NOZZLE SIZE & K FACTOR

Exhaust & sample gas conditions

Desired sampling rate at orifice (SR_o)	10 l/min	0.353 ft^3/min
Expected meter outlet temperature (T_m)	20 °C	

(guide is a sampling rate of 0.75 ft^3/min or 21.2 l/min at the orifice)

Conditions at nozzle		Conditions at orifice/meter	
Sampling rate (SR_n)	23.08 l/min	Sampling rate (SR_o)	10.00 l/min
Temperature (T_{duct})	378.50 °C	Temperature (T_o)	20.00 °C
Pressure (P_{duct})	98.55 kPa	Pressure (P_m)	98.60 kPa
Water vapour (H_2O_{duct}	3.60 %	Water vapour (H_2O_m)	0 %
Molecular weight (M_{duct})	28.72	Molecular weight (M_m)	29.12

Orifice Parameters

Orifice plate coefficient ($\Delta H_@$)	2.1935 " w.g.

Determination of nozzle diameter

based on isokinetic sampling and the average gas velocity

$D_{nr} = 2000 \times \sqrt{[SR_n / V_{duct} \times \pi \times 60000]}$

where D_{nr} is the recommended nozzle diameter (mm)

Recommended nozzle diameter (D_{nr}	=	6.758	mm
Diameter of nozzle selected (D_n)	=	6.28	mm

Determination of K Factor

based on preliminary exhaust gas conditions

K Factor is a proportionality factor relating the pressure drop measured with the Pitot tube in the duct (h) with the corresponding pressure drop at the orifice (ΔH), i.e.

$\Delta H = K * h$

$K = 8.038 \times 10^{-5} \times C_p^2 \times \Delta H_@ \times D_n^4 \times (M_m/M_{duct}) \times [(100-H_2O_{duct})/(100-H_2O_m)]^2 . (T_m+273/T_{duct}+273).(P_{duct}/P_m)$

where $\Delta H_@$ is the orifice plate coefficient (mm w.g.)

K Factor	=	2.9502
K Factor$_1$ (independent of C_p)	=	2.9502

SCIENTIFICS MONITORING REPORT FORM
TOTAL PARTICULATE MATTER to BS EN 13284-1/BS ISO 9096

Company	City of London	Test Ref	crem 6 (a)
Site	Crematorium		
Sample point	Cremator 6 run 1		
Test carried out by	S Huntley & T Swannack		

SAMPLING TIMES

Determination		tpm
Date		13-Jan-10
Time Start		09:22
Time End		10:42
Duration (t)	min	80

Sampling plane

Dimension traversed by sampling probe (D)	m	0.42
Cross sectional area of sampling plane (A)	m^2	0.18

Duct gas conditions

Determination		tpm
Ambient temperature (T_{Amb})	°C	9.0
Average duct gas temperature (T_{duct})	°C	368.2
Duct static gas pressure (P_{Static})	kPa	-0.05
Barometric pressure (P_{Baro})	kPa	98.60
Volume flow rate @ ref. conditions (Q_{Ref})	m^3/s	0.30
Gas compressibility correction (ε)		0.995
Wet gas density (ρ_a)		0.52
Exhaust gas conditions measurements		crem 6 (a)

Reference conditions

Determination		tpm
Actual Duct Flow Conditions		
Average temperature (T_{duct})	°C	368.2
Total pressure (P_{duct})	kPa	98.55
Oxygen (O_{2duct})	% vol,dry	17.00
Water vapour (H_2O_{duct})	% vol	2.18
Reference Conditions		
Temperature (T_{Ref})	°C	0
Pressure (P_{Ref})	kPa	101.3
Oxygen (O_{2Ref})	% vol, dry	11
Water vapour (H_2O_{Ref})	% vol	0

Sampling conditions

Determination				tpm
Nozzle diameter (d)	Ti24	Titanium	mm	6.280
Initial gas meter reading			m^3	640.266
Final gas meter reading			m^3	641.136
Sampled volume (SV_M)			m^3	0.870

Calculation of sample gas volume at reference conditions, SV_{Ref}

$$SV_{Ref} = SV_{Meter} \times Y \times [273 + T_{Ref}]/[273 + T_{Meter}] \times P_{Baro}/P_{Ref} \times [100-H_2O_{Meter}]/[100-H_2O_{Ref}] \times [20.9-O_{2Duct}]/[20.9-O_{2Ref}]$$

Corrections
Temperature
Pressure
Water vapour
Oxygen

Determination		tpm
Sampled volume @ ref. conditions (SV_{Ref})	m^3	0.288

SAMPLING DATA tpm

Test Ref crem 6 (a)

Initial gas meter reading 640266 l Start Time 09:22

Distance from Duct Wall Fraction of D	Port	Time of Day h:mm	Run time mm	Gas meter reading l	Pitot Reading (h) mm w.g.	Orifice ΔH mm w.g. Desired (ΔH_a) mh x K_1 x Cp^2	Orifice ΔH mm w.g. Actual (ΔH_a)	Isokinetic difference ($\Delta H_a/\Delta H_s$) %	Temperatures: Gas (T_{duct}) °C	Probe (T_p) °C	Filter (T_f) °C	Meter (T_g) Inlet °C	Meter (T_g) Outlet °C	Impinger (T_{imp}) °C	Oxygen Content % v/v, dry
0.500	A	09:22	0	640266	5	10.41	10.4	100	367	156	157	19.0		6	
		09:27	5	640322	3.6	7.49	7.5	100	363	158	158	19.0		7	
		09:32	10	640381	5.8	12.07	12.1	100	382	160	160	20.0		8	
		09:37	15	640443	8.7	18.11	18.1	100	397	160	160	20.0		9	
		09:42	20	640516	8.8	18.32	18.4	100	396	160	160	20.0		11	
		09:47	25	640593	8.2	17.07	17.1	100	399	160	160	20.0		11	
		09:52	30	640667	8.5	17.69	17.7	100	393	160	160	21.0		12	
		09:57	35	640741	6.2	12.91	12.9	100	361	160	160	21.0		12	
		10:02	40	640802	3.9	8.12	8.1	100	369	160	160	21.0		14	
		10:07	45	640853	3.1	6.45	6.5	101	360	160	160	21.0		15	
		10:12	50	640898	2.7	5.62	5.6	100	349	160	160	21.0		17	
		10:17	55	640941	1.8	3.75	3.8	101	333	160	160	21.0		19	
		10:22	60	640979	4	8.33	8.3	100	336	160	160	21.0		8	
		10:27	65	641030	2.1	4.37	4.4	101	351	160	160	21.0		9	
		10:32	70	641070	2	4.16	4.2	101	356	160	160	21.0		10	
		10:37	75	641108	2	4.16	4.2	101	357	160	160	21.0		11	
		10:42	80	641136											
	Averages								368.2	159.6	159.7	20.5		11.3	n.m

Final gas meter reading 641136 l End Time 10:42

Equipment used

Item	File No.
Control box	P1302
Meter coefficient (y)	0.926
K factor, (K, independent of C_p)	2.958
Orifice plate pressure units	mm w.g.
Pitot differential pressure units	mm w.g.
Pitot	S
Pitot coefficient (C_p)	0.84
Probe liner thermocouple Titanium	P1007
Duct gas thermocouple	P1011
Oven thermocouple	P1395
Impinger exit thermocouple	P1333
Timer	P1187

Leak check

		Start	End
Start Time		08:43	10:36
End Time		08:45	10:38
Initial meter reading	m^3	640.2658	641.1362
Final meter reading	m^3	640.266	641.1364
Duration of leak test	min	2	2
Pump vacuum	"Hg	-15	-15
Leak rate	l/min	0.1	0.1
Less than 2% of normal sampling rate?		Yes	Yes

Approach to isokinetic sampling

Average gas velocity (V_{duct})	16.6 m/s
Nozzle diameter (D_n)	6.280 mm
Sampling time (t)	80 min
Theoretical isokinetic sample volume SV_i	1684.89 l
Actual sample volume (SV_a)	1898.23 l
Approach to isokinetic sampling (Δ)	112.2 %

where: V_{duct} is the average duct velocity based on the above measurements

$V_{duct} = C_p \times (1+\epsilon) \times \sqrt{2\rho_s \times h}$ (Reference BS 1042:Section 2.1:1983 (ISO 3966), pages 8&9)

SV_i is the theoretical isokinetic sample volume based on V_{duct} & D_n

$SV_i = V_{duct} \times \pi \times [D_n/2000]^2 \times t \times 60 \times 1000$

SV_a is the sample volume at duct conditions

$SV_a = SV_m \times Y \times [(273 + T_{duct})/(273 + T_m)] \times (P_{bar}/P_{duct}) \times (100 - H_2O_{duct})/(100-H_2O_{duct})$

Determination of exhaust gas flow rate

based on measurements at sample points only

Flow rate at duct conditions (Q_{duct})	1.98 m^3/s
Flow rate at STP (Q_{STP})	0.79 m^3/s
Flow rate at reference conditions (Q_{ref})	0.38 m^3/s

where:

$Q_{duct} = V_{duct} \times A$

$Q_{STP} = Q_{duct} \times [(T_{STP} + 273)/(T_{duct} + 273)] \times (P_{duct}/P_{STP})$

$Q_{ref} = Q_{STP} \times [(20.9-O_{2ref})/(20.9-O_{2duct})] \times [(100-H_2O_{duct})/(100-H_2O_{ref})]$

PARTICULATE WEIGHINGS

Test Ref crem 6 (a)

Filters

Determination		Method Blank	Field Blank	tpm
Filter No.		0	012467	012450
Pre-sampling conditioning temperature (±5°C)	°C	180	180	180
Post-sampling conditioning temperature (±5°C)	°C	160	160	160
Diameter	mm	110	110	110
Material		Quartz	Quartz	Quartz
Pre-sampling weights				
after 1 min	g		0.8014	0.8196
after 2 min	g		0.8014	0.8196
after 3 min	g		0.8014	0.8196
Weight extrapolated to zero time (M_{fi0})	g		0.8014	0.8196
Post-sampling weights				
after 1 min	g		0.8005	0.8359
after 2 min	g		0.8005	0.8359
after 3 min	g		0.8006	0.8358
Weight extrapolated to zero time (M_{ff0})	g		0.8004	0.8360

Rinsings

Pre-sampling conditioning temperature (±5°C)	°C	180	180	180
Post-sampling conditioning temperature (±5°C)	°C	160	160	160
Pre-sampling weights (container only)				
after 1 min	g		68.6805	72.0110
after 2 min	g		68.6805	72.0109
after 3 min	g		68.6805	72.0109
Weight extrapolated to zero time (M_{ri0})	g		68.6805	72.0110
Post-sampling weights (container and evaporated rinsings)				
after 1 min	g		68.6820	72.0145
after 2 min	g		68.6819	72.0143
after 3 min	g		68.6818	72.0142
Weight extrapolated to zero time (M_{rf0})	g		68.6821	72.0146

Summary

Determination		Method Blank (M_{fmb})	Field Blank	tpm
Mass collected on filter ($M_f = (M_{ff0} - M_{fi0} - M_{fmb})$)	g	0.0000	-0.0010	0.0164
Mass collected in rinsings ($M_r = (M_{rf0} - M_{ri0} - M_{rmb})$)	g	0.0000	0.0016	0.0036
Total mass collected ($M = M_f + M_r$)	g	0.0000	0.0006	0.0200

Uncertainty Calculation Parameters

Standard uncertainty for gas volume measurement (U6)	2.9 %
Standard uncertainty for filter weighing (U17)	0.57 mg
Standard uncertainty for washings weighing (U17)	0.50 mg
Limit of detection for filter weighing (U17)	0.50 mg
Limit of detecion for washings weighing (U17)	0.50 mg
Standard uncertainty for oxygen correction (U11)	0.95 %
Standard uncertainty for gas flow measurement (U14)	5.7 %

Emission Limit Value

Emission limit value (ELV) at reference conditions	80 mg/m^3

SUMMARY OF MEASUREMENTS

Test Ref crem 6 (a)

Calculation of Particulate Concentration and Discharge Rate

Particulate concentration (C), mg/m^3 = M x 1000/ SV_{Ref}

Discharge rate, kg/h = C x Q_{Ref} x 0.0036

Determination		Field Blank	tpm
Particulate concentration at reference conditions	mg/m^3	2.20	69.38
Uncertainty	mg/m^3	2.20	11.41
Particulate concentration at duct conditions (raw)	mg/m^3	0.35	11.09
Particulate discharge rate	kg/h	0.00	0.08
Uncertainty	kg/h	0.00	0.01

Note: Field blank results based on average sampling conditions

Uncertainty budget

Uncertainties		Field Blank	tpm
Volume measurement (m_{vol})	mg	0.02	0.58
Filter weighings (m_f)	mg	-0.97	0.57
Rinsings weighings (m_w)	mg	1.33	1.46
Total for uncorrected measurement (U_u)	mg	1.65	1.67
Correction to reference conditions (m_{corr})	mg	0.00	0.00
Total for corrected measurement (U_c)	mg	1.65	1.67
Concentration at 95% confidence interval (U_{95c})	mg/m^3	2.20	11.41

Based on Procedure 55 and Uncertainty Policies 11 & 17
(in accordance with requirements of BS EN ISO 14956:2002 and ENV 13005 (GUM))

$U_u = \sqrt{m_{vol}^2 + m_f^2 + m_w^2}$

$U_c = \sqrt{U_u^2 + m_{corr}^2}$

$U_{95c} = 1.96 \times U_c / SV_{Ref}$

COMPLIANCE WITH BS EN 13284-1:2002/BS ISO 9096 CONDITIONS

Flow conditions (BS EN 13284-1, 5.2 & BS ISO 9096, 5.3)

Standard	ISO 9096
Angle of gas flow less than 15°	Yes
No local negative gas flow	Yes
Minimum differential pressure greater than 5 Pa	Yes
Ratio of highest to lowest local gas velocites less than 3:1	No

Compliance with BS ISO 9096

Blank value is less than 10% of ELV (Table 3)
Nozzle diameter greater than 4 mm (Clause 6.2.2)
Average sampling rate was within -5% and +15% of isokinetic conditions (Clause 7.3.5)
Leak rate is within 2% of sample rate (Clause 7.3.5)
Blank value is greater than limit of 2 mg/m3 - outside standard (Table 3)

SCIENTIFICS MONITORING REPORT FORM
Hydrogen chloride to BS EN 1911

Company	City of London	Test Ref	HCl
Site	Crematorium	Date	13-Jan-10
Sample point	Cremator 6 run 1	Time start	09:22
Test carried out by	S Huntley & T Swannack	Time End	10:42
Determinand	Hydrogen chloride to BS EN 1911	Duration (min)	80
		Sampling conditions	crem 6 (a)

ANALYSIS OF COLLECTED SOLUTIONS

Determination		HCl
Volume of sampling solution in first stage (Vs1)	ml	560
Volume of sampling solution in final stage (Vs2)	ml	0
Volume of sampling solution in field blank (Vsb)	ml	400
Chloride detection limit in sampling solution (qd)	mg/l	0.10
Chloride in first stage sampling solution (qs1)	mg/l	4.75
Chloride in final stage sampling solution (qs2)	mg/l	
Chloride in field blank sampling solution (qcb)	mg/l	0.00
Emission limit value (ELV, daily)	mg/m³	200

Calculation of hydrogen chloride concentration in duct gas, Cg

C_g (mg/m³) = ([V_{s1} x q_{s1}]+[V_{s2} x q_{s2}]) x MW_c)/(V_{std} x MW_{cl} x N_a)

where MWc is the molecular weight of hydrogen chloride (i.e. 36.5 kg/kgmole)
MWcl is the molecular weight of the chloride ion (i.e. 35.5 kg/kgmole)
Na is the number of chloride ions in hydrogen chloride (i.e. 1)

Calculation of hydrogen chloride discharge rate, Dg

$D_g = C_g \times Q_{std} \times 0.0036$

MEASUREMENTS OF HYDROGEN CHLORIDE

Determination		HCl
Concentration at reference conditions (C_g)	mg/m³	9.50
Uncertainty (95% confidence limit)	mg/m³	1.09
Uncertainty as a proportion of ELV	%	0.55
Discharge rate (D_g)	kg/h	0.810
Uncertainty (95% confidence limit)	kg/h	0.002
Detection limit	mg/m³	0.200

FIELD BLANK

Determination		HCl
Field blank concentration*	mg/m³	0.00
Field blank as a proportion of ELV	±%	0.0

*assuming same sample volume as for sample

ABSORPTION EFFICIENCY (where determined)

Calculation of Absorption Efficicency, e

$e = m_s \times 100 / (m_{s1} + m_{s2})$

Determination		HCl
Chloride in first stage absorber (m1)	mg	2.66
Chloride in final stage absorber (m2)	mg	0.00
Absorption efficiency	%	n.d.

Uncertainty Calculation Parameters

Standard uncertainty for gas volume measurement (U6)	2.9 %
Standard uncertainty for liquid volume measurement (U16)	1 %
Analytical uncertainty at X times LOD (U15)	5 %
X (U15)	10
Standard uncertainty for oxygen correction (U11)	0.95 %
Standard uncertainty for gas flow measurement (U14)	5.7 %

Uncertainty budget

Uncertainties		HCl
Sample gas volume measurement (m_{vol})	%	2.9
Solution volume measurement (m_{sol})	%	1.0
Analysis of washings (m_w)	%	5.0
Total for uncorrected measurement (U_c)	mg/m³	0.56
Correction to reference conditions (m_{corr})	mg/m³	0.00
Concentration at 95% confidence interval (U_{95})	mg/m³	1.093

Based on Procedure 55 and Uncertainty Policies 11 & 16
(in accordance with requirements of BS EN ISO 14956:2002 and ENV 13005 (GUM))

COMPLIANCE WITH STANDARD

Probe temperature is at least 150C (Clause 6.2)
Leak rate less than 2% of sample rate (Clause 1-8.2)
Sampling outside 10% of isokinetic conditions - outside standard (Clause 1-5.1.5)
Sample concentration is greater than 10 times field blank (3-4.2.1)
Field blank concentration is less than 10% of ELV (not normative)
Measurement uncertainty is less than 20% of ELV (not normative)

scientifics

SCIENTIFICS MONITORING REPORT FORM
Carbon Monoxide to BS EN 15058:2006

Company	City of London	Date	13-Jan-10
Site	Crematorium	Test Ref	crem 6 (a)
Sample point	Cremator 6, run 1	Time Start	09:30
Test carried out by	S Huntley, T Swannack	Time End	10:49

Measurements: 5 minutes' averaging period

Start	End	No. Readings	Maximum	Minimum	Average	Maximum	Minimum	Average
			ppm , dry			$mgCO/m^3$, ref. cond.		
09:30	09:34	20	29	<5	9	65	9	25
09:35	09:39	20	15	6	9	36	14	20
09:40	09:44	20	8	6	7	17	14	16
09:45	09:49	20	7	6	7	18	15	16
09:50	09:54	20	7	<5	6	18	11	14
09:55	09:59	20	6	<5	5	17	13	15
10:00	10:04	20	9	<5	6	25	14	16
10:05	10:09	20	6	<5	5	17	13	15
10:10	10:14	20	6	<5	5	21	15	17
10:15	10:19	20	5	<5	<5	22	16	19
10:20	10:24	20	11	<5	7	48	20	36
10:25	10:29	20	10	<5	6	38	17	25
10:30	10:34	20	6	<5	<5	20	15	17
10:35	10:39	20	5	<5	<5	25	14	18
10:40	10:44	20	5	<5	<5	27	15	18
10:45	10:49	20	<5	<5	<5	32	18	23
09:30	10:49	320	29	<5	6	65	9	19

Summary of measurements

Average concentration	19.4 $mgCO/m^3$
Uncertainty	5.5 $mgCO/m^3$
Discharge rate	0.021 kgCO/h

Compliance with BS 15058:2006

No correction for drift applied (Clause 8.4.3)
Response time is within limit (Clause 7.2)
Uncertainty is within specified limit of 6% of ELV (Clause 7.3)

Calibration Checks

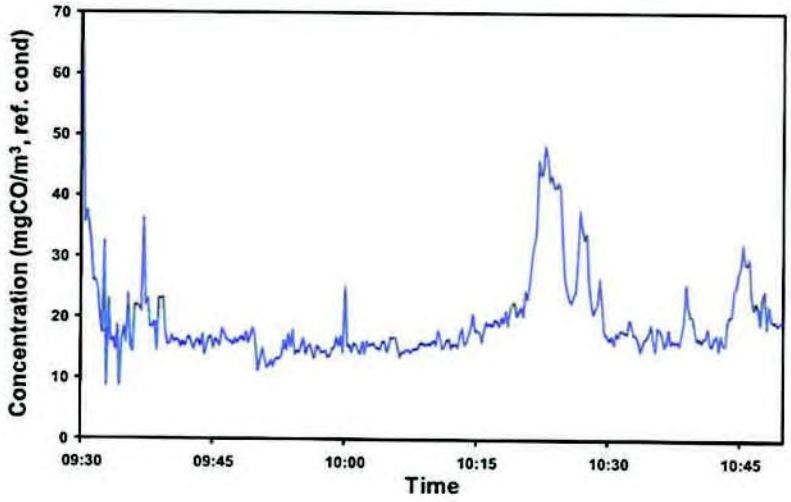
Type	Honba PG 250	**Range**	0 to 50 ppm
Equipment No.	P1301		
Measurement method	Non-dispersive infra-red		

Calibration		Zero	Span
Gas reference		CH49	DG2
Concentration	ppm	0.00	25.12
		Analyser response	
Gas into analyser before sampling	ppm	0.00	25.20
Gas into system before sampling	ppm	0.40	25.30
Gas into system after sampling	ppm	0.30	25.50
Drift	% span	0.40	0.79
Response time	s	22	

Uncertainty budget

Quantity		Variation		Value		Partial uncertainty ($x_{i,mon}$)		$x_{i,mon}^2$
						ppm CO	mgCO/m³	
Lack of fit	$u(Corr_{lof})$	-		2.00	% range	0.58	0.72	0.52
Zero drift	$u(Corr_{z,dr})$	-		0.26	% range	0.08	0.09	0.01
Span drift	$u(Corr_{s,dr})$	-		0.29	% range	0.08	0.10	0.01
Sample volume flow	$u(Corr_{s,vf})$	-		0.00	% range	0.00	0.00	0.00
Atmospheric pressure	$u(Corr_{atmos})$	0	kPa	0.00	% range/2kP	0.00	0.00	0.00
Ambient temperature	$u(Corr_{temp})$	1	K	0.50	% range/10K	0.01	0.01	0.00
Electric voltage	$u(Corr_{elv})$	40	V	0.00	% range/10V	0.00	0.00	0.00
Interferents	$u(Corr_{int})$	-		1.60	% range	0.46	0.58	0.33
Losses & leakage	$u(Corr_{loss})$	-		0.00	% range	0.00	0.00	0.00
Repeatability at zero	$u(Corr_{z,rep})$	-		0.14	% range	0.04	0.05	0.00
Repeatability at span	$u(Corr_{s,rep})$	-		0.00	% range	0.00	0.00	0.00
Converter efficiency	$u(Corr_{conv})$	-		100.00	% reading	0.00	0.00	0.00
Response factor	$u(Corr_{resp})$	-		100.00	% reading	0.00	0.00	0.00
Calibration gas	$u(Corr_{wf})$	-		1.00	% value	0.40	0.50	0.25
Combined uncertainty	$u(C_{CO})$							1.06
Expanded uncertainty	$U(C_{CO})$							2.08
$U(C_{CO})$:ELV (%)								2.08

Measured concentration of Carbon Monoxide at Cremator 6, run 1



SCIENTIFICS MONITORING REPORT FORM
Volatile Organic Compounds to BS EN 12619:1999 & BS EN 13526:2002

Company	City of London	Date	13-Jan-10
Site	Crematorium	Test Ref	crem 6 (a)
Sample point	Cremator 6, run 1	Time Start	09:24
Test carried out by	S Huntley, T Swannack	Time End	10:48

Measurements: 5 minutes' averaging period

Start	End	No. Readings	Maximum	Minimum	Average	Maximum	Minimum	Average
			ppm , wet			mgCarbon/m3, ref cond.		
09:24	09:28	5	<1	<1	<1	2.5	2.1	2.3
09:29	09:33	5	7.8	<1	1.9	32.5	1.5	8.0
09:34	09:38	5	<1	<1	<1	4.0	2.3	2.9
09:39	09:43	5	1.0	<1	<1	4.2	3.1	3.7
09:44	09:48	5	<1	<1	<1	2.9	2.5	2.8
09:49	09:53	5	<1	<1	<1	2.3	1.3	1.7
09:54	09:58	5	<1	<1	<1	1.0	<1	<1
09:59	10:03	5	<1	<1	<1	<1	<1	<1
10:04	10:08	5	<1	<1	<1	<1	<1	<1
10:09	10:13	5	<1	<1	<1	<1	<1	<1
10:14	10:18	5	<1	<1	<1	<1	<1	<1
10:19	10:23	5	<1	<1	<1	<1	<1	<1
10:24	10:28	5	<1	<1	<1	<1	<1	<1
10:29	10:33	5	<1	<1	<1	<1	<1	<1
10:34	10:38	5	<1	<1	<1	<1	<1	<1
10:39	10:43	5	<1	<1	<1	<1	<1	<1
10:44	10:48	5	<1	<1	<1	2.7	<1	1.1
09:24	10:48	85	7.8	<1	<1	32.5	<1	1.4

Summary of measurements

Average concentration	1.4 mgCarbon/m3
Uncertainty	1.4 mgCarbon/m3
Discharge rate	0.002 kgCarbon/h

Compliance with BS EN 12619/BS EN 13526

No correction for drift applied (BS EN 14789, Clause 8.4.3)
Response time is within limit (BS EN 12619, Clause 6.1.1)
Uncertainty is within specified limit of 10% of ELV (BS EN 14789, Clause 1)

Calibration Checks

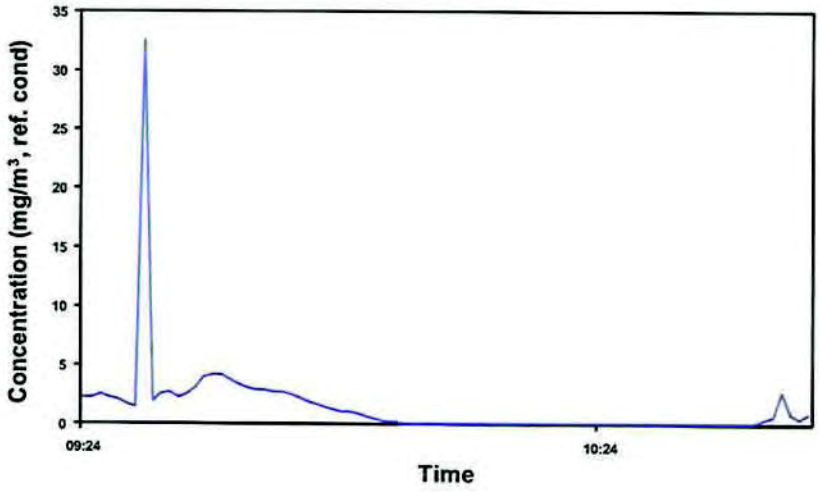
Type Bernath 3006 **Range** 0 to 10 ppm
Equipment No. P1366
Measurement method Flame ionisation detection

Calibration		Zero	Span
Gas reference		CH49	DG2
Concentration	ppm	0.00	8.92
		Analyser response	
Gas into analyser before sampling	ppm	0.02	8.90
Gas into system before sampling	ppm	0.04	8.90
Gas into system after sampling	ppm	-0.04	8.80
Drift	% span	0.90	1.12
Response time	s	9	

Uncertainty budget

Quantity		Variation		Value		Partial uncertainty (x_{imax})		x_{imax}^2
						ppm	mg/m³	
Lack of fit	$u(Corr_{fit})$	-		2.00	% range	0.12	0.19	0.03
Zero drift	$u(Corr_{0,dr})$	-		2.00	% range	0.12	0.19	0.03
Span drift	$u(Corr_{s,dr})$	-		2.00	% range	0.12	0.19	0.03
Sample volume flow	$u(Corr_{s,vf})$	-		1.00	% range	0.06	0.09	0.01
Atmospheric pressure	$u(Corr_{atmos})$	0	kPa	0.50	% range/2kP	0.00	0.00	0.00
Ambient temperature	$u(Corr_{temp})$	1	K	2.00	% range/10K	0.01	0.01	0.00
Electric voltage	$u(Corr_{vlt})$	40	V	2.00	% range/10V	0.23	0.37	0.14
Interferents	$u(Corr_{int})$	-		3.50	% range	0.20	0.32	0.11
Losses & leakage	$u(Corr_{loss})$	-		0.20	% range	0.01	0.02	0.00
Repeatability at zero	$u(Corr_{r,rep})$	-		1.00	% range	0.06	0.09	0.01
Repeatability at span	$u(Corr_{s,rep})$	-		2.00	% range	0.12	0.19	0.03
Converter efficiency	$u(Corr_{conv})$	-		100.00	% reading	0.00	0.00	0.00
Response factor	$u(Corr_{resp})$	-		100.00	% reading	0.00	0.00	0.00
Calibration gas	$u(Corr_{std})$	-		1.00	% value	0.06	0.10	0.01
Combined uncertainty	$u(C_{VOC})$							0.63
Expanded uncertainty	$U(C_{VOC})$							1.24
$U(C_{VOC})$:ELV (%)								6.19

Measured concentration of Volatile Organic Compounds at Cremator 6, run 1



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SCIENTIFICS MONITORING REPORT FORM
Oxygen to BS EN 14789:2005

Company	City of London	Date	13-Jan-10
Site	Crematorium	Test Ref	crem 6 (a)
Sample point	Cremator 6, run 1	Time Start	09:30
Test carried out by	S Huntley, T Swannack	Time End	10:49

Measurements: 5 minutes' averaging period

Start	End	No. Readings	Maximum	Minimum	Average	Maximum	Minimum	Average
			%, dry			% dry		
09:30	09:34	20	16.8	15.3	16.1	16.8	15.3	16.1
09:35	09:39	20	15.8	15.2	15.5	15.8	15.2	15.5
09:40	09:44	20	15.7	15.3	15.4	15.7	15.3	15.4
09:45	09:49	20	16.5	15.5	16.0	16.5	15.5	16.0
09:50	09:54	20	16.3	15.4	15.9	16.3	15.4	15.9
09:55	09:59	20	16.6	16.1	16.3	16.6	16.1	16.3
10:00	10:04	20	16.7	16.2	16.5	16.7	16.2	16.5
10:05	10:09	20	17.0	16.2	16.7	17.0	16.2	16.7
10:10	10:14	20	17.4	16.6	17.0	17.4	16.6	17.0
10:15	10:19	20	18.4	17.4	17.9	18.4	17.4	17.9
10:20	10:24	20	18.8	18.1	18.5	18.8	18.1	18.5
10:25	10:29	20	18.4	17.0	17.8	18.4	17.0	17.8
10:30	10:34	20	17.5	17.2	17.4	17.5	17.2	17.4
10:35	10:39	20	19.0	17.5	17.8	19.0	17.5	17.8
10:40	10:44	20	19.3	17.6	17.9	19.3	17.6	17.9
10:45	10:49	20	19.7	18.3	18.8	19.7	18.3	18.8
09:30	10:49	320	19.7	15.2	17.0	19.7	15.2	17.0

Summary of measurements

Average concentration	17.0 $\%O_2$, dry
Uncertainty	0.6 $\%O_2$, dry

Compliance with BS 15058:2006

No correction for drift applied (Clause 8.4.3)
Response time is within limit (Clause 7.2)
Uncertainty is within specified limit of 6% of measured concentration (Clause 1)

Calibration Checks

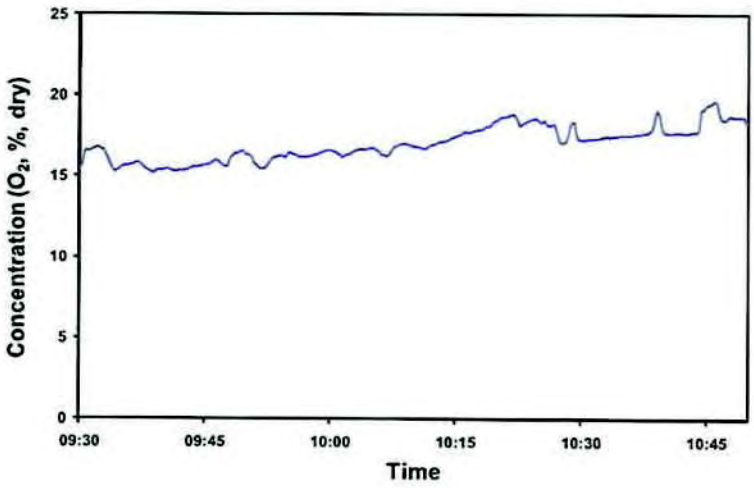
Type	Horiba PG 250	**Range**	0 to 25 %
Equipment No.	P1301		
Measurement method	Zirconium cell		

Calibration		Zero	Span
Gas reference		CH49	DG2
Concentration	%	0.00	13.10
		Analyser response	
Gas into analyser before sampling	%	0.00	13.10
Gas into system before sampling	%	0.00	13.15
Gas into system after sampling	%	0.10	13.18
Drift	% span	0.76	0.23
Response time	s	19	

Uncertainty budget

Quantity		Variation		Value		Partial uncertainty ($x_{i,max}$)	$x_{i,max}^2$
						$\%O_2$	
Lack of fit	$u(Corr_{fit})$	-		2.00	% range	0.29	0.08
Zero drift	$u(Corr_{0,dr})$	-		0.11	% range	0.02	0.00
Span drift	$u(Corr_{s,dr})$	-		0.24	% range	0.03	0.00
Sample volume flow	$u(Corr_{s,vf})$	-		0.00	% range	0.00	0.00
Atmospheric pressure	$u(Corr_{atmos})$	0	kPa	0.00	% range/2kP	0.00	0.00
Ambient temperature	$u(Corr_{temp})$	1	K	0.40	% range/10K	0.00	0.00
Electric voltage	$u(Corr_{volt})$	40	V	0.00	% range/10V	0.00	0.00
Interferents	$u(Corr_{int})$	-		0.00	% range	0.00	0.00
Losses & leakage	$u(Corr_{leak})$	-		0.00	% range	0.00	0.00
Repeatability at zero	$u(Corr_{z,rep})$	-		0.00	% range	0.00	0.00
Repeatability at span	$u(Corr_{s,rep})$	-		0.00	% range	0.00	0.00
Converter efficiency	$u(Corr_{conv})$	-		100.00	% reading	0.00	0.00
Response factor	$u(Corr_{resp})$	-		100.00	% reading	0.00	0.00
Calibration gas	$u(Corr_{gas})$	-		1.00	% value	0.13	0.02
Combined uncertainty	$u(C_{O2})$						0.32
Expanded uncertainty	$U(C_{O2})$						0.62
$U(C_{O2})/C_{O2}(\%)$							3.66

Measured concentration of Oxygen at Cremator 6, run 1



SCIENTIFICS MONITORING REPORT FORM
Carbon Dioxide to ISO 12039:2001

Company	City of London	Date	13-Jan-10
Site	Crematorium	Test Ref	crem 6 (a)
Sample point	Cremator 6, run 1	Time Start	09:30
Test carried out by	S Huntley, T Swannack	Time End	10:49

Measurements: 5 minutes' averaging period

Start	End	No. Readings	Maximum	Minimum	Average	Maximum	Minimum	Average
			%, dry			$\%CO_2$, ref. cond.		
09:30	09:34	20	4.9	3.6	4.1	9.0	7.8	8.5
09:35	09:39	20	4.4	4.0	4.2	7.9	7.6	7.7
09:40	09:44	20	4.4	4.1	4.3	7.8	7.8	7.8
09:45	09:49	20	4.2	3.4	3.9	7.8	7.4	7.8
09:50	09:54	20	4.2	3.4	3.8	7.8	7.4	7.5
09:55	09:59	20	3.9	3.5	3.8	8.2	8.1	8.1
10:00	10:04	20	3.9	3.5	3.7	8.2	8.2	8.2
10:05	10:09	20	3.9	3.3	3.5	8.3	8.2	8.2
10:10	10:14	20	3.6	2.9	3.3	8.3	8.2	8.3
10:15	10:19	20	2.9	2.1	2.5	8.3	8.2	8.3
10:20	10:24	20	2.2	1.7	1.9	8.3	7.1	7.9
10:25	10:29	20	2.4	1.6	1.9	6.6	6.0	6.3
10:30	10:34	20	2.2	2.0	2.1	6.0	5.8	5.9
10:35	10:39	20	2.0	0.9	1.7	5.8	4.9	5.5
10:40	10:44	20	1.9	0.8	1.7	5.6	4.7	5.4
10:45	10:49	20	1.5	0.6	1.1	5.7	4.5	5.3
09:30	10:49	320	4.9	0.6	3.0	9.0	4.5	7.3

Summary of measurements

Average concentration	7.3 $\%CO_2$
Uncertainty	0.8 $\%CO_2$

Compliance with BS 14792:2005

No correction for drift applied (BS EN 14789, Clause 8.4.3)
Response time is within limit (ISO 12039, Clause A.2)
Uncertainty is above specified limit of 6% of measured concentration (BS EN 14789, Clause 1) - non compliance

Calibration Checks

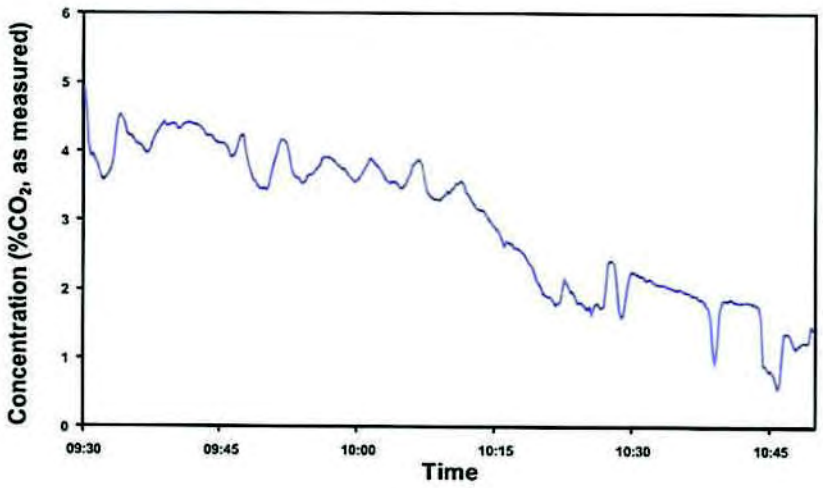
Type Horiba PG 250 **Range** 0 to 10 %
Equipment No. P1301
Measurement method Non-dispersive infra-red

Calibration		Zero	Span
Gas reference		CH49	DG2
Concentration	%	0.00	5.08
		Analyser response	
Gas into analyser before sampling	%	0.00	5.09
Gas into system before sampling	%	0.08	5.15
Gas into system after sampling	%	0.15	5.19
Drift	% span	1.38	0.78
Response time	s	25	

Uncertainty budget

Quantity		Variation		Value		Partial uncertainty (x_{imax})	x_{imax}^2
						$\%CO_2$	
Lack of fit	$u(Corr_{fit})$	-		2.00	% range	0.12	0.01
Zero drift	$u(Corr_{z,dr})$	-		0.26	% range	0.02	0.00
Span drift	$u(Corr_{s,dr})$	-		0.29	% range	0.02	0.00
Sample volume flow	$u(Corr_{v,d})$	-		0.00	% range	0.00	0.00
Atmospheric pressure	$u(Corr_{atmos})$	0	kPa	0.00	% range/2kPa	0.00	0.00
Ambient temperature	$u(Corr_{temp})$	1	K	0.50	% range/10K	0.00	0.00
Electric voltage	$u(Corr_{volt})$	40	V	0.00	% range/10V	0.00	0.00
Interferents	$u(Corr_{int})$	-		1.60	% range	0.09	0.01
Losses & leakage	$u(Corr_{leak})$	-		0.00	% range	0.00	0.00
Repeatability at zero	$u(Corr_{z,rep})$	-		0.14	% range	0.01	0.00
Repeatability at span	$u(Corr_{s,rep})$	-		0.00	% range	0.00	0.00
Converter efficiency	$u(Corr_{conv})$	-		100.00	% reading	0.00	0.00
Response factor	$u(Corr_{resp})$	-		100.00	% reading	0.00	0.00
Calibration gas	$u(Corr_{gas})$	-		1.00	% value	0.05	0.00
Combined uncertainty	$u(C_{CO2})$						0.16
Expanded uncertainty	$U(C_{CO2})$						0.31
$U(C_{CO2})/C_{CO2}(\%)$							10.44

Measured concentration of Carbon Dioxide at Cremator 6, run 1



SCIENTIFICS MONITORING REPORT FORM
WATER VAPOUR DETERMINATION to BS EN 14790:2005

Company	City of London	Test Ref	h2o 6 (a)
Site	Crematorium	Date	13-Jan-10
Sample point	Cremator 6 run 1	Time start	09:22
Test carried out by	S Huntley & T Swannack	Time End	10:42
		Duration (min)	80
		Data from	crem 6 (a)

Collection of water from gas

Collection Stage (ci)	Initial Mass(M_{ci}) g	Final Mass (M_{cf}) g	Mass gain (Mci) g
Container 1	766.63	768.78	2.15
Container 2	743.42	744.03	0.61
Container 3	584.66	585.56	0.9
Container 4	908.82	918.19	9.37
Total (M)	2923.53	2936.56	13.03

Calculation of dry gas sample volume at STP (SV_{STP})

$$SV_{STP} = SV_m \times (273/(273 + T_m)) \times (P_m/101.3)$$

Volume of dry gas sampled at STP (SV_{STP})	m^3	0.7295

Calculation of water vapour content (H_2O_{duct})

$$H_2O_{duct} = 100 \times (M \times MV_{STP}/MW_{H2O})/[SV_{STP} + (M \times MV_{STP}/MW_{H2O})]$$

where MV_{STP} molecular volume at STP (22.412 m^3/kgmole)

MW_{H2O} molecular weight of water (18 kg/kgmole)

Water vapour content (H_2O_{duct})	%	2.16 ± 0.16

Compliance with BS 14790

Uncertainty less than 20% of measured value (Clause 7.3)
Temperature is greater than 4oC based on calculated water dew point (Clause 6.4.2) - outside standard
Leak rate is no more than 2% of sample flow rate
Sampling duration is within minimum of 30 minutes (Clause 6.1)
Sampling volume is within minimum of 50l (Clause 6.1)
Residual water content at outlet is above 1.25% (Clause 5.8) - outside standard
Sampling temperature was within minimum of 120oC during sampling (Clause 5.2)

Uncertainty Budget (based on BS 14790 and Uncertainty Policy U25)

Volume of sampled gas	V	0.729 m^3
Average temperature of gas at meter	T	20.5 °C
Average barometric pressure at meter	P	986 mb
Sampling line leakage		1E-04 m^3/min
Duration of sampling	t	80 min
Total mass weighed	M	2936.56 g

Source of uncertainty		Value		Value of standard uncertainty		Relative standard uncertainty (%)	
Measurement of sample gas volume	$u_i V_m$	2.0 %	u_i	$u_i V_m = \frac{u_i V}{\sqrt{3}}$	0.0084 m^3	$u_i V_m$	1.15
Measurement of sample gas temperature	$u_i T_m$	1.0 %	u_i	$u_i T_m = \frac{u_i T + 273}{\sqrt{3}}$	1.6945 K	$u_i T_m$	0.58
Measurement of absolute pressure	$u_i P_m$	1.0 %	u_i	$u_i P_m = \frac{\Delta P}{\sqrt{3}}$	5.6927 mb	$u_i P_m$	0.58
Leakage in sampling line	$u_i L$	1.1 %	u_i	$u_i L = \frac{u_i V}{\sqrt{3}}$	0.0046 m^3	$u_i L$	0.63
Measurement of weight - balance uncertainty	$u_i W_m$	0.01 %	u_{im}	$u_i W_m = \frac{u_{im} M}{\sqrt{3}}$	0.1695 g		-
Measurement of weight - balance repeatability	$u_i W_r$	0.011 g	u_{ir}	$u_i W_r = u_{ir}$	0.0110 g		-
Total measurement of weight	$u_i W$	-	-	$u_i W =$	0.1805 g	$u_i W$	1.39

Total standard relative uncertainty	$u_c = \sqrt{u_i V_m^2 + u_i T_m^2 + u_i P_m^2 + u_i L^2 + u_i W^2 + Corr.}$	3.65 %
Total relative uncertainty	$U = 1.96 u_c$	7.16 %

SCIENTIFICS MONITORING REPORT FORM
TOTAL PARTICULATE MATTER to BS EN 13284-1/BS ISO 9096

Company	City of London	Test Ref	crem 6 (b)
Site	Crematorium		
Sample point	Cremator 6 run 2		
Test carried out by	S Huntley & T Swannack		

SAMPLING TIMES

Determination		TPM
Date		13-Jan-10
Time Start		11:12
Time End		12:27
Duration (t)	min	75

Sampling plane

Dimension traversed by sampling probe (D)	m	0.42
Cross sectional area of sampling plane (A)	m^2	0.18

Duct gas conditions

Determination		TPM
Ambient temperature (T_{Amb})	°C	9.0
Average duct gas temperature (T_{duct})	°C	354.0
Duct static gas pressure (P_{Static})	kPa	-0.05
Barometric pressure (P_{Baro})	kPa	98.60
Volume flow rate @ ref. conditions (Q_{Ref})	m^3/s	0.24
Gas compressibility correction (ε)		0.995
Wet gas density (ρ_s)		0.52
Exhaust gas conditions measurements		crem 6 (b)

Reference conditions

Determination		TPM
Actual Duct Flow Conditions		
Average temperature (T_{duct})	°C	354.0
Total pressure (P_{duct})	kPa	98.55
Oxygen (O_{2Duct})	% vol,dry	17.40
Water vapour (H_2O_{duct})	% vol	2.80
Reference Conditions		
Temperature (T_{Ref})	°C	0
Pressure (P_{Ref})	kPa	101.3
Oxygen (O_{2Ref})	% vol, dry	11
Water vapour (H_2O_{Ref})	% vol	0

Sampling conditions

Determination				TPM
Nozzle diameter (d)	T124	Titanium	mm	6.280
Initial gas meter reading			m^3	641.151
Final gas meter reading			m^3	641.844
Sampled volume (SV_M)			m^3	0.693

Calculation of sample gas volume at reference conditions, SV_{Ref}

$$SV_{Ref} = SV_{Meter} \times \gamma \times \frac{[273 + T_{Ref}]}{[273 + T_{Meter}]} \times \frac{P_{Baro}}{P_{Ref}} \times \frac{[100 - H_2O_{Meter}]}{[100 - H_2O_{Ref}]} \times \frac{[20.9 - O_{2Duct}]}{[20.9 - O_{2Ref}]}$$

Corrections
Temperature
Pressure
Water vapour
Oxygen

Determination		TPM
Sampled volume @ ref. conditions (SV_{Ref})	m^3	0.205

SAMPLING DATA TPM

Test Ref crem 6 (b)

Initial gas meter reading: 641151 l Start Time: 11:12

Distance from Duct Wall Fraction of D	Port	Time of Day h:mm	Run time mm	Gas meter reading l	Pitot Reading (h) mm w.g.	Orifice ΔH mm w.g. Desired (ΔH_d) mh x K_f x Cp^2	Orifice ΔH mm w.g. Actual (ΔH_a)	Isokinetic difference ($\Delta H_a/\Delta H_d$) %	Temperatures: Gas (T_{duct}) °C	Probe (T_p) °C	Filter (T_f) °C	Meter (T_m) Inlet °C	Meter (T_m) Outlet °C	Impinger (T_{imp}) °C	Oxygen Content % v/v, dry
0.500	A	11:12	0	641151	3.8	7.91	7.9	100	357	157	156	22.0		9	
		11:17	5	641201	4	8.33	8.3	100	359	158	156	22.0		10	
		11:22	10	641251	5.2	10.82	10.8	100	362	160	160	22.0		11	
		11:27	15	641308	7.1	14.78	14.8	100	374	160	160	22.0		12	
		11:32	20	641392	8.5	17.69	17.7	100	377	160	160	22.0		13	
		11:37	25	641444	5.9	12.28	12.3	100	366	160	160	22.0		14	
		11:42	30	641518	3.2	6.66	6.6	99	359	160	160	22.0		15	
		11:47	35	641557	2.5	5.20	5.2	100	352	160	160	22.0		16	
		11:52	40	641600	1.9	3.96	3.9	99	351	160	160	23.0		17	
		11:57	45	641638	1.3	2.71	2.7	100	350	160	160	23.0		17	
		12:02	50	641666	2	4.16	4.2	101	349	160	160	23.0		18	
		12:07	55	641701	1.3	2.71	2.7	100	337	160	160	22.0		19	
		12:12	60	641734	1.9	3.96	4	101	336	160	160	22.0		8	
		12:17	65	641764	1.9	3.96	4	101	332	160	160	22.0		8	
		12:22	70	641807	1.8	3.75	3.7	99	329	160	160	22.6		9	
		12:27	75	641844											
	Averages								354.8	159.7	159.5	22.2		13.1	n.m

Final gas meter reading: 641844 l End Time: 12:27

Equipment used

Item	File No.
Control box	P1302
Meter coefficient (γ)	0.926
K factor, (K_f, independent of C_p)	2.958
Orifice plate pressure units	mm w.g.
Pitot differential pressure units	mm w.g.
Pitot	S
Pitot coefficient (C_p)	0.84
Probe liner thermocouple Titanium	P1607
Duct gas thermocouple	P1611
Oven thermocouple	P1395
Impinger exit thermocouple	P1333
Timer	P1187

Leak check

		Start	End
Start Time		11:02	12:31
End Time		11:04	12:33
Initial meter reading	m^3	641.1507	641.8436
Final meter reading	m^3	641.151	641.8441
Duration of leak test	min	2	2
Pump vacuum	"Hg	-15	-15
Leak rate	l/min	0.15	0.15
Less than 2% of normal sampling rate?		Yes	Yes

Approach to isokinetic sampling

Average gas velocity (V_{duct})	9.1 m/s
Nozzle diameter (D_n)	0.200 mm
Sampling time (t)	75 min
Theoretical isokinetic sample volume SV_t	1274.42 l
Actual sample volume (SV_a)	1403.11 l
Approach to isokinetic sampling (Δ)	110.1 %

where: V_{duct} is the average duct velocity based on the above measurements

$V_{duct} = C_p \times (1+\varepsilon) \times \sqrt{2/\rho_a} \times \sqrt{h}$ (Reference BS 1042:Section 2.1:1983 (ISO 3966), pages 8&9)

SV_t is the theoretical isokinetic sample volume based on V_{duct} & D_n

$SV_t = V_{duct} \times \pi \times [D_n/2000]^2 \times t \times 60 \times 1000$

SV_a is the sample volume at duct conditions

$SV_a = SV_m \times \gamma \times [(273 + T_{duct})/(273 + T_m)] \times (P_{atm}/P_{duct}) \times (100 - H_2O_m)/(100-H_2O_{duct})$

Determination of exhaust gas flow rate

based on measurements at sample points only

Flow rate at duct conditions (Q_{duct})	1.61 m^3/s
Flow rate at STP (Q_{STP})	0.68 m^3/s
Flow rate at reference conditions (Q_{ref})	0.24 m^3/s

where

$Q_{duct} = V_{duct} \times A$

$Q_{STP} = Q_{duct} \times [(T_{duct} + 273)/(T_{duct} + 273)] \times (P_{duct}/P_{atm})$

$Q_{ref} = Q_{STP} \times [(20.9-O_{2m})/(20.9-O_{2ref})] \times [(100-H_2O_{duct})/(100-H_2O_{ref})]$

PARTICULATE WEIGHINGS

Test Ref crem 6 (b)

Filters

Determination		Method Blank	Field Blank	TPM
Filter No.		0	012467	012468
Pre-sampling conditioning temperature (±5°C)	°C	180	180	180
Post-sampling conditioning temperature (±5°C)	°C	160	160	160
Diameter	mm	110	110	110
Material		Quartz	Quartz	Quartz
Pre-sampling weights				
after 1 min	g		0.8014	0.7979
after 2 min	g		0.8014	0.7979
after 3 min	g		0.8014	0.7980
Weight extrapolated to zero time (M_{f0})	g		0.8014	0.7978
Post-sampling weights				
after 1 min	g		0.8005	0.8333
after 2 min	g		0.8005	0.8333
after 3 min	g		0.8006	0.8334
Weight extrapolated to zero time (M_{f0})	g		0.8004	0.8332

Rinsings

Pre-sampling conditioning temperature (±5°C)	°C	180	180	180
Post-sampling conditioning temperature (±5°C)	°C	160	160	160
Pre-sampling weights (container only)				
after 1 min	g		68.6805	69.0011
after 2 min	g		68.6805	69.0011
after 3 min	g		68.6805	69.0011
Weight extrapolated to zero time (M_{r10})	g		68.6805	69.0011
Post-sampling weights (container and evaporated rinsings)				
after 1 min	g		68.6820	69.0055
after 2 min	g		68.6819	69.0054
after 3 min	g		68.6818	69.0053
Weight extrapolated to zero time (M_{r10})	g		68.6821	69.0056

Summary

Determination		Method Blank (M_{mb})	Field Blank	TPM
Mass collected on filter ($M_f = (M_{f0} - M_{f10} - M_{fmb})$)	g	0.0000	-0.0010	0.0354
Mass collected in rinsings ($M_r = (M_{r10} - M_{r10} - M_{rmb})$)	g	0.0000	0.0016	0.0045
Total mass collected ($M = M_f + M_r$)	g	0.0000	0.0006	0.0399

Uncertainty Calculation Parameters

Standard uncertainty for gas volume measurement (U6)	2.9 %
Standard uncertainty for filter weighing (U17)	0.57 mg
Standard uncertainty for washings weighing (U17)	0.50 mg
Limit of detection for filter weighing (U17)	0.50 mg
Limit of detecion for washings weighing (U17)	0.50 mg
Standard uncertainty for oxygen correction (U11)	0.95 %
Standard uncertainty for gas flow measurement (U14)	5.7 %

Emission Limit Value

Emission limit value (ELV) at reference conditions	80 mg/m³

SUMMARY OF MEASUREMENTS

Test Ref crem 6 (b)

Calculation of Particulate Concentration and Discharge Rate

Particulate concentration (C), mg/m^3 = M x 1000/ SV_{Ref}

Discharge rate, kg/h = C x Q_{Ref} x 0.0036

Determination		Field Blank	TPM
Particulate concentration at reference conditions	mg/m^3	3.10	195.00
Uncertainty	mg/m^3	3.10	15.31
Particulate concentration at duct conditions (raw)	mg/m^3	0.45	28.44
Particulate discharge rate	kg/h	0.00	0.17
Uncertainty	kg/h	0.00	0.02

Note: Field blank results based on average sampling conditions

Uncertainty budget

Uncertainties		Field Blank	TPM
Volume measurement (m_{vol})	mg	0.02	1.16
Filter weighings (m_f)	mg	-0.97	0.57
Rinsings weighings (m_w)	mg	1.33	0.94
Total for uncorrected measurement (U_u)	mg	1.65	1.60
Correction to reference conditions (m_{corr})	mg	0.00	0.00
Total for corrected measurement (U_c)	mg	1.65	1.60
Concentration at 95% confidence interval (U_{95c})	mg/m^3	3.10	15.31

Based on Procedure 55 and Uncertainty Policies 11 & 17
(in accordance with requirements of BS EN ISO 14956:2002 and ENV 13005 (GUM))

$U_u = \sqrt{m_{vol}^2 + m_f^2 + m_w^2}$

$U_c = \sqrt{U_u^2 + m_{corr}^2}$

$U_{95c} = 1.96 \times U_c / SV_{Ref}$

COMPLIANCE WITH BS EN 13284-1:2002/BS ISO 9096 CONDITIONS

Flow conditions (BS EN 13284-1, 5.2 & BS ISO 9096, 5.3)

Standard	ISO 9096
Angle of gas flow less than 15°	Yes
No local negative gas flow	Yes
Minimum differential pressure greater than 5 Pa	Yes
Ratio of highest to lowest local gas velocites less than 3:1	No

Compliance with BS ISO 9096

Blank value is less than 10% of ELV (Table 3)
Nozzle diameter greater than 4 mm (Clause 6.2.2)
Average sampling rate was within -5% and +15% of isokinetic conditions (Clause 7.3.5)
Leak rate is within 2% of sample rate (Clause 7.3.5)
Blank value is greater than limit of 2 mg/m3 - outside standard (Table 3)

SCIENTIFICS MONITORING REPORT FORM
Hydrogen chloride to BS EN 1911

Company	City of London	Test Ref	HCl
Site	Crematorium	Date	13-Jan-10
Sample point	Cremator 6 run 2	Time start	11:12
Test carried out by	S Huntley & T Swannack	Time End	12:27
Determinand	Hydrogen chloride to BS EN 1911	Duration (min)	75
		Sampling conditions	crem 6 (b)

ANALYSIS OF COLLECTED SOLUTIONS

Determination		HCl
Volume of sampling solution in first stage (Vs1)	ml	500
Volume of sampling solution in final stage (Vs2)	ml	0
Volume of sampling solution in field blank (Vsb)	ml	400
Chloride detection limit in sampling solution (qd)	mg/l	0.10
Chloride in first stage sampling solution (qs1)	mg/l	19.70
Chloride in final stage sampling solution (qs2)	mg/l	
Chloride in field blank sampling solution (qcb)	mg/l	0.00
Emission limit value (ELV, daily)	mg/m³	200

Calculation of hydrogen chloride concentration in duct gas, Cg

C_g (mg/m³) = $([[V_{s1} \times q_{s1}]+[V_{s2} \times q_{s2}]) \times MW_c)/(V_{std} \times MW_{cl} \times N_a)$

where MWc is the molecular weight of hydrogen chloride (i.e. 36.5 kg/kgmole)
MWcl is the molecular weight of the chloride ion (i.e. 35.5 kg/kgmole)
Na is the number of chloride ions in hydrogen chloride (i.e. 1)

Calculation of hydrogen chloride discharge rate, Dg

$D_g = C_g \times Q_{act} \times 0.0036$

MEASUREMENTS OF HYDROGEN CHLORIDE

Determination		HCl
Concentration at reference conditions (C_g)	mg/m³	58.40
Uncertainty (95% confidence limit)	mg/m³	6.71
Uncertainty as a proportion of ELV	%	3.36
Discharge rate (D_g)	kg/h	0.049
Uncertainty (95% confidence limit)	kg/h	0.008
Detection limit	mg/m³	0.296

FIELD BLANK

Determination		HCl
Field blank concentration*	mg/m³	0.00
Field blank as a proportion of ELV	±%	0.0

*assuming same sample volume as for sample

ABSORPTION EFFICIENCY (where determined)

Calculation of Absorption Efficiency, e

$e = m_2 \times 100 / (m_{s1} + m_{s2})$

Determination		HCl
Chloride in first stage absorber (m1)	mg	11.62
Chloride in final stage absorber (m2)	mg	0.00
Absorption efficiency	%	n.d.

Uncertainty Calculation Parameters

Standard uncertainty for gas volume measurement (U6)	2.9 %
Standard uncertainty for liquid volume measurement (U16)	1 %
Analytical uncertainty at X times LOD (U15)	5 %
X (U15)	10
Standard uncertainty for oxygen correction (U11)	0.95 %
Standard uncertainty for gas flow measurement (U14)	5.7 %

Uncertainty budget

Uncertainties		HCl
Sample gas volume measurement (m_{vol})	%	2.9
Solution volume measurement (m_{vol})	%	1.0
Analysis of washings (m_{an})	%	5.0
Total for uncorrected measurement (U_u)	mg/m³	3.43
Correction to reference conditions (m_{corr})	mg/m³	0.00
Concentration at 95% confidence interval (U_{95c})	mg/m³	6.715

Based on Procedure 55 and Uncertainty Policies 11 & 16
(In accordance with requirements of BS EN ISO 14956:2002 and ENV 13005 (GUM))

$U_U = \sqrt{m_{vol}^2 + m_{sol}^2 + m_{an}^2 / SV_{int}}$
$U_{95c} = 1.95 \times \sqrt{U_u^2 + m_{corr}^2}$

COMPLIANCE WITH STANDARD

Probe temperature is at least 150C (Clause 6.2)
Leak rate less than 2% of sample rate (Clause 1-8.2)
Sampling outside 10% of isokinetic conditions - outside standard (Clause 1-5.1.5)
Absorption efficiency not determined
Sample concentration is greater than 10 times field blank (3-4.2.1)
Field blank concentration is less than 10% of ELV (not normative)
Measurement uncertainty is less than 20% of ELV (not normative)

SCIENTIFICS MONITORING REPORT FORM
Carbon Monoxide to BS EN 15058:2006

Company	City of London	Date	13-Jan-10
Site	Crematorium	Test Ref	crem 6 (b)
Sample point	Cremator 6, run 2	Time Start	11:14
Test carried out by	S Huntley, T Swannack	Time End	12:29

Measurements: 5 minutes' averaging period

Start	End	No. Readings	Maximum	Minimum	Average	Maximum	Minimum	Average
			ppm , dry			$mgCO/m^3$, ref. cond.		
11:14	11:19	20	101	5	12	227	15	33
11:19	11:24	20	42	5	8	97	15	24
11:24	11:29	20	21	6	13	52	14	31
11:29	11:34	20	13	7	9	35	17	23
11:34	11:39	20	8	6	7	23	15	18
11:39	11:44	20	7	6	6	20	15	17
11:44	11:49	20	7	5	6	20	16	18
11:49	11:54	20	6	<5	5	21	16	19
11:54	11:59	20	6	<5	5	26	19	23
11:59	12:04	20	6	<5	<5	27	20	23
12:04	12:09	20	<5	<5	<5	26	15	21
12:09	12:14	20	<5	<5	<5	20	15	17
12:14	12:19	20	6	<5	<5	28	16	21
12:19	12:24	20	<5	<5	<5	23	15	20
12:24	12:29	20	<5	<5	<5	28	19	24
11:14	12:29	300	101	<5	6	227	14	22

Summary of measurements

Average concentration	22.0 $mgCO/m^3$
Uncertainty	5.7 $mgCO/m^3$
Discharge rate	0.019 kgCO/h

Compliance with BS 15058:2006

No correction for drift applied (Clause 8.4.3)
Response time is within limit (Clause 7.2)
Uncertainty is within specified limit of 6% of ELV (Clause 7.3)

Calibration Checks

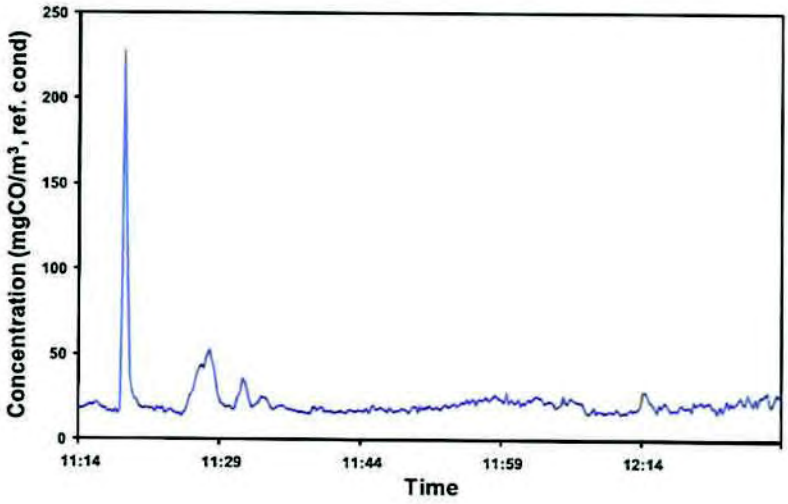
Type Horiba PG 250 **Range** 0 to 50 ppm
Equipment No. P1301
Measurement method Non-dispersive infra-red

Calibration		Zero	Span
Gas reference		CH49	DG2
Concentration	ppm	0.00	25.12
		Analyser response	
Gas into analyser before sampling	ppm	0.00	25.20
Gas into system before sampling	ppm	0.40	25.30
Gas into system after sampling	ppm	0.30	25.50
Drift	% span	0.40	0.79
Response time	s	22	

Uncertainty budget

Quantity		Variation		Value		Partial uncertainty ($x_{i,mean}$)		$x_{i,mean}^2$
						ppm CO	mgCO/m³	
Lack of fit	$u(Corr_{fit})$	-		2.00	% range	0.58	0.72	0.52
Zero drift	$u(Corr_{0,dr})$	-		0.26	% range	0.08	0.09	0.01
Span drift	$u(Corr_{s,dr})$	-		0.29	% range	0.08	0.10	0.01
Sample volume flow	$u(Corr_{s,vf})$	-		0.00	% range	0.00	0.00	0.00
Atmospheric pressure	$u(Corr_{atmos})$	0	kPa	0.00	% range/2kP	0.00	0.00	0.00
Ambient temperature	$u(Corr_{temp})$	1	K	0.50	% range/10K	0.01	0.01	0.00
Electric voltage	$u(Corr_{volt})$	40	V	0.00	% range/10V	0.00	0.00	0.00
Interferents	$u(Corr_{int})$	-		1.60	% range	0.46	0.58	0.33
Losses & leakage	$u(Corr_{leak})$	-		0.00	% range	0.00	0.00	0.00
Repeatability at zero	$u(Corr_{z,rep})$	-		0.14	% range	0.04	0.05	0.00
Repeatability at span	$u(Corr_{s,rep})$	-		0.00	% range	0.00	0.00	0.00
Converter efficiency	$u(Corr_{conv})$	-		100.00	% reading	0.00	0.00	0.00
Response factor	$u(Corr_{resp})$	-		100.00	% reading	0.00	0.00	0.00
Calibration gas	$u(Corr_{wf})$	-		1.00	% value	0.40	0.50	0.25
Combined uncertainty	$u(C_{CO})$							1.06
Expanded uncertainty	$U(C_{CO})$							2.08
$U(C_{CO})$ ELV (%)								2.08

Measured concentration of Carbon Monoxide at Cremator 6, run 2



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SCIENTIFICS MONITORING REPORT FORM
Volatile Organic Compounds to BS EN 12619:1999 & BS EN 13526:2002

Company	City of London	Date	13-Jan-10
Site	Crematorium	Test Ref	crem 6 (b)
Sample point	Cremator 6, run 2	Time Start	11:13
Test carried out by	S Huntley, T Swannack	Time End	12:27

Measurements: 5 minutes' averaging period

Start	End	No. Readings	Maximum	Minimum	Average	Maximum	Minimum	Average
			ppm , wet			mgCarbon/m3, ref cond.		
11:13	11:17	5	<1	<1	<1	<1	<1	<1
11:18	11:22	5	2.5	<1	<1	11.5	<1	2.3
11:23	11:27	5	<1	<1	<1	<1	<1	<1
11:28	11:32	5	<1	<1	<1	<1	<1	<1
11:33	11:37	5	<1	<1	<1	<1	<1	<1
11:38	11:42	5	<1	<1	<1	<1	<1	<1
11:43	11:47	5	<1	<1	<1	<1	<1	<1
11:48	11:52	5	<1	<1	<1	<1	<1	<1
11:53	11:57	5	<1	<1	<1	<1	<1	<1
11:58	12:02	5	<1	<1	<1	<1	<1	<1
12:03	12:07	5	<1	<1	<1	<1	<1	<1
12:08	12:12	5	<1	<1	<1	<1	<1	<1
12:13	12:17	5	<1	<1	<1	2.3	<1	<1
12:18	12:22	5	<1	<1	<1	<1	<1	<1
12:23	12:27	5	<1	<1	<1	<1	<1	<1
11:13	12:27	75	2.5	<1	<1	11.5	<1	<1

Summary of measurements

Average concentration	<1 mgCarbon/m3
Uncertainty	1 mgCarbon/m3
Discharge rate	<0.00084708 kgCarbon/h

Compliance with BS EN 12619/BS EN 13526

No correction for drift applied (BS EN 14789, Clause 8.4.3)
Response time is within limit (BS EN 12619, Clause 6.1.1)
Uncertainty is within specified limit of 10% of ELV (BS EN 14789, Clause 1)

Calibration Checks

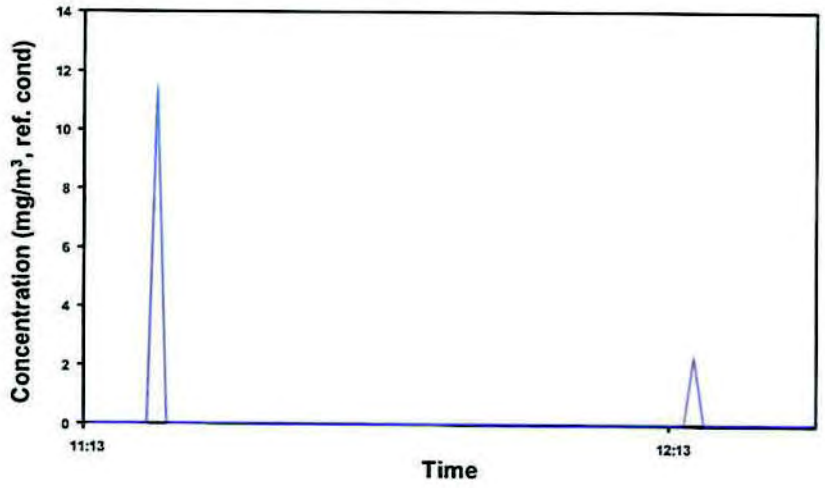
Type	Bernath 3006	**Range**	0 to 10 ppm
Equipment No.	P1366		
Measurement method	Flame ionisation detection		

Calibration		Zero	Span
Gas reference		CH49	DG2
Concentration	ppm	0.00	8.92
		Analyser response	
Gas into analyser before sampling	ppm	0.02	8.90
Gas into system before sampling	ppm	-0.04	8.80
Gas into system after sampling	ppm	0.03	8.85
Drift	% span	0.78	0.57
Response time	s	9	

Uncertainty budget

Quantity		Variation		Value		Partial uncertainty (x_{impact})		x_{impact}^2
						ppm	mg/m³	
Lack of fit	$u(Corr_{fit})$	-		2.00	% range	0.12	0.19	0.03
Zero drift	$u(Corr_{0,dr})$	-		2.00	% range	0.12	0.19	0.03
Span drift	$u(Corr_{s,dr})$	-		2.00	% range	0.12	0.19	0.03
Sample volume flow	$u(Corr_{s,d})$	-		1.00	% range	0.06	0.09	0.01
Atmospheric pressure	$u(Corr_{atmos})$	0	kPa	0.50	% range/2kP	0.00	0.00	0.00
Ambient temperature	$u(Corr_{amb})$	1	K	2.00	% range/10K	0.01	0.01	0.00
Electric voltage	$u(Corr_{el})$	40	V	2.00	% range/10V	0.23	0.37	0.14
Interferents	$u(Corr_{int})$	-		3.50	% range	0.20	0.32	0.11
Losses & leakage	$u(Corr_{leak})$	-		1.20	% range	0.07	0.11	0.01
Repeatability at zero	$u(Corr_{z,rep})$	-		1.00	% range	0.06	0.09	0.01
Repeatability at span	$u(Corr_{s,rep})$	-		2.00	% range	0.12	0.19	0.03
Converter efficiency	$u(Corr_{conv})$	-		100.00	% reading	0.00	0.00	0.00
Response factor	$u(Corr_{resp})$	-		100.00	% reading	0.00	0.00	0.00
Calibration gas	$u(Corr_{cal})$	-		1.00	% value	0.06	0.10	0.01
Combined uncertainty	$u(C_{VOC})$							0.64
Expanded uncertainty	$U(C_{VOC})$							1.26
$U(C_{VOC})$:ELV (%)								6.29

Measured concentration of Volatile Organic Compounds at Cremator 6, run 2



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SCIENTIFICS MONITORING REPORT FORM
Oxygen to BS EN 14789:2005

Company	City of London	Date	13-Jan-10
Site	Crematorium	Test Ref	crem 6 (b)
Sample point	Cremator 6, run 2	Time Start	11:14
Test carried out by	S Huntley, T Swannack	Time End	12:29

Measurements: 5 minutes' averaging period

Start	End	No. Readings	Maximum	Minimum	Average	Maximum	Minimum	Average
			%, dry			% dry		
11:14	11:19	20	17.7	15.4	16.8	17.7	15.4	16.8
11:19	11:24	20	17.3	15.6	16.8	17.3	15.6	16.8
11:24	11:29	20	16.1	15.5	15.8	16.1	15.5	15.8
11:29	11:34	20	16.3	16.0	16.2	16.3	16.0	16.2
11:34	11:39	20	16.6	16.0	16.3	16.6	16.0	16.3
11:39	11:44	20	16.8	16.2	16.5	16.8	16.2	16.5
11:44	11:49	20	17.1	16.6	16.8	17.1	16.6	16.8
11:49	11:54	20	17.7	17.2	17.5	17.7	17.2	17.5
11:54	11:59	20	18.3	17.7	18.0	18.3	17.7	18.0
11:59	12:04	20	18.7	18.1	18.3	18.7	18.1	18.3
12:04	12:09	20	18.7	17.5	18.3	18.7	17.5	18.3
12:09	12:14	20	18.1	17.6	17.8	18.1	17.6	17.8
12:14	12:19	20	18.3	18.1	18.2	18.3	18.1	18.2
12:19	12:24	20	18.8	18.3	18.5	18.8	18.3	18.5
12:24	12:29	20	19.0	18.9	19.0	19.0	18.9	19.0
11:14	12:29	300	19.0	15.4	17.4	19.0	15.4	17.4

Summary of measurements

Average concentration	17.4 $\%O_2$, dry
Uncertainty	0.6 $\%O_2$, dry

Compliance with BS 15058:2006

No correction for drift applied (Clause 8.4.3)
Response time is within limit (Clause 7.2)
Uncertainty is within specified limit of 6% of measured concentration (Clause 1)

Calibration Checks

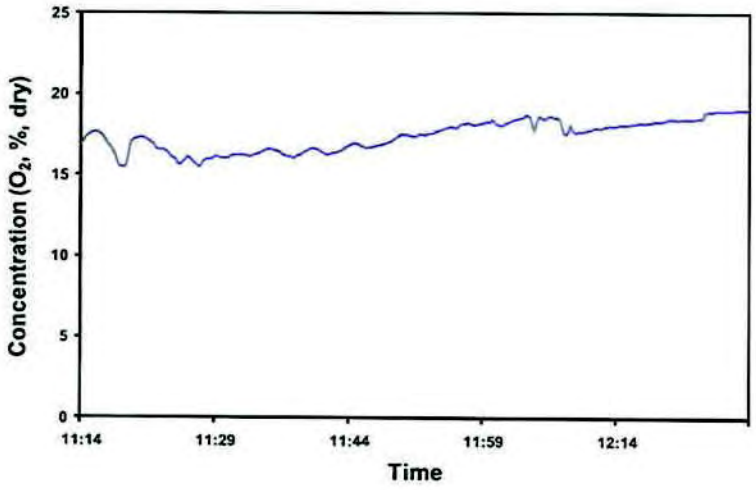
Type Honba PG 250 **Range** 0 to 25 %
Equipment No. P1301
Measurement method Zirconium cell

Calibration		Zero	Span
Gas reference		CH49	DG2
Concentration	%	0.00	13.10
		Analyser response	
Gas into analyser before sampling	%	0.00	13.10
Gas into system before sampling	%	0.00	13.15
Gas into system after sampling	%	0.10	13.18
Drift	% span	0.76	0.23
Response time	s	19	

Uncertainty budget

Quantity		Variation		Value		Partial uncertainty (x_{imax})	x_{imax}^2
						$\%O_2$	
Lack of fit	$u(Corr_{fit})$	-		2.00	% range	0.29	0.08
Zero drift	$u(Corr_{0,dr})$	-		0.11	% range	0.02	0.00
Span drift	$u(Corr_{s,dr})$	-		0.24	% range	0.03	0.00
Sample volume flow	$u(Corr_{v,d})$	-		0.00	% range	0.00	0.00
Atmospheric pressure	$u(Corr_{atmpress})$	0	kPa	0.00	% range/2kP	0.00	0.00
Ambient temperature	$u(Corr_{temp})$	1	K	0.40	% range/10K	0.00	0.00
Electric voltage	$u(Corr_{volt})$	40	V	0.00	% range/10V	0.00	0.00
Interferents	$u(Corr_{int})$	-		0.00	% range	0.00	0.00
Losses & leakage	$u(Corr_{loss})$	-		0.00	% range	0.00	0.00
Repeatability at zero	$u(Corr_{z\,rep})$	-		0.00	% range	0.00	0.00
Repeatability at span	$u(Corr_{s,rep})$	-		0.00	% range	0.00	0.00
Converter efficiency	$u(Corr_{conv})$	-		100.00	% reading	0.00	0.00
Response factor	$u(Corr_{resp})$	-		100.00	% reading	0.00	0.00
Calibration gas	$u(Corr_{wb})$	-		1.00	% value	0.13	0.02
Combined uncertainty	$u(C_{CO})$						0.32
Expanded uncertainty	$U(C_{CO})$						0.62
$U(C_{CO}):C_{CO}(\%)$							3.57

Measured concentration of Oxygen at Cremator 6, run 2



SCIENTIFICS MONITORING REPORT FORM
Carbon Dioxide to ISO 12039:2001

Company	City of London	Date	13-Jan-10
Site	Crematorium	Test Ref	crem 6 (b)
Sample point	Cremator 6, run 2	Time Start	11:14
Test carried out by	S Huntley, T Swannack	Time End	12:29

Measurements: 5 minutes' averaging period

Start	End	No. Readings	Maximum	Minimum	Average	Maximum	Minimum	Average
			%, dry			$\%CO_2$, ref. cond.		
11:14	11:19	20	5.1	2.9	3.7	9.2	8.9	9.0
11:19	11:24	20	5.0	3.1	3.6	9.3	8.3	8.6
11:24	11:29	20	4.3	3.9	4.1	8.2	7.8	7.9
11:29	11:34	20	3.9	3.7	3.8	7.9	7.9	7.9
11:34	11:39	20	3.9	3.5	3.7	8.0	7.9	8.0
11:39	11:44	20	3.8	3.4	3.6	8.1	8.0	8.1
11:44	11:49	20	3.5	3.1	3.3	8.2	8.1	8.2
11:49	11:54	20	3.0	2.7	2.8	8.2	8.1	8.2
11:54	11:59	20	2.7	2.2	2.4	8.2	8.1	8.2
11:59	12:04	20	2.3	1.7	2.1	8.2	7.7	7.9
12:04	12:09	20	2.2	1.5	1.8	7.8	6.3	6.9
12:09	12:14	20	2.1	1.7	1.9	6.4	5.9	6.1
12:14	12:19	20	1.7	1.4	1.5	5.8	5.5	5.7
12:19	12:24	20	1.4	1.2	1.3	5.9	5.2	5.4
12:24	12:29	20	1.2	1.1	1.1	6.1	5.9	6.0
11:14	12:29	300	5.1	1.1	2.7	9.3	5.2	7.5

Summary of measurements

Average concentration	7.5 $\%CO_2$
Uncertainty	0.9 $\%CO_2$

Compliance with BS 14792:2005

No correction for drift applied (BS EN 14789, Clause 8.4.3)
Response time is within limit (ISO 12039, Clause A.2)
Uncertainty is above specified limit of 6% of measured concentration (BS EN 14789, Clause 1) - non compliance

Calibration Checks

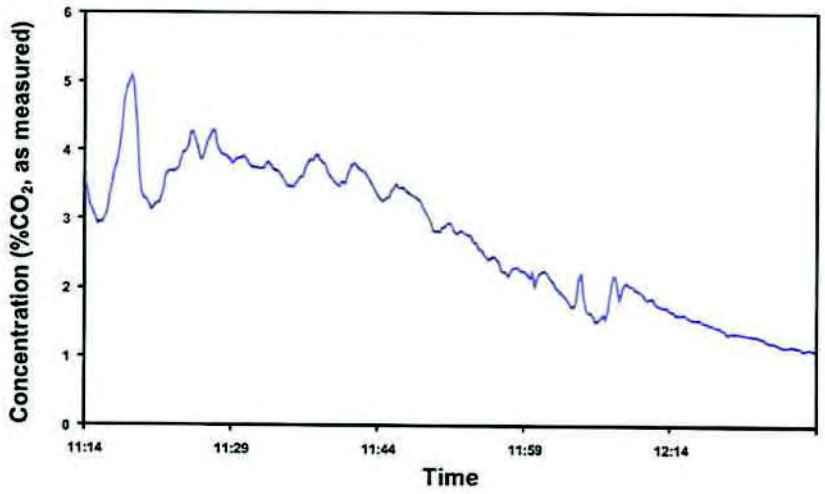
Type	Horiba PG 250	**Range**	0 to 10 %
Equipment No.	P1301		
Measurement method	Non-dispersive infra-red		

Calibration		Zero	Span
Gas reference		CH49	DG2
Concentration	%	0.00	5.08
		Analyser response	
Gas into analyser before sampling	%	0.00	5.09
Gas into system before sampling	%	0.08	5.15
Gas into system after sampling	%	0.15	5.19
Drift	% span	1.38	0.78
Response time	s	25	

Uncertainty budget

Quantity		Variation		Value		Partial uncertainty (x_{imax})	x_{imax}^2
						$\%CO_2$	
Lack of fit	$u(Corr_{lof})$	-		2.00	% range	0.12	0.01
Zero drift	$u(Corr_{z,dr})$	-		0.26	% range	0.02	0.00
Span drift	$u(Corr_{s,dr})$	-		0.29	% range	0.02	0.00
Sample volume flow	$u(Corr_{s,vf})$	-		0.00	% range	0.00	0.00
Atmospheric pressure	$u(Corr_{atmos})$	0	kPa	0.00	% range/2kP	0.00	0.00
Ambient temperature	$u(Corr_{temp})$	1	K	0.50	% range/10K	0.00	0.00
Electric voltage	$u(Corr_{volt})$	40	V	0.00	% range/10V	0.00	0.00
Interferents	$u(Corr_{int})$	-		1.60	% range	0.09	0.01
Losses & leakage	$u(Corr_{leak})$	-		0.00	% range	0.00	0.00
Repeatability at zero	$u(Corr_{z,rep})$	-		0.14	% range	0.01	0.00
Repeatability at span	$u(Corr_{s,rep})$	-		0.00	% range	0.00	0.00
Converter efficiency	$u(Corr_{conv})$	-		100.00	% reading	0.00	0.00
Response factor	$u(Corr_{resp})$	-		100.00	% reading	0.00	0.00
Calibration gas	$u(Corr_{wfc})$	-		1.00	% value	0.05	0.00
Combined uncertainty	$u(C_{CO2})$						0.16
Expanded uncertainty	$U(C_{CO2})$						0.31
$U(C_{CO2})/C_{CO2}(\%)$							11.41

Measured concentration of Carbon Dioxide at Cremator 6, run 2



SCIENTIFICS MONITORING REPORT FORM
WATER VAPOUR DETERMINATION to BS EN 14790:2005

Company	City of London	Test Ref	crem 6 (b) h2o
Site	Crematorium	Date	13-Jan-10
Sample point	Cremator 6 run 2	Time start	11:12
Test carried out by	S Huntley & T Swannack	Time End	12:27
		Duration (min)	75
		Data from	crem 6 (b)

Collection of water from gas

Collection Stage (ci)	Initial Mass(Mci$_i$) g	Final Mass (Mci$_f$) g	Mass gain (Mci) g
Container 1	748.78	756.22	7.44
Container 2	724.03	728.29	4.26
Container 3	565.56	567.17	1.61
Container 4	918.19	918.24	0.05
Total (M)	2896.56	2909.92	13.36

Mass of water collected (M) = Σ(Mc1$_f$-Mc1$_i$),....(Mci$_f$-Mci$_i$)

Calculation of dry gas sample volume at STP (SV_{STP})

$$SV_{STP} = SV_M \times (273/(273 + T_M)) \times (P_M/101.3)$$

Volume of dry gas sampled at STP (SV_{STP})	m^3	0.5777

Calculation of water vapour content (H_2O_{direct})

$$H_2O_{direct} = 100 \times (M \times MV_{STP}/MW_{H2O})/[SV_{STP} + (M \times MV_{STP}/MW_{H2O})]$$

where
MV_{STP} molecular volume at STP (22.412 m^3/kgmole)
MW_{H2O} molecular weight of water (18 kg/kgmole)

Water vapour content (H_2O_{direct})	%	2.80	±	0.12

Compliance with BS 14790

Uncertainty less than 20% of measured value (Clause 7.3)
Temperature at outlet is less than 4oC based on calculated dew point (Clause 6.4.2)
Leak rate is no more than 2% of sample flow rate
Sampling duration is within minimum of 30 minutes (Clause 6.1)
Sampling volume is within minimum of 50l (Clause 6.1)
Residual water content at outlet is below 1.25%(Clause 5.8)
Sampling temperature was within minimum of 120oC during sampling (Clause 5.2)

Uncertainty Budget (based on BS 14790 and Uncertainty Policy U25)

Volume of sampled gas	V	0.578 m^3
Average temperature of gas at meter	T	22.2 °C
Average barometric pressure at meter	P	986 mb
Sampling line leakage	L	0.00015 m^3/min
Duration of sampling	t	75 min
Total mass weighed	M	2909.92 g

Source of uncertainty		Value		Value of standard uncertainty		Relative standard uncertainty (%)	
Measurement of sample gas volume	$u_r V_m$	2.0 %	u_v	$u_v V_m = \frac{u_v \cdot V_m}{\sqrt{3}}$	0.0067 m^3	$u_r V_m$	1.15
Measurement of sample gas temperature	$u_r T_m$	1.0 %	u_t	$u_t T_m = \frac{u_t \cdot T_m}{\sqrt{3}(T_m + 273)}$	1.7043 K	$u_r T_m$	0.58
Measurement of absolute pressure	$u_r P_m$	1.0 %	u_p	$u_p P_m = \frac{u_p \cdot P_m}{\sqrt{3}}$	5.6927 mb	$u_r P_m$	0.58
Leakage in sampling line	$u_r L$	1.9 %	u_l	$u_l L = \frac{u_l \cdot L}{\sqrt{3}}$	0.0065 m^3	$u_r L$	1.12
Measurement of weight - balance uncertainty	$u_r W_m$	0.01 %	u_{bal}	$u_r W_m = \frac{u_{bal} \cdot M}{\sqrt{3}}$	0.1680 g		-
Measurement of weight - balance repeatability	$u_r W_r$	0.011 g	u_{br}	$u_r W_r = \frac{u_{br}}{\sqrt{3}}$	0.0110 g		-
Total measurement of weight	$u_r W$	-	-	$u_r W$ =	0.1790 g	$u_r W$	1.34

Total standard relative uncertainty	$u_r = \sqrt{u_r V_m^2 + u_r T_m^2 + u_r P_m^2 + u_r L^2 + u_r W^2 + Corr_r}$	2.26 %
Total relative uncertainty	$U_r = 1.96 u_r$	4.43 %

SCIENTIFICS MONITORING REPORT FORM
TOTAL PARTICULATE MATTER to BS EN 13284-1/BS ISO 9096

Company	City of London	Test Ref	crem 6 (c)
Site	Crematorium		
Sample point	Cremator 6 run 3		
Test carried out by	S Huntley & T Swannack		

SAMPLING TIMES

Determination		tpm
Date		13-Jan-10
Time Start		14:18
Time End		15:23
Duration (t)	min	65

Sampling plane

Dimension traversed by sampling probe (D)	m	0.42
Cross sectional area of sampling plane (A)	m^2	0.18

Duct gas conditions

Determination		tpm
Ambient temperature (T_{Amb})	°C	9.0
Average duct gas temperature (T_{duct})	°C	353.8
Duct static gas pressure (P_{Static})	kPa	-0.05
Barometric pressure (P_{Baro})	kPa	98.60
Volume flow rate @ ref. conditions (Q_{Ref})	m^3/s	0.17
Gas compressibility correction (ε)		0.995
Wet gas density (ρ_s)		0.52
Exhaust gas conditions measurements		crem 6 (c)

Reference conditions

Determination		tpm
Actual Duct Flow Conditions		
Average temperature (T_{duct})	°C	353.8
Total pressure (P_{duct})	kPa	98.55
Oxygen (O_{2duct})	% vol,dry	18.40
Water vapour (H_2O_{duct})	% vol	3.00
Reference Conditions		
Temperature (T_{Ref})	°C	0
Pressure (P_{Ref})	kPa	101.3
Oxygen (O_{2Ref})	% vol, dry	11
Water vapour (H_2O_{Ref})	% vol	0

Sampling conditions

Determination				tpm
Nozzle diameter (d)	Ti24	Titanium	mm	6.280
Initial gas meter reading			m^3	642.158
Final gas meter reading			m^3	642.778
Sampled volume (SV_M)			m^3	0.620

Calculation of sample gas volume at reference conditions, SV_{Ref}

$$SV_{Ref} = SV_{Meter} \times Y \times \frac{[273 + T_{Ref}]}{[273 + T_{Meter}]} \times \frac{P_{Baro}}{P_{Ref}} \times \frac{[100 - H_2O_{Meter}]}{[100 - H_2O_{Ref}]} \times \frac{[20.9 - O_{2Duct}]}{[20.9 - O_{2Ref}]}$$

Corrections
Temperature
Pressure
Water vapour
Oxygen

Determination		tpm
Sampled volume @ ref. conditions (SV_{Ref})	m^3	0.131

SAMPLING DATA tpm Test Ref crem 6 (c)

Initial gas meter reading: 642158 l Start Time: 14:18

Distance from Duct Wall Fraction of D	Port	Time of Day h:m:m	Run time mm	Gas meter reading l	Pitot Reading (h) mm w.g.	Orifice ΔH mm w.g. Desired (ΔH$_d$) mm x K$_f$ x Co^2	Orifice ΔH mm w.g. Actual (ΔH$_a$)	Isokinetic difference (ΔH$_a$/ΔH$_d$) %	Temperatures Gas (T$_{duct}$) °C	Probe (T$_p$) °C	Filter (T$_f$) °C	Meter (T$_m$) Inlet °C	Meter (T$_m$) Outlet °C	Impinger (T$_{imp}$) °C	Oxygen Content % v/v, dry
0.500	A	14:18	0	642158	5.5	11.45	11.4	100	364	158	159	23.0		7	
		14:23	5	642216	5.2	10.82	10.8	100	361	159	159	23.0		8	
		14:28	10	642275	4.9	10.20	10.2	100	357	160	160	23.0		9	
		14:33	15	642332	5	10.41	10.4	100	355	160	160	23.0		11	
		14:38	20	642390	7.2	14.99	15	100	362	160	160	23.0		12	
		14:43	25	642458	4.8	9.99	10	100	366	160	160	23.0		14	
		14:48	30	642513	2.4	5.00	5	100	359	160	160	23.0		15	
		14:53	35	642555	2.2	4.58	4.6	100	352	160	160	23.0		16	
		14:58	40	642594	1.8	3.75	3.8	101	351	160	160	23.0		16	
		15:03	45	642630	1.8	3.75	3.8	101	350	160	160	23.0		17	
		15:08	50	642666	2.2	4.58	4.6	100	349	160	160	23.0		18	
		15:13	55	642702	2	4.16	4.2	101	337	160	160	23.0		18	
		15:18	60	642741	2.1	4.37	4.4	101	336	160	160	23.0		19	
		15:23	65	642778											
	Averages								353.8	159.8	159.8	23.0		13.8	n.m

Final gas meter reading: 642778 l End Time: 15:23

Equipment used

Item	File No.
Control box	P1382
Meter coefficient (γ)	0.926
K factor, (K, independent of C$_p$)	2.950
Orifice plate pressure units	mm w.g.
Pitot differential pressure units	mm w.g.
Pitot	S
Pitot coefficient (C$_p$)	0.84
Probe liner thermocouple Titanium	P1607
Duct gas thermocouple	P1611
Oven thermocouple	P1395
Impinger exit thermocouple	P1333
Timer	P1187

Leak check

		Start	End
Start Time		14:13	15:25
End Time		14:15	15:27
Initial meter reading	m^3	642.1578	642.7782
Final meter reading	m^3	642.158	642.7785
Duration of leak test	min	2	2
Pump vacuum	"Hg	-15	-15
Leak rate	l/min	0.1	0.15
Less than 2% of normal sampling rate?		Yes	Yes

Approach to isokinetic sampling

Average gas velocity (V$_{duct}$)	9.5 m/s
Nozzle diameter (D$_n$)	0.288 mm
Sampling time (t)	65 min
Theoretical isokinetic sample volume SV$_t$	1142.67 l
Actual sample volume (SV$_a$)	1254.85 l
Approach to isokinetic sampling (Δ)	109.7 %

where V$_{duct}$ is the average duct velocity based on the above measurements

$V_{duct} = C_p \times (1-\varepsilon) \times \sqrt{2/\rho_s} \times \sqrt{h}$ (Reference BS 1042:Section 2.1:1983 (ISO 3966), pages 8&9)

SV$_t$ is the theoretical isokinetic sample volume based on V$_{duct}$ & D$_n$

$SV_t = V_{duct} \times \pi \times [D_n/2000]^2 \times t \times 60 \times 1000$

SV$_a$ is the sample volume at duct conditions

$SV_a = SV_m \times \gamma \times [(273 + T_{duct})/(273 + T_m)] \times (P_{atm}/P_{duct}) \times (100 - H_2O_{duct})/(100-H_2O_{atm})$

Determination of exhaust gas flow rate
based on measurements at sample points only

Flow rate at duct conditions (Q$_{duct}$)	1.67 m^3/s
Flow rate at STP (Q$_{STP}$)	0.71 m^3/s
Flow rate at reference conditions (Q$_{ref}$)	0.17 m^3/s

where

$Q_{duct} = V_{duct} \times A$

$Q_{STP} = Q_{duct} \times [(T_{duct} + 273)/(T_{duct} + 273)] \times (P_{duct}/P_{std})$

$Q_{ref} = Q_{STP} \times [(20.9-O_{2act})/(20.9-O_{2ref})] \times [(100-H_2O_{duct})/(100-H_2O_{ref})]$

PARTICULATE WEIGHINGS

Test Ref crem 6 (c)

Filters

Determination		Method Blank	Field Blank	tpm
Filter No.		0	012467	012466
Pre-sampling conditioning temperature (±5°C)	°C	180	180	180
Post-sampling conditioning temperature (±5°C)	°C	160	160	160
Diameter	mm	110	110	110
Material		Quartz	Quartz	Quartz
Pre-sampling weights				
after 1 min	g		0.8014	0.8267
after 2 min	g		0.8014	0.8267
after 3 min	g		0.8014	0.8267
Weight extrapolated to zero time (M_{rt0})	g		0.8014	0.8267
Post-sampling weights				
after 1 min	g		0.8005	0.8372
after 2 min	g		0.8005	0.8372
after 3 min	g		0.8006	0.8372
Weight extrapolated to zero time (M_{rt0})	g		0.8004	0.8372

Rinsings

Pre-sampling conditioning temperature (±5°C)	°C	180	180	180
Post-sampling conditioning temperature (±5°C)	°C	160	160	160
Pre-sampling weights (container only)				
after 1 min	g		68.6805	66.1992
after 2 min	g		68.6805	66.1992
after 3 min	g		68.6805	66.1991
Weight extrapolated to zero time (M_{rt0})	g		68.6805	66.1993
Post-sampling weights (container and evaporated rinsings)				
after 1 min	g		68.6820	66.2025
after 2 min	g		68.6819	66.2023
after 3 min	g		68.6818	66.2022
Weight extrapolated to zero time (M_{rt0})	g		68.6821	66.2026

Summary

Determination		Method Blank (M_{mb})	Field Blank	tpm
Mass collected on filter ($M_f = (M_{ft0} - M_{ft0} - M_{fmb})$)	g	0.0000	-0.0010	0.0105
Mass collected in rinsings ($M_r = (M_{rt0} - M_{rt0} - M_{rmb})$)	g	0.0000	0.0016	0.0034
Total mass collected ($M = M_f + M_r$)	g	0.0000	0.0006	0.0139

Uncertainty Calculation Parameters

Standard uncertainty for gas volume measurement (U6)	2.9 %
Standard uncertainty for filter weighing (U17)	0.57 mg
Standard uncertainty for washings weighing (U17)	0.50 mg
Limit of detection for filter weighing (U17)	0.50 mg
Limit of detecion for washings weighing (U17)	0.50 mg
Standard uncertainty for oxygen correction (U11)	0.95 %
Standard uncertainty for gas flow measurement (U14)	5.7 %

Emission Limit Value

Emission limit value (ELV) at reference conditions	80 mg/m^3

SUMMARY OF MEASUREMENTS

Test Ref crem 6 (c)

Calculation of Particulate Concentration and Discharge Rate

Particulate concentration (C), mg/m^3 = M x 1000/ SV_{Ref}

Discharge rate, kg/h = C x Q_{Ref} x 0.0036

Determination		Field Blank	tpm
Particulate concentration at reference conditions	mg/m^3	4.85	106.21
Uncertainty	mg/m^3	4.85	25.39
Particulate concentration at duct conditions (raw)	mg/m^3	0.51	11.06
Particulate discharge rate	kg/h	0.00	0.07
Uncertainty	kg/h	0.00	0.01

Note: Field blank results based on average sampling conditions

Uncertainty budget

Uncertainties		Field Blank	tpm
Volume measurement (m_{vol})	mg	0.02	0.40
Filter weighings (m_f)	mg	-0.97	0.57
Rinsings weighings (m_w)	mg	1.33	1.54
Total for uncorrected measurement (U_u)	mg	1.65	1.69
Correction to reference conditions (m_{corr})	mg	0.00	0.00
Total for corrected measurement (U_c)	mg	1.65	1.69
Concentration at 95% confidence interval (U_{95c})	mg/m^3	4.85	25.39

Based on Procedure 55 and Uncertainty Policies 11 & 17
(in accordance with requirements of BS EN ISO 14956:2002 and ENV 13005 (GUM))

$U_u = \sqrt{m_{vol}^2 + m_f^2 + m_w^2}$

$U_c = \sqrt{U_u^2 + m_{corr}^2}$

$U_{95c} = 1.96 \times U_c / SV_{Ref}$

COMPLIANCE WITH BS EN 13284-1:2002/BS ISO 9096 CONDITIONS

Flow conditions (BS EN 13284-1, 5.2 & BS ISO 9096, 5.3)

Standard	ISO 9096
Angle of gas flow less than 15°	Yes
No local negative gas flow	Yes
Minimum differential pressure greater than 5 Pa	Yes
Ratio of highest to lowest local gas velocites less than 3:1	No

Compliance with BS ISO 9096

Blank value is less than 10% of ELV (Table 3)
Nozzle diameter greater than 4 mm (Clause 6.2.2)
Average sampling rate was within -5% and +15% of isokinetic conditions (Clause 7.3.5)
Leak rate is within 2% of sample rate (Clause 7.3.5)
Blank value is greater than limit of 2 mg/m3 - outside standard (Table 3)

SCIENTIFICS MONITORING REPORT FORM
Hydrogen chloride to BS EN 1911

Company	City of London	Test Ref	HCl
Site	Crematorium	Date	13-Jan-10
Sample point	Cremator 6 run 3	Time start	14:18
Test carried out by	S Huntley & T Swannack	Time End	15:23
Determinand	Hydrogen chloride to BS EN 1911	Duration (min)	65
		Sampling conditions	crem 6 (c)

ANALYSIS OF COLLECTED SOLUTIONS

Determination		HCl
Volume of sampling solution in first stage (Vs1)	ml	720
Volume of sampling solution in field blank (Vsb)	ml	400
Chloride detection limit in sampling solution (qd)	mg/l	0.10
Chloride in first stage sampling solution (qs1)	mg/l	6.29
Chloride in field blank sampling solution (qcb)	mg/l	0.00
Emission limit value (ELV, daily)	mg/m^3	200

Calculation of hydrogen chloride concentration in duct gas, Cg

$$C_g\ (mg/m^3) = \{([V_{s1} \times q_{s1}]+[V_{s2} \times q_{s2}]) \times MW_c\}/(V_{mstd} \times MW_{cl} \times N_a)$$

where MWc is the molecular weight of hydrogen chloride (i.e. 36.5 kg/kgmole)
MWcl is the molecular weight of the chloride ion (i.e. 35.5 kg/kgmole)
Na is the number of chloride ions in hydrogen chloride (i.e. 1)

Calculation of hydrogen chloride discharge rate, Dg

$$D_g = C_g \times Q_{N,d} \times 0.0036$$

MEASUREMENTS OF HYDROGEN CHLORIDE

Determination		HCl
Concentration at reference conditions (C_g)	mg/m^3	35.67
Uncertainty (95% confidence limit)	mg/m^3	4.10
Uncertainty as a proportion of ELV	%	2.05
Discharge rate (D_g)	kg/h	0.022
Uncertainty (95% confidence limit)	kg/h	0.004
Detection limit	mg/m^3	0.567

FIELD BLANK

Determination		HCl
Field blank concentration*	mg/m^3	0.00
Field blank as a proportion of ELV	±%	0.0

*assuming same sample volume as for sample

Uncertainty Calculation Parameters

Standard uncertainty for gas volume measurement (U6)	2.9 %
Standard uncertainty for liquid volume measurement (U16)	1 %
Analytical uncertainty at X times LOD (U15)	5 %
X (U15)	10
Standard uncertainty for oxygen correction (U11)	0.95 %
Standard uncertainty for gas flow measurement (U14)	5.7 %

Uncertainty budget

Uncertainties		HCl
Sample gas volume measurement (m_{vol})	%	2.9
Solution volume measurement (m_{sol})	%	1.0
Analysis of washings (m_w)	%	5.0
Total for uncorrected measurement (U_u)	mg/m^3	2.09
Correction to reference conditions (m_{corr})	mg/m^3	0.00
Concentration at 95% confidence interval (U_{95c})	mg/m^3	4.101

Based on Procedure 55 and Uncertainty Policies 11 & 16
(in accordance with requirements of BS EN ISO 14956:2002 and ENV 13005 (GUM))

COMPLIANCE WITH STANDARD

Probe temperature is at least 150C (Clause 6.2)
Leak rate less than 2% of sample rate (Clause 1-8.2)
Sampling within 10% of isokinetic conditions (Clause 1-5.1.5)
Sample concentration is greater than 10 times field blank (3-4.2.1)
Field blank concentration is less than 10% of ELV (not normative)
Measurement uncertainty is less than 20% of ELV (not normative)

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SCIENTIFICS MONITORING REPORT FORM
Carbon Monoxide to BS EN 15058:2006

Company	City of London	Date	13-Jan-10
Site	Crematorium	Test Ref	crem 6 (c)
Sample point	Cremator 6, run 3	Time Start	14:24
Test carried out by	S Huntley, T Swannack	Time End	15:24

Measurements: 5 minutes' averaging period

Start	End	No. Readings	Maximum	Minimum	Average	Maximum	Minimum	Average
			ppm , dry			$mgCO/m^3$, ref. cond.		
14:24	14:29	20	6	<5	5	38	17	25
14:29	14:34	20	182	<5	21	637	21	86
14:34	14:39	20	6	<5	5	21	16	18
14:39	14:44	20	6	<5	5	22	16	18
14:44	14:49	20	6	<5	<5	22	18	20
14:49	14:54	20	5	<5	<5	25	18	21
14:54	14:59	20	11	<5	<5	68	21	28
14:59	15:04	20	5	<5	<5	35	22	28
15:04	15:09	20	<5	<5	<5	30	15	22
15:09	15:14	20	<5	<5	<5	24	13	19
15:14	15:19	20	<5	<5	<5	25	15	21
15:19	15:24	20	<5	<5	<5	26	17	20
14:24	15:24	240	182	<5	6	637	13	27

Summary of measurements

Average concentration	27.0 $mgCO/m^3$
Uncertainty	7.9 $mgCO/m^3$
Discharge rate	0.017 kgCO/h

Compliance with BS 15058:2006

No correction for drift applied (Clause 8.4.3)
Response time is within limit (Clause 7.2)
Uncertainty is within specified limit of 6% of ELV (Clause 7.3)

Calibration Checks

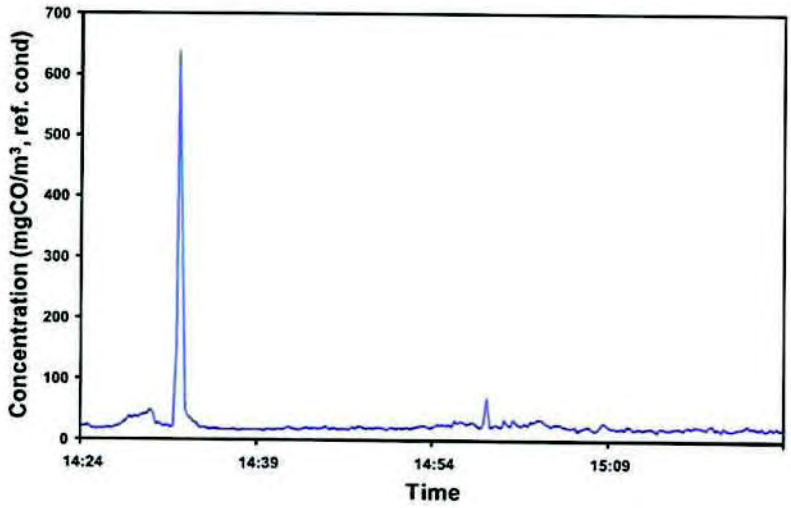
Type	Horiba PG 250	**Range**	0 to 50 ppm
Equipment No.	P1301		
Measurement method	Non-dispersive infra-red		

Calibration		Zero	Span
Gas reference		CH49	DG2
Concentration	ppm	0.00	25.12
		Analyser response	
Gas into analyser before sampling	ppm	0.00	25.20
Gas into system before sampling	ppm	0.40	25.30
Gas into system after sampling	ppm	0.30	25.50
Drift	% span	0.40	0.79
Response time	s	22	

Uncertainty budget

Quantity		Variation		Value		Partial uncertainty ($x_{i,max}$)		$x_{i,max}^2$
						ppm CO	mgCO/m³	
Lack of fit	$u(Corr_{fit})$	-		2.00	% range	0.58	0.72	0.52
Zero drift	$u(Corr_{d,z})$	-		0.26	% range	0.08	0.09	0.01
Span drift	$u(Corr_{d,sp})$	-		0.29	% range	0.08	0.10	0.01
Sample volume flow	$u(Corr_{v,sf})$	-		0.00	% range	0.00	0.00	0.00
Atmospheric pressure	$u(Corr_{apress})$	0	kPa	0.00	% range/2kP	0.00	0.00	0.00
Ambient temperature	$u(Corr_{temp})$	1	K	0.50	% range/10K	0.01	0.01	0.00
Electric voltage	$u(Corr_{volt})$	40	V	0.00	% range/10V	0.00	0.00	0.00
Interferents	$u(Corr_{int})$	-		1.60	% range	0.46	0.58	0.33
Losses & leakage	$u(Corr_{leak})$	-		0.00	% range	0.00	0.00	0.00
Repeatability at zero	$u(Corr_{r,rep})$	-		0.14	% range	0.04	0.05	0.00
Repeatability at span	$u(Corr_{s,rep})$	-		0.00	% range	0.00	0.00	0.00
Converter efficiency	$u(Corr_{conv})$	-		100.00	% reading	0.00	0.00	0.00
Response factor	$u(Corr_{resp})$	-		100.00	% reading	0.00	0.00	0.00
Calibration gas	$u(Corr_{cal})$	-		1.00	% value	0.40	0.50	0.25
Combined uncertainty	$u(C_{CO})$							1.06
Expanded uncertainty	$U(C_{CO})$							2.08
$U(C_{CO})$:ELV (%)								2.08

Measured concentration of Carbon Monoxide at Cremator 6, run 3



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SCIENTIFICS MONITORING REPORT FORM
Volatile Organic Compounds to BS EN 12619:1999 & BS EN 13526:2002

Company	City of London	Date	13-Jan-10
Site	Crematorium	Test Ref	crem 6 (c)
Sample point	Cremator 6, run 3	Time Start	14:20
Test carried out by	S Huntley, T Swannack	Time End	15:24

Measurements: 5 minutes' averaging period

Start	End	No. Readings	Maximum	Minimum	Average	Maximum	Minimum	Average
			ppm , wet			mgCarbon/m3, ref cond.		
14:20	14:24	5	<1	<1	<1	2.6	<1	<1
14:25	14:29	5	<1	<1	<1	<1	<1	<1
14:30	14:34	5	<1	<1	<1	2.0	<1	<1
14:35	14:39	5	<1	<1	<1	<1	<1	<1
14:40	14:44	5	<1	<1	<1	<1	<1	<1
14:45	14:49	5	<1	<1	<1	<1	<1	<1
14:50	14:54	5	<1	<1	<1	<1	<1	<1
14:55	14:59	5	<1	<1	<1	<1	<1	<1
15:00	15:04	5	<1	<1	<1	<1	<1	<1
15:05	15:09	5	<1	<1	<1	<1	<1	<1
15:10	15:14	5	<1	<1	<1	<1	<1	<1
15:15	15:19	5	<1	<1	<1	<1	<1	<1
15:20	15:24	5	<1	<1	<1	<1	<1	<1
14:20	15:24	65	<1	<1	<1	3	<1	<1

Summary of measurements

Average concentration	<1	mgCarbon/m3
Uncertainty	1	mgCarbon/m3
Discharge rate	<0.00062568	kgCarbon/h

Compliance with BS EN 12619/BS EN 13526

No correction for drift applied (BS EN 14789, Clause 8.4.3)
Response time is within limit (BS EN 12619, Clause 6.1.1)
Uncertainty is within specified limit of 10% of ELV (BS EN 14789, Clause 1)

Calibration Checks

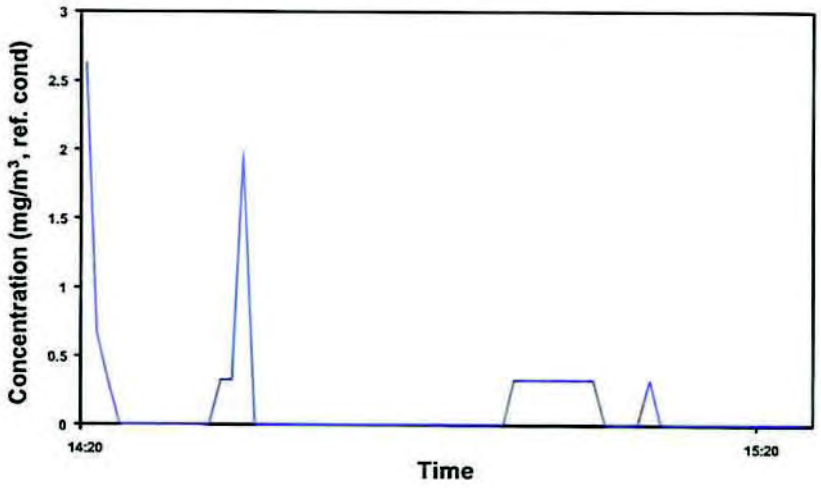
Type	Bernath 3006	Range	0 to 10 ppm
Equipment No.	P1366		
Measurement method	Flame ionisation detection		

Calibration		Zero	Span
Gas reference		CH49	DG2
Concentration	ppm	0.00	8.92
		Analyser response	
Gas into analyser before sampling	ppm	0.02	8.90
Gas into system before sampling	ppm	0.03	8.85
Gas into system after sampling	ppm	-0.05	8.93
Drift	% span	0.90	0.90
Response time	s	9	

Uncertainty budget

Quantity		Variation		Value		Partial uncertainty (x_{max})		x_{max}^2
						ppm	mg/m³	
Lack of fit	$u(Corr_{fit})$	-		2.00	% range	0.12	0.19	0.03
Zero drift	$u(Corr_{0,dr})$	-		2.00	% range	0.12	0.19	0.03
Span drift	$u(Corr_{s,dr})$	-		2.00	% range	0.12	0.19	0.03
Sample volume flow	$u(Corr_{v,sl})$	-		1.00	% range	0.06	0.09	0.01
Atmospheric pressure	$u(Corr_{atmos})$	0	kPa	0.50	% range/2kP	0.00	0.00	0.00
Ambient temperature	$u(Corr_{temp})$	1	K	2.00	% range/10K	0.01	0.01	0.00
Electric voltage	$u(Corr_{volt})$	40	V	2.00	% range/10V	0.23	0.37	0.14
Interferents	$u(Corr_{int})$	-		3.50	% range	0.20	0.32	0.11
Losses & leakage	$u(Corr_{loss})$	-		0.70	% range	0.04	0.06	0.00
Repeatability at zero	$u(Corr_{z,rep})$	-		1.00	% range	0.06	0.09	0.01
Repeatability at span	$u(Corr_{s,rep})$	-		2.00	% range	0.12	0.19	0.03
Converter efficiency	$u(Corr_{conv})$	-		100.00	% reading	0.00	0.00	0.00
Response factor	$u(Corr_{resp})$	-		100.00	% reading	0.00	0.00	0.00
Calibration gas	$u(Corr_{ref})$	-		1.00	% value	0.06	0.10	0.01
Combined uncertainty	$u(C_{VOC})$							0.64
Expanded uncertainty	$U(C_{VOC})$							1.24
$U(C_{VOC})$:ELV (%)								6.22

Measured concentration of Volatile Organic Compounds at Cremator 6, run 3



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SCIENTIFICS MONITORING REPORT FORM
Oxygen to BS EN 14789:2005

Company	City of London	Date	13-Jan-10
Site	Crematorium	Test Ref	crem 6 (c)
Sample point	Cremator 6, run 3	Time Start	14:24
Test carried out by	S Huntley, T Swannack	Time End	15:24

Measurements: 5 minutes' averaging period

Start	End	No. Readings	Maximum	Minimum	Average	Maximum	Minimum	Average
			%, dry				% dry	
14:24	14:29	20	19.3	16.7	18.1	19.3	16.7	18.1
14:29	14:34	20	19.4	17.2	18.5	19.4	17.2	18.5
14:34	14:39	20	17.9	16.6	17.1	17.9	16.6	17.1
14:39	14:44	20	17.5	17.1	17.3	17.5	17.1	17.3
14:44	14:49	20	17.9	17.6	17.7	17.9	17.6	17.7
14:49	14:54	20	18.5	17.9	18.2	18.5	17.9	18.2
14:54	14:59	20	19.1	18.6	18.9	19.1	18.6	18.9
14:59	15:04	20	19.4	19.0	19.1	19.4	19.0	19.1
15:04	15:09	20	19.4	18.5	18.8	19.4	18.5	18.8
15:09	15:14	20	19.0	18.6	18.7	19.0	18.6	18.7
15:14	15:19	20	19.1	18.8	19.0	19.1	18.8	19.0
15:19	15:24	20	19.1	19.1	19.1	19.1	19.1	19.1
14:24	15:24	240	19.4	16.6	18.4	19.4	16.6	18.4

Summary of measurements

Average concentration	18.4 $\%O_2$, dry
Uncertainty	0.6 $\%O_2$, dry

Compliance with BS 15058:2006

No correction for drift applied (Clause 8.4.3)
Response time is within limit (Clause 7.2)
Uncertainty is within specified limit of 6% of measured concentration (Clause 1)

Calibration Checks

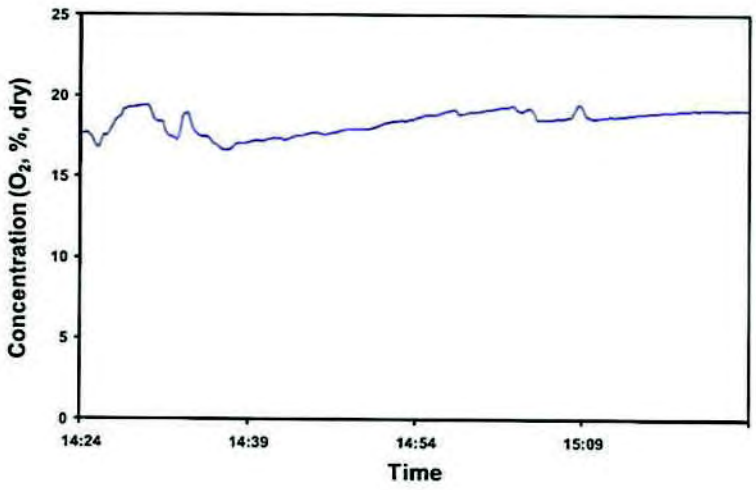
Type	Horiba PG 250	**Range**	0 to 25 %
Equipment No.	P1301		
Measurement method	Zirconium cell		

Calibration		Zero	Span
Gas reference		CH49	DG2
Concentration	%	0.00	13.10
		Analyser response	
Gas into analyser before sampling	%	0.00	13.10
Gas into system before sampling	%	0.00	13.15
Gas into system after sampling	%	0.10	13.18
Drift	% span	0.76	0.23
Response time	s	19	

Uncertainty budget

Quantity		Variation		Value		Partial uncertainty (x_{max})	x_{max}^2
						$\%O_2$	
Lack of fit	$u(Corr_{fit})$	-		2.00	% range	0.29	0.08
Zero drift	$u(Corr_{0,dr})$	-		0.11	% range	0.02	0.00
Span drift	$u(Corr_{s,dr})$	-		0.24	% range	0.03	0.00
Sample volume flow	$u(Corr_{v,d})$	-		0.00	% range	0.00	0.00
Atmospheric pressure	$u(Corr_{atmos})$	0	kPa	0.00	% range/2kP	0.00	0.00
Ambient temperature	$u(Corr_{temp})$	1	K	0.40	% range/10K	0.00	0.00
Electric voltage	$u(Corr_{el})$	40	V	0.00	% range/10V	0.00	0.00
Interferents	$u(Corr_{int})$	-		0.00	% range	0.00	0.00
Losses & leakage	$u(Corr_{loss})$	-		0.00	% range	0.00	0.00
Repeatability at zero	$u(Corr_{r,zer})$	-		0.00	% range	0.00	0.00
Repeatability at span	$u(Corr_{r,zer})$	-		0.00	% range	0.00	0.00
Converter efficiency	$u(Corr_{conv})$	-		100.00	% reading	0.00	0.00
Response factor	$u(Corr_{resp})$	-		100.00	% reading	0.00	0.00
Calibration gas	$u(Corr_{gas})$	-		1.00	% value	0.13	0.02
Combined uncertainty	$u(C_{O2})$						0.32
Expanded uncertainty	$U(C_{O2})$						0.62
$U(C_{O2}):C_{O2}(\%)$							3.38

Measured concentration of Oxygen at Cremator 6, run 3



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SCIENTIFICS MONITORING REPORT FORM
Carbon Dioxide to ISO 12039:2001

Company	City of London	Date	13-Jan-10
Site	Crematorium	Test Ref	crem 6 (c)
Sample point	Cremator 6, run 3	Time Start	14:24
Test carried out by	S Huntley, T Swannack	Time End	15:24

Measurements: 5 minutes' averaging period

Start	End	No. Readings	Maximum	Minimum	Average	Maximum	Minimum	Average
			%, dry			$\%CO_2$, ref. cond.		
14:24	14:29	20	3.6	1.4	2.3	8.5	7.2	8.1
14:29	14:34	20	3.0	1.2	2.0	8.3	7.9	8.1
14:34	14:39	20	3.5	2.5	3.1	8.1	8.0	8.1
14:39	14:44	20	3.1	2.9	3.0	8.4	8.1	8.2
14:44	14:49	20	2.8	2.5	2.7	8.5	8.4	8.4
14:49	14:54	20	2.6	2.0	2.3	8.5	8.3	8.4
14:54	14:59	20	1.9	1.3	1.6	8.3	6.8	7.9
14:59	15:04	20	1.3	1.0	1.1	6.8	6.1	6.5
15:04	15:09	20	1.4	0.8	1.2	6.1	5.5	5.7
15:09	15:14	20	1.3	1.1	1.2	5.6	5.2	5.4
15:14	15:19	20	1.1	0.9	1.0	5.2	4.8	5.0
15:19	15:24	20	0.9	0.8	0.9	4.8	4.7	4.7
14:24	15:24	240	3.6	0.8	1.9	8.5	4.7	7.1

Summary of measurements

Average concentration	7.1 $\%CO_2$
Uncertainty	1.2 $\%CO_2$

Compliance with BS 14792:2005

No correction for drift applied (BS EN 14789, Clause 8.4.3)
Response time is within limit (ISO 12039, Clause A.2)
Uncertainty is above specified limit of 6% of measured concentration (BS EN 14789, Clause 1) - non compliance

Calibration Checks

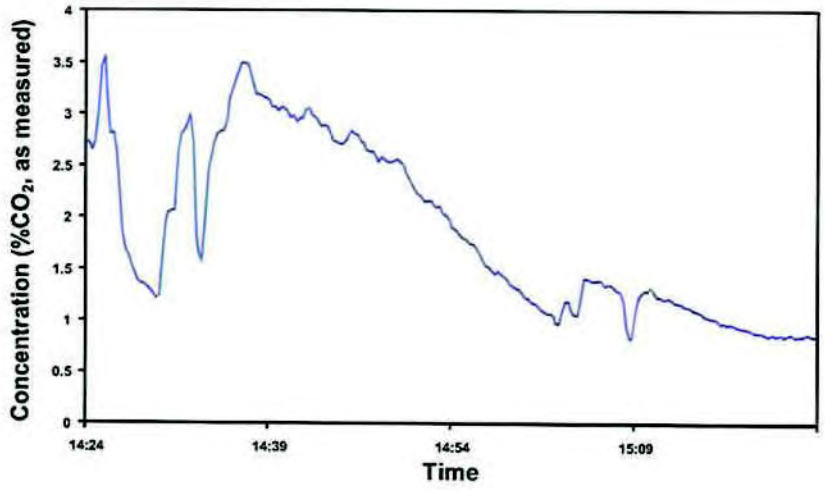
Type	Horiba PG 250	**Range**	0 to 10 %
Equipment No.	P1301		
Measurement method	Non-dispersive infra-red		

Calibration		Zero	Span
Gas reference		CH49	DG2
Concentration	%	0.00	5.08
		Analyser response	
Gas into analyser before sampling	%	0.00	5.09
Gas into system before sampling	%	0.08	5.15
Gas into system after sampling	%	0.15	5.19
Drift	% span	1.38	0.78
Response time	s	25	

Uncertainty budget

Quantity		Variation		Value		Partial uncertainty (x_{max})	x_{max}^2
						$\%CO_2$	
Lack of fit	$u(Corr_{fit})$	-		2.00	% range	0.12	0.01
Zero drift	$u(Corr_{0,dr})$	-		0.26	% range	0.02	0.00
Span drift	$u(Corr_{s,dr})$	-		0.29	% range	0.02	0.00
Sample volume flow	$u(Corr_{s,vf})$	-		0.00	% range	0.00	0.00
Atmospheric pressure	$u(Corr_{atmos})$	0	kPa	0.00	% range/2kP	0.00	0.00
Ambient temperature	$u(Corr_{temp})$	1	K	0.50	% range/10K	0.00	0.00
Electric voltage	$u(Corr_{ele})$	40	V	0.00	% range/10V	0.00	0.00
Interferents	$u(Corr_{int})$	-		1.60	% range	0.09	0.01
Losses & leakage	$u(Corr_{leak})$	-		0.00	% range	0.00	0.00
Repeatability at zero	$u(Corr_{z,rep})$	-		0.14	% range	0.01	0.00
Repeatability at span	$u(Corr_{s,rep})$	-		0.00	% range	0.00	0.00
Converter efficiency	$u(Corr_{conv})$	-		100.00	% reading	0.00	0.00
Response factor	$u(Corr_{resp})$	-		100.00	% reading	0.00	0.00
Calibration gas	$u(Corr_{wk})$	-		1.00	% value	0.05	0.00
Combined uncertainty	$u(C_{CO2})$						0.16
Expanded uncertainty	$U(C_{CO2})$						0.31
$U(C_{CO2})/C_{CO2}(\%)$							16.56

Measured concentration of Carbon Dioxide at Cremator 6, run 3



SCIENTIFICS MONITORING REPORT FORM
WATER VAPOUR DETERMINATION to BS EN 14790:2005

Company	City of London	Test Ref	crem 6 (c) h2o
Site	Crematorium	Date	13-Jan-10
Sample point	Cremator 6 run 3	Time start	14:18
Test carried out by	S Huntley & T Swanneck	Time End	15:23
		Duration (min)	65
		Data from	crem 6 (c)

Collection of water from gas

Collection Stage (ci)	Initial Mass(Mci$_i$) g	Final Mass (Mci$_f$) g	Mass gain (Mci) g
Container 1	776.63	783.56	6.93
Container 2	748.38	752.18	3.8
Container 3	507.44	508.21	0.77
Container 4	918.31	919.53	1.22
Total (M)	2950.76	2963.48	12.72

Mass of water collected (M) = Σ(Mc1$_f$-Mc1$_i$)....(Mci$_f$-Mci$_i$)

Calculation of dry gas sample volume at STP (SV_{STP})

SV_{STP} = $SV_m \times (273/(273 + T_m)) \times (P_m/101.3)$

Volume of dry gas sampled at STP (SV_{STP})	m^3	0.5155

Calculation of water vapour content (H_2O_{duct})

H_2O_{duct} = $100 \times (M \times MV_{STP}/MW_{H2O})/[SV_{STP} + (M \times MV_{STP}/MW_{H2O})]$

where:
MV_{STP} molecular volume at STP (22.412 m^3/kgmole)
MW_{H2O} molecular weight of water (18 kg/kgmole)

Water vapour content (H_2O_{duct})	%	2.98	±	0.15

Compliance with BS 14790

Uncertainty less than 20% of measured value (Clause 7.3)
Temperature at outlet is less than 4oC based on calculated dew point (Clause 6.4.2)
Leak rate is no more than 2% of sample flow rate
Sampling duration is within minimum of 30 minutes (Clause 6.1)
Sampling volume is within minimum of 50l (Clause 6.1)
Residual water content at outlet is below 1.25% (Clause 5.8)
Sampling temperature was within minimum of 120oC during sampling (Clause 5.2)

Uncertainty Budget (based on BS 14790 and Uncertainty Policy U25)

Volume of sampled gas	V	0.515 m^3
Average temperature of gas at meter	T	23.0 °C
Average barometric pressure at meter	P	986 mb
Sampling line leakage		0.000125 m^3/min
Duration of sampling	t	65 min
Total mass weighed	M	2963.48 g

Source of uncertainty		Value		Value of standard uncertainty		Relative standard uncertainty (%)	
Measurement of sample gas volume	u_iV_m	2.0 %	u_v	$u_{iv}V_m = \frac{V \times u_v}{\sqrt{3}}$	0.0060 m^3	u_iV_m	1.15
Measurement of sample gas temperature	u_iT_m	1.0 %	u_t	$u_{it}T_m = \frac{(u_t \times 273)}{\sqrt{3}}$	1.7090 K	u_iT_m	0.58
Measurement of absolute pressure	u_iP_m	1.0 %	u_p	$u_{ip}P_m = \frac{P_m \times u_p}{\sqrt{3}}$	5.6927 mb	u_iP_m	0.58
Leakage in sampling line	u_iL	1.0 %	u_l	$u_{il}L = \frac{V \times u_l}{\sqrt{3}}$	0.0047 m^3	u_iL	0.91
Measurement of weight - balance uncertainty	u_iW_m	0.01 %	u_{bwm}	$u_{iw}W_m = \frac{W \times u_{bwm}}{\sqrt{3}}$	0.1711 g		-
Measurement of weight - balance repeatability	u_iW_r	0.011 g	u_{wr}	$u_{ir}W_r = \frac{u_{wr}}{\sqrt{3}}$	0.0110 g		-
Total measurement of weight	u_iW	-	-	u_iW =	0.1821 g	u_iW	1.43

Total standard relative uncertainty	$u_c = \sqrt{u_iV_m^2 + u_iT_m^2 + u_iP_m^2 + u_iL^2 + u_iW^2 + Corr.}$	2.50 %
Total relative uncertainty	$U_r = 1.96u_c$	4.90 %

SCIENTIFICS MONITORING REPORT FORM
PITOT TRAVERSE (BS EN 13284-1)

Company	City of London	Date	05-Jan-10
Site	Crematorium	Test Ref	crem 7 flow
Sample point	Cremator 7	Time Start	11:45
Test carried out by	S Huntley & T Swannack	Time End	11:55

SAMPLING PLANE GEOMETRY

Geometry of duct		Rectangular
Dimension traversed by sampling probe (D)	m	0.42
Other dimension (if applicable)	m	0.4200
Cross sectional area of sampling plane (A)	m^2	0.1764

MOLECULAR WEIGHT & DENSITY DETERMINATION

Duct gas conditions

Ambient temperature (T_a)	°C	9.00
Duct static gas pressure	kPa	-0.05
Average duct gas temperature (T_{duct})	°C	327.05
Barometric pressure (P_m)	kPa	98.60

Calculation of molecular weight from assumed gas composition

Gas	Vol% Dry gas	Vol% Wet gas	Dry Mol Wt g/gmole	Wet Mol Wt g/gmole
CO_2	2.70	2.60	1.19	1.15
O_2	17.10	16.48	5.47	5.28
CO	0.20	0.19	0.06	0.05
N_2	80.00	77.12	22.40	21.59
H_2O	------	3.60	------	0.65
		Total	29.12	28.72

Calculation of dry and wet gas density from molecular weight results

Dry density	kg/m^3	1.30	At STP
Wet density	kg/m^3	1.28	(0°C & 101.3 kPa)
Dry density	kg/m^3	0.58	At Duct Conditions
Wet density (ρ_a)	kg/m^3	0.57	(see above)
Wet specific gravity (sg)		0.99	

CALCULATION OF NOZZLE SIZE & K FACTOR

Exhaust & sample gas conditions

Desired sampling rate at orifice (SR_o)	10 l/min	0.353 ft^3/min
Expected meter outlet temperature (T_m)	50 °C	

(guide is a sampling rate of 0.75 ft^3/min or 21.2 l/min at the orifice)

Conditions at nozzle		Conditions at orifice/meter	
Sampling rate (SR_n)	19.28 l/min	Sampling rate (SR_o)	10.00 l/min
Temperature (T_{duct})	327.05 °C	Temperature (T_a)	50.00 °C
Pressure (P_{duct})	98.55 kPa	Pressure (P_m)	98.60 kPa
Water vapour (H_2O_{duct})	3.60 %	Water vapour (H_2O_m)	0 %
Molecular weight (M_{duct})	28.72	Molecular weight (M_m)	29.12

Orifice Parameters

Orifice plate coefficient ($\Delta H_@$)	2.1935 " w.g.

Determination of nozzle diameter

based on isokinetic sampling and the average gas velocity

$D_{nr} = 2000 \times \sqrt{[SR_n / V_{duct} \times \pi \times 60000]}$

where D_{nr} is the recommended nozzle diameter (mm)

Recommended nozzle diameter (D_{nr}	=	6.306	mm
Diameter of nozzle selected (D_n)	=	6.28	mm

Determination of K Factor

based on preliminary exhaust gas conditions

K Factor is a proportionality factor relating the pressure drop measured with the Pitot tube in the duct (h) with the corresponding pressure drop at the orifice (ΔH), i.e.

$\Delta H = K * h$

$K = 8.038 \times 10^{-5} \times C_p^2 \times \Delta H_@ \times D_n^4 \times (M_m/M_{duct}) \times [(100-H_2O_{duct})/(100-H_2O_m)]^2 . (T_m+273/T_{duct}+273).(P_{duct}/P_m)$

where $\Delta H_@$ is the orifice plate coefficient (mm w.g.)

K Factor	=	*3.5312*
K Factor$_1$ (independent of C_p)	=	3.5312

SCIENTIFICS MONITORING REPORT FORM
TOTAL PARTICULATE MATTER to BS EN 13284-1/BS ISO 9096

Company	City of London	Test Ref	crem 7
Site	Crematorium		
Sample point	Cremator 7 run 1		
Test carried out by	S Huntley & T Swannack		

SAMPLING TIMES

Determination		tpm
Date		05-Jan-10
Time Start		12:00
Time End		13:40
Duration (t)	min	100

Sampling plane

Dimension traversed by sampling probe (D)	m	0.42
Cross sectional area of sampling plane (A)	m^2	0.18

Duct gas conditions

Determination		tpm
Ambient temperature (T_{Amb})	°C	9.0
Average duct gas temperature (T_{duct})	°C	324.4
Duct static gas pressure (P_{Static})	kPa	-0.05
Barometric pressure (P_{Baro})	kPa	98.60
Volume flow rate @ ref. conditions (Q_{Ref})	m^3/s	0.21
Gas compressibility correction (ε)		0.995
Wet gas density (ρ_w)		0.57
Exhaust gas conditions measurements		crem 7

Reference conditions

Determination		tpm
Actual Duct Flow Conditions		
Average temperature (T_{duct})	°C	324.4
Total pressure (P_{duct})	kPa	98.55
Oxygen (O_{2duct})	% vol,dry	18.10
Water vapour (H_2O_{duct})	% vol	4.87
Reference Conditions		
Temperature (T_{Ref})	°C	0
Pressure (P_{Ref})	kPa	101.3
Oxygen (O_{2Ref})	% vol, dry	11
Water vapour (H_2O_{Ref})	% vol	0

Sampling conditions

Determination				tpm
Nozzle diameter (d)	TI24	Titanium	mm	6.280
Initial gas meter reading			m^3	621.870
Final gas meter reading			m^3	622.948
Sampled volume (SV_M)			m^3	1.078

Calculation of sample gas volume at reference conditions, SV_{Ref}

$$SV_{Ref} = SV_{Meter} \times Y \times \frac{[273 + T_{Ref}]}{[273 + T_{Meter}]} \times \frac{P_{Baro}}{P_{Ref}} \times \frac{[100 - H_2O_{Meter}]}{[100 - H_2O_{Ref}]} \times \frac{[20.9 - O_{2Duct}]}{[20.9 - O_{2Ref}]}$$

Corrections
Temperature
Pressure
Water vapour
Oxygen

Determination		tpm
Sampled volume @ ref. conditions (SV_{Ref})	m^3	0.233

SAMPLING DATA tpm — Test Ref crem 7

Initial gas meter reading: 621870 l — Start Time: 12:00

Distance from Duct Wall Fraction of D	Port	Time of Day h:mm	Run time mm	Gas meter reading l	Pitot Reading (h) mm w.g.	Orifice ΔH mm w.g. Desired (ΔH_d) m x K_1 x Cp^2	Orifice ΔH mm w.g. Actual (ΔH_a)	Isokinetic difference ($\Delta H_a/\Delta H_d$) %	Temperatures: Gas (T_{duct}) °C	Probe (T_p) °C	Filter (T_f) °C	Meter (T_m) Inlet °C	Meter (T_m) Outlet °C	Impinger (T_{imp}) °C	Oxygen Content % v/v, dry
0.500	A	12:00	0	621870	8	19.93	18.4	92	325	156	155	48.0		11	
		12:05	5	621954	4.8	11.96	11	92	324	158	156	58.0		12	
		12:10	10	622018	8.2	20.43	19	93	326	160	160	51.0		14	
		12:15	15	622070	4.5	11.21	10.4	93	325	160	160	51.0		14	
		12:20	20	622125	7.2	17.94	16.6	93	325	160	160	51.0		15	
		12:25	25	622193	3.1	7.72	7.1	92	325	160	160	51.0		17	
		12:30	30	622238	7.2	17.94	16.6	93	325	160	160	51.0		18	
		12:35	35	622314	2.3	5.73	5.3	92	325	160	160	58.0		19	
		12:40	40	622354	5	12.46	11.5	92	327	160	160	51.0		9	
		12:45	45	622419	2.2	5.48	5	91	324	160	160	51.0		9	
		12:50	50	622462	2.1	5.23	4.9	94	326	160	160	51.0		11	
		12:55	55	622498	4.4	10.96	10.1	92	323	160	160	51.0		12	
		13:00	60	622542	4.1	10.22	9.4	92	324	160	160	51.0		14	
		13:05	65	622597	3.5	8.72	8.1	93	325	160	160	58.0		15	
		13:10	70	622656	3.2	7.97	7.4	93	327	160	160	58.0		15	
		13:15	75	622712	2.6	6.98	6.5	93	326	160	160	58.0		17	
		13:20	80	622738	4.1	10.22	9.4	92	323	160	160	58.0		9	
		13:25	85	622809	4	9.97	9.2	92	321	160	160	58.0		9	
		13:30	90	622867	2.7	6.73	6.2	92	320	160	160	58.0		11	
		13:35	95	622913	1.4	3.49	3.2	92	322	160	160	58.0		12	
		13:40	100	622948											
	Averages								324.4	159.7	159.6	56.4		13.2	n.m

Final gas meter reading: 622948 l — End Time: 13:40

Equipment used

Item	File No.
Control box	P1302
Meter coefficient (γ)	0.926
K factor, (K_1, independent of C_p)	3.531
Orifice plate pressure units	mm w.g.
Pitot differential pressure units	mm w.g.
Pitot	S
Pitot coefficient (C_p)	0.84
Probe liner thermocouple Titanium	P1007
Duct gas thermocouple	P1611
Oven thermocouple	P1395
Impinger exit thermocouple	P1333
Timer	P1187

Leak check

		Start	End
Start Time		11:52	13:42
End Time		11:54	13:44
Initial meter reading	m^3	621.8896	622.9481
Final meter reading	m^3	621.8899	622.9484
Duration of leak test	min	2	2
Pump vacuum	"Hg	-15	-15
Leak rate	l/min	0.15	0.15
Less than 2% of normal sampling rate?		Yes	Yes

Approach to isokinetic sampling

Average gas velocity (V_{duct})	9.9 m/s
Nozzle diameter (D_n)	6.280 mm
Sampling time (t)	100 min
Theoretical isokinetic sample volume SV_t	1832.44 l
Actual sample volume (SV_a)	1939.60 l
Approach to isokinetic sampling (Δ)	105.8 %

where: Vduct is the average duct velocity based on the above measurements

$V_{duct} = C_p \times (1-\tau) \times \sqrt{2/\rho_s} \times \sqrt{h}$ (Reference BS 1042:Section 2.1:1983 (ISO 3966), pages 8&9)

SV_t is the theoretical isokinetic sample volume based on V_{duct} & D_n

$SV_t = V_{duct} \times \pi \times [D_n/2000]^2 \times t \times 60 \times 1000$

SV_a is the sample volume at duct conditions

$SV_a = SV_m \times \gamma \times [(273 + T_{duct})/(273 + T_m)] \times (P_{bar}/P_{duct}) \times [(100 - H_2O_{duct})/(100-H_2O_{duct})]$

Determination of exhaust gas flow rate

based on measurements at sample points only

Flow rate at duct conditions (Q_{duct})	1.74 m^3/s
Flow rate at STP (Q_{STP})	0.77 m^3/s
Flow rate at reference conditions (Q_{ref})	0.21 m^3/s

where:

$Q_{duct} = V_{duct} \times A$

$Q_{STP} = Q_{duct} \times [(T_{duct} + 273)/(T_{duct} + 273)] \times (P_{duct}/P_{std})$

$Q_{ref} = Q_{STP} \times [(20.9-O_{2duct})/(20.9-O_{2ref})] \times [(100-H_2O_{duct})/(100-H_2O_{ref})]$

PARTICULATE WEIGHINGS

Test Ref crem 7

Filters

Determination		Method Blank	Field Blank	tpm
Filter No.		0	012446	012443
Pre-sampling conditioning temperature (±5°C)	°C	180	180	180
Post-sampling conditioning temperature (±5°C)	°C	160	160	160
Diameter	mm	110	110	110
Material		Quartz	Quartz	Quartz
Pre-sampling weights				
after 1 min	g		0.7349	0.7394
after 2 min	g		0.7350	0.7394
after 3 min	g		0.7350	0.7394
Weight extrapolated to zero time (M_{fi0})	g		0.7349	0.7394
Post-sampling weights				
after 1 min	g		0.7346	0.7799
after 2 min	g		0.7346	0.7799
after 3 min	g		0.7346	0.7800
Weight extrapolated to zero time (M_{ff0})	g		0.7346	0.7798

Rinsings

Pre-sampling conditioning temperature (±5°C)	°C	180	180	180
Post-sampling conditioning temperature (±5°C)	°C	160	160	160
Pre-sampling weights (container only)				
after 1 min	g		64.8242	72.3952
after 2 min	g		64.8241	72.3952
after 3 min	g		64.8240	72.3951
Weight extrapolated to zero time (M_{ri0})	g		64.8243	72.3953
Post-sampling weights (container and evaporated rinsings)				
after 1 min	g		64.8241	72.4087
after 2 min	g		64.8241	72.4086
after 3 min	g		64.8240	72.4086
Weight extrapolated to zero time (M_{rf0})	g		64.8242	72.4087

Summary

Determination		Method Blank (M_{rmb})	Field Blank	tpm
Mass collected on filter ($M_f = (M_{ff0} - M_{fi0} - M_{fmb})$)	g	0.0000	-0.0003	0.0404
Mass collected in rinsings ($M_r = (M_{rf0} - M_{ri0} - M_{rmb})$)	g	0.0000	-0.0001	0.0135
Total mass collected ($M = M_f + M_r$)	g	0.0000	0.0000	0.0539

Uncertainty Calculation Parameters

Standard uncertainty for gas volume measurement (U6)	2.9 %
Standard uncertainty for filter weighing (U17)	0.57 mg
Standard uncertainty for washings weighing (U17)	0.50 mg
Limit of detection for filter weighing (U17)	0.50 mg
Limit of detecion for washings weighing (U17)	0.50 mg
Standard uncertainty for oxygen correction (U11)	0.95 %
Standard uncertainty for gas flow measurement (U14)	5.7 %

Emission Limit Value

Emission limit value (ELV) at reference conditions	80 mg/m^3

SUMMARY OF MEASUREMENTS

Test Ref crem 7

Calculation of Particulate Concentration and Discharge Rate

Particulate concentration (C), mg/m^3 = M x 1000/ SV_{Ref}

Discharge rate, kg/h = C x Q_{Ref} x 0.0036

Determination		Field Blank	tpm
Particulate concentration at reference conditions	mg/m^3	0.00	231.73
Uncertainty	mg/m^3	0.00	14.64
Particulate concentration at duct conditions (raw)	mg/m^3	0.00	27.79
Particulate discharge rate	kg/h	0.00	0.17
Uncertainty	kg/h	#DIV/0!	0.02

Note: Field blank results based on average sampling conditions

Uncertainty budget

Uncertainties		Field Blank	tpm
Volume measurement (m_{vol})	mg	0.00	1.56
Filter weighings (m_f)	mg	-0.27	0.57
Rinsings weighings (m_w)	mg	-0.13	0.50
Total for uncorrected measurement (U_u)	mg	0.30	1.74
Correction to reference conditions (m_{corr})	mg	0.00	0.00
Total for corrected measurement (U_c)	mg	0.30	1.74
Concentration at 95% confidence interval (U_{95c})	mg/m^3	0.00	14.64

Based on Procedure 55 and Uncertainty Policies 11 & 17
(in accordance with requirements of BS EN ISO 14956:2002 and ENV 13005 (GUM))

$U_u = \sqrt{m_{vol}^2 + m_f^2 + m_w^2}$

$U_c = \sqrt{U_u^2 + m_{corr}^2}$

$U_{95c} = 1.96 \times U_c / SV_{Ref}$

COMPLIANCE WITH BS EN 13284-1:2002/BS ISO 9096 CONDITIONS

Flow conditions (BS EN 13284-1, 5.2 & BS ISO 9096, 5.3)

Standard	ISO 9096
Angle of gas flow less than 15°	Yes
No local negative gas flow	Yes
Minimum differential pressure greater than 5 Pa	Yes
Ratio of highest to lowest local gas velocites less than 3:1	No

Compliance with BS ISO 9096

Blank value is less than 10% of ELV (Table 3)
Nozzle diameter greater than 4 mm (Clause 6.2.2)
Average sampling rate was within -5% and +15% of isokinetic conditions (Clause 7.3.5)
Leak rate is within 2% of sample rate (Clause 7.3.5)
Blank value is less than 2 mg/m3 (Table 3)

SCIENTIFICS MONITORING REPORT FORM
Hydrogen chloride to BS EN 1911

Company	City of London	Test Ref	HCl
Site	Crematorium	Date	05-Jan-10
Sample point	Cremator 7 run 1	Time start	12:00
Test carried out by	S Huntley & T Swannack	Time End	13:40
Determinand	Hydrogen chloride to BS EN 1911	Duration (min)	100
		Sampling conditions	crem 7

ANALYSIS OF COLLECTED SOLUTIONS

Determination		HCl
Volume of sampling solution in first stage (Vs1)	ml	575
Volume of sampling solution in field blank (Vsb)	ml	190
Chloride detection limit in sampling solution (qd)	mg/l	0.10
Chloride in first stage sampling solution (qs1)	mg/l	35.10
Chloride in field blank sampling solution (qcb)	mg/l	0.00
Emission limit value (ELV, daily)	mg/m³	200

Calculation of hydrogen chloride concentration in duct gas, Cg

C_g (mg/m³) = $(([V_{s1} \times q_{s1}]+[V_{s2} \times q_{s2}]) \times MW_c).(V_{mstd} \times MW_{cl} \times N_a)$

where MWc is the molecular weight of hydrogen chloride (i.e. 36.5 kg/kgmole)
MWcl is the molecular weight of the chloride ion (i.e. 35.5 kg/kgmole)
Na is the number of chloride ions in hydrogen chloride (i.e. 1)

Calculation of hydrogen chloride discharge rate, Dg

$D_g = C_g \times Q_{std} \times 0.0036$

MEASUREMENTS OF HYDROGEN CHLORIDE

Determination		HCl
Concentration at reference conditions (C_g)	mg/m³	89.22
Uncertainty (95% confidence limit)	mg/m³	10.26
Uncertainty as a proportion of ELV	%	5.13
Discharge rate (D_g)	kg/h	0.067
Uncertainty (95% confidence limit)	kg/h	0.011
Detection limit	mg/m³	0.254

FIELD BLANK

Determination		HCl
Field blank concentration*	mg/m³	0.00
Field blank as a proportion of ELV	±%	0.0

*assuming same sample volume as for sample

Uncertainty Calculation Parameters

Standard uncertainty for gas volume measurement (U6)	2.9 %
Standard uncertainty for liquid volume measurement (U16)	1 %
Analytical uncertainty at X times LOD (U15)	5 %
X (U15)	10
Standard uncertainty for oxygen correction (U11)	0.95 %
Standard uncertainty for gas flow measurement (U14)	5.7 %

Uncertainty budget

Uncertainties		HCl
Sample gas volume measurement (m_{vol})	%	2.9
Solution volume measurement (m_{sol})	%	1.0
Analysis of washings (m_w)	%	5.0
Total for uncorrected measurement (U_u)	mg/m³	5.23
Correction to reference conditions (m_{corr})	mg/m³	0.00
Concentration at 95% confidence interval (U_{95c})	mg/m³	10.257

Based on Procedure 55 and Uncertainty Policies 11 & 16
(in accordance with requirements of BS EN ISO 14956:2002 and ENV 13005 (GUM))

COMPLIANCE WITH STANDARD

Probe temperature is at least 150C (Clause 6.2)
Leak rate less than 2% of sample rate (Clause 1-8.2)
Sampling within 10% of isokinetic conditions (Clause 1-5.1.5)
Sample concentration is greater than 10 times field blank (3-4.2.1)
Field blank concentration is less than 10% of ELV (not normative)
Measurement uncertainty is less than 20% of ELV (not normative)

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SCIENTIFICS MONITORING REPORT FORM
Carbon Monoxide to BS EN 15058:2006

Company	City of London	Date	5-Jan-10
Site	Crematorium	Test Ref	CREM 7
Sample point	Cremator 7, run 1	Time Start	12:06
Test carried out by	S Huntley & T Swannack	Time End	13:46

Measurements: 5 minutes' averaging period

Start	End	No. Readings	Maximum	Minimum	Average	Maximum	Minimum	Average
			ppm , dry			$mgCO/m^3$, ref. cond.		
12:06	12:11	20	10	<5	6	45	17	27
12:11	12:16	20	9	<5	<5	39	<5	19
12:16	12:21	20	7	<5	<5	33	13	19
12:21	12:26	20	8	<5	6	35	16	24
12:26	12:31	20	10	<5	<5	43	12	20
12:31	12:36	20	8	<5	<5	34	14	21
12:36	12:41	20	6	<5	<5	26	11	17
12:41	12:46	20	6	<5	<5	24	12	16
12:46	12:51	20	<5	<5	<5	22	12	17
12:51	12:56	20	5	<5	<5	23	12	16
12:56	13:01	20	<5	<5	<5	12	6	9
13:01	13:06	20	6	<5	<5	25	5	11
13:06	13:11	20	14	<5	9	62	17	42
13:11	13:16	20	225	7	58	994	29	256
13:16	13:21	20	17	5	11	75	23	48
13:21	13:26	20	12	<5	8	55	21	34
13:26	13:31	20	9	<5	<5	38	15	22
13:31	13:36	20	10	<5	7	43	17	31
13:36	13:41	20	27	9	15	119	41	66
13:41	13:46	20	74	25	49	328	109	219
12:06	13:46	400	225	<5	11	994	<5	47

Summary of measurements

Average concentration	46.6 $mgCO/m^3$
Uncertainty	7.4 $mgCO/m^3$
Discharge rate	0.035 kgCO/h

Compliance with BS 15058:2006

No correction for drift applied (Clause 8.4.3)
Response time is within limit (Clause 7.2)
Uncertainty is within specified limit of 6% of ELV (Clause 7.3)

Calibration Checks

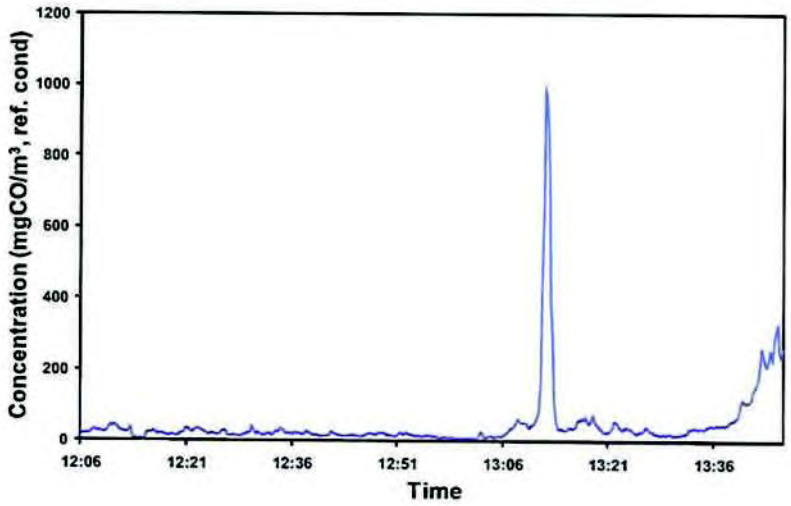
Type Horiba PG 250 **Range** 0 to 50 ppm
Equipment No. P1301
Measurement method Non-dispersive infra-red

Calibration		Zero	Span
Gas reference		CH49	DG2
Concentration	ppm	0.00	25.12
		Analyser response	
Gas into analyser before sampling	ppm	0.00	25.10
Gas into system before sampling	ppm	0.30	25.15
Gas into system after sampling	ppm	0.40	25.20
Drift	% span	0.40	0.20
Response time	s	22	

Uncertainty budget

Quantity		Variation		Value		Partial uncertainty (x_{imp})		x_{imp}^2
						ppm CO	mgCO/m³	
Lack of fit	$u(Corr_{fit})$	-		2.00	% range	0.58	0.72	0.52
Zero drift	$u(Corr_{0,dr})$	-		0.26	% range	0.08	0.09	0.01
Span drift	$u(Corr_{s,dr})$	-		0.29	% range	0.08	0.10	0.01
Sample volume flow	$u(Corr_{s,d})$	-		0.00	% range	0.00	0.00	0.00
Atmospheric pressure	$u(Corr_{atmosc})$	0	kPa	0.00	% range/2kP	0.00	0.00	0.00
Ambient temperature	$u(Corr_{temp})$	2	K	0.50	% range/10K	0.01	0.02	0.00
Electric voltage	$u(Corr_{el})$	40	V	0.00	% range/10V	0.00	0.00	0.00
Interferents	$u(Corr_{int})$	-		1.60	% range	0.46	0.58	0.33
Losses & leakage	$u(Corr_{leak})$	-		0.00	% range	0.00	0.00	0.00
Repeatability at zero	$u(Corr_{z,rep})$	-		0.14	% range	0.04	0.05	0.00
Repeatability at span	$u(Corr_{s,rep})$	-		0.00	% range	0.00	0.00	0.00
Converter efficiency	$u(Corr_{conv})$	-		100.00	% reading	0.00	0.00	0.00
Response factor	$u(Corr_{resp})$	-		100.00	% reading	0.00	0.00	0.00
Calibration gas	$u(Corr_{std})$	-		1.00	% value	0.40	0.50	0.25
Combined uncertainty	$u(C_{CO})$							1.06
Expanded uncertainty	$U(C_{CO})$							2.08
$U(C_{CO})$:ELV (%)								2.08

Measured concentration of Carbon Monoxide at Cremator 7, run 1



SCIENTIFICS MONITORING REPORT FORM
Oxygen to BS EN 14789:2005

Company	City of London	Date	5-Jan-10
Site	Crematorium	Test Ref	CREM 7
Sample point	Cremator 7, run 1	Time Start	12:06
Test carried out by	S Huntley & T Swannack	Time End	13:46

Measurements: 5 minutes' averaging period

Start	End	No. Readings	Maximum	Minimum	Average	Maximum	Minimum	Average
			%, dry			% dry		
12:06	12:11	20	17.9	16.9	17.5	17.9	16.9	17.5
12:11	12:16	20	20.9	16.8	18.8	20.9	16.8	18.8
12:16	12:21	20	17.7	17.2	17.4	17.7	17.2	17.4
12:21	12:26	20	18.2	16.8	17.4	18.2	16.8	17.4
12:26	12:31	20	20.9	17.3	19.4	20.9	17.3	19.4
12:31	12:36	20	17.7	16.8	17.3	17.7	16.8	17.3
12:36	12:41	20	17.4	16.9	17.1	17.4	16.9	17.1
12:41	12:46	20	17.4	16.6	17.0	17.4	16.6	17.0
12:46	12:51	20	17.8	16.9	17.3	17.8	16.9	17.3
12:51	12:56	20	20.9	17.0	17.4	20.9	17.0	17.4
12:56	13:01	20	20.9	20.9	20.9	20.9	20.9	20.9
13:01	13:06	20	20.9	17.6	19.1	20.9	17.6	19.1
13:06	13:11	20	18.9	18.0	18.3	18.9	18.0	18.3
13:11	13:16	20	19.1	18.3	18.5	19.1	18.3	18.5
13:16	13:21	20	18.8	17.9	18.3	18.8	17.9	18.3
13:21	13:26	20	18.8	18.1	18.2	18.8	18.1	18.2
13:26	13:31	20	18.4	18.2	18.3	18.4	18.2	18.3
13:31	13:36	20	18.4	17.5	17.8	18.4	17.5	17.8
13:36	13:41	20	19.2	17.5	17.8	19.2	17.5	17.8
13:41	13:46	20	17.6	17.5	17.6	17.6	17.5	17.6
12:06	13:46	400	20.9	16.6	18.1	20.9	16.6	18.1

Summary of measurements

Average concentration	18.1 $\%O_2$, dry
Uncertainty	0.6 $\%O_2$, dry

Compliance with BS 15058:2006

No correction for drift applied (Clause 8.4.3)
Response time is within limit (Clause 7.2)
Uncertainty is within specified limit of 6% of measured concentration (Clause 1)

Calibration Checks

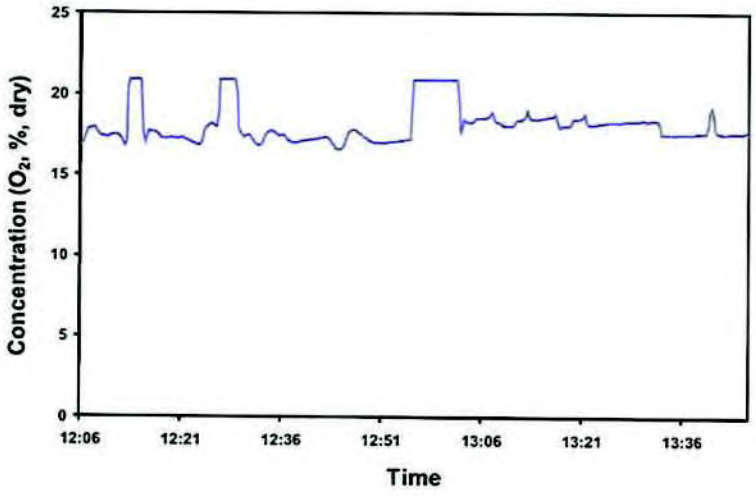
Type	Horiba PG 250	**Range**	0 to 25 %
Equipment No.	P1301		
Measurement method	Zirconium cell		

Calibration		Zero	Span
Gas reference		CH49	DG2
Concentration	%	0.00	13.10
		Analyser response	
Gas into analyser before sampling	%	0.00	13.10
Gas into system before sampling	%	0.00	13.10
Gas into system after sampling	%	0.10	13.20
Drift	% span	0.76	0.76
Response time	s	19	

Uncertainty budget

Quantity		Variation		Value		Partial uncertainty (x_{imax})	x_{imax}^2
						%O_2	
Lack of fit	$u(Corr_{fit})$	-		2.00	% range	0.29	0.08
Zero drift	$u(Corr_{Azr})$	-		0.11	% range	0.02	0.00
Span drift	$u(Corr_{Asr})$	-		0.24	% range	0.03	0.00
Sample volume flow	$u(Corr_{v,d})$	-		0.00	% range	0.00	0.00
Atmospheric pressure	$u(Corr_{atmos})$	0	kPa	0.00	% range/2kP	0.00	0.00
Ambient temperature	$u(Corr_{temp})$	2	K	0.40	% range/10K	0.01	0.00
Electric voltage	$u(Corr_{volt})$	40	V	0.00	% range/10V	0.00	0.00
Interferents	$u(Corr_{int})$	-		0.00	% range	0.00	0.00
Losses & leakage	$u(Corr_{leak})$	-		0.00	% range	0.00	0.00
Repeatability at zero	$u(Corr_{z,rep})$	-		0.00	% range	0.00	0.00
Repeatability at span	$u(Corr_{s,rep})$	-		0.00	% range	0.00	0.00
Converter efficiency	$u(Corr_{conv})$	-		100.00	% reading	0.00	0.00
Response factor	$u(Corr_{resp})$	-		100.00	% reading	0.00	0.00
Calibration gas	$u(Corr_{ref})$	-		1.00	% value	0.13	0.02
Combined uncertainty	$u(C_{CO})$						0.32
Expanded uncertainty	$U(C_{CO})$						0.62
$U(C_{CO}):C_{CO}(\%)$							3.44

Measured concentration of Oxygen at Cremator 7, run 1



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SCIENTIFICS MONITORING REPORT FORM
Carbon Dioxide to ISO 12039:2001

Company	City of London	Date	5-Jan-10
Site	Crematorium	Test Ref	CREM 7
Sample point	Cremator 7, run 1	Time Start	12:06
Test carried out by	S Huntley & T Swannack	Time End	13:46

Measurements: 5 minutes' averaging period

Start	End	No. Readings	Maximum	Minimum	Average	Maximum	Minimum	Average
			%, dry			$\%CO_2$, ref. cond.		
12:06	12:11	20	3.3	2.4	2.8	11.5	8.6	9.8
12:11	12:16	20	3.3	<0.1	1.6	11.5	0.1	5.8
12:16	12:21	20	2.9	2.5	2.8	10.2	8.9	9.8
12:21	12:26	20	3.2	2.1	2.8	11.2	7.4	9.7
12:26	12:31	20	2.8	<0.1	1.2	10.0	0.1	4.1
12:31	12:36	20	3.2	2.5	2.8	11.1	8.7	9.8
12:36	12:41	20	3.0	2.7	2.9	10.7	9.5	10.2
12:41	12:46	20	3.3	2.6	2.9	11.5	9.4	10.4
12:46	12:51	20	3.0	2.3	2.7	10.5	8.3	9.5
12:51	12:56	20	3.0	<0.1	2.6	10.4	0.3	9.3
12:56	13:01	20	<0.1	<0.1	<0.1	0.2	0.1	0.1
13:01	13:06	20	2.5	<0.1	1.3	8.8	0.1	4.6
13:06	13:11	20	2.0	1.5	1.8	7.2	5.2	6.5
13:11	13:16	20	1.9	1.3	1.7	6.6	4.7	6.0
13:16	13:21	20	2.0	1.5	1.7	6.9	5.2	6.2
13:21	13:26	20	1.9	1.4	1.8	6.6	5.1	6.3
13:26	13:31	20	1.7	1.6	1.7	6.1	5.8	6.0
13:31	13:36	20	2.2	1.6	2.0	7.8	5.8	7.1
13:36	13:41	20	2.2	1.1	2.0	7.7	4.1	7.0
13:41	13:46	20	2.1	2.1	2.1	7.6	7.3	7.4
12:06	13:46	400	3.3	<0.1	2.1	11.5	0.1	7.3

Summary of measurements

Average concentration	7.3 $\%CO_2$
Uncertainty	1.1 $\%CO_2$

Compliance with BS 14792:2005

No correction for drift applied (BS EN 14789, Clause 8.4.3)
Response time is within limit (ISO 12039, Clause A.2)
Uncertainty is above specified limit of 6% of measured concentration (BS EN 14789, Clause 1) - non compliance

Calibration Checks

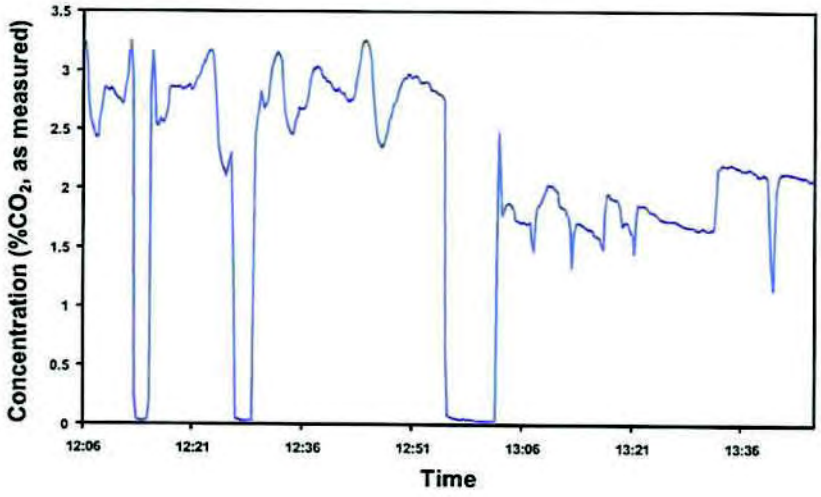
Type	Horiba PG 250	**Range**	0 to 10 %
Equipment No.	P1301		
Measurement method	Non-dispersive infra-red		

Calibration		Zero	Span
Gas reference		CH49	DG2
Concentration	%	0.00	5.08
		Analyser response	
Gas into analyser before sampling	%	0.00	5.09
Gas into system before sampling	%	0.08	5.10
Gas into system after sampling	%	0.15	5.15
Drift	% span	1.38	0.98
Response time	s	25	

Uncertainty budget

Quantity		Variation		Value		Partial uncertainty (x_{imax})	x_{imax}^2
						$\%CO_2$	
Lack of fit	$u(Corr_{fit})$	-		2.00	% range	0.12	0.01
Zero drift	$u(Corr_{0,dr})$	-		0.26	% range	0.02	0.00
Span drift	$u(Corr_{s,dr})$	-		0.29	% range	0.02	0.00
Sample volume flow	$u(Corr_{v,d})$	-		0.00	% range	0.00	0.00
Atmospheric pressure	$u(Corr_{atmos})$	0	kPa	0.00	% range/2kP	0.00	0.00
Ambient temperature	$u(Corr_{temp})$	2	K	0.50	% range/10K	0.00	0.00
Electric voltage	$u(Corr_{volt})$	40	V	0.00	% range/10V	0.00	0.00
Interferents	$u(Corr_{int})$	-		1.60	% range	0.09	0.01
Losses & leakage	$u(Corr_{leak})$	-		0.00	% range	0.00	0.00
Repeatability at zero	$u(Corr_{r,rep})$	-		0.14	% range	0.01	0.00
Repeatability at span	$u(Corr_{s,rep})$	-		0.00	% range	0.00	0.00
Converter efficiency	$u(Corr_{conv})$	-		100.00	% reading	0.00	0.00
Response factor	$u(Corr_{resp})$	-		100.00	% reading	0.00	0.00
Calibration gas	$u(Corr_{gc})$	-		1.00	% value	0.05	0.00
Combined uncertainty	$u(C_{CO2})$						0.16
Expanded uncertainty	$U(C_{CO2})$						0.31
$U(C_{CO2})/C_{CO2}(\%)$							15.04

Measured concentration of Carbon Dioxide at Cremator 7, run 1



SCIENTIFICS MONITORING REPORT FORM
WATER VAPOUR DETERMINATION to BS EN 14790:2005

Company	City of London	Test Ref	crem 7(a) h2o
Site	Crematorium	Date	05-Jan-10
Sample point	Cremator 7 run 1	Time start	12:00
Test carried out by	S Huntley & T Swannack	Time End	13:40
		Duration (min)	100
		Data from	crem 7

Collection of water from gas

Collection Stage (ci)	Initial Mass(Mci_i) g	Final Mass (Mci_f) g	Mass gain (Mci) g
Container 1	778.32	794.68	16.36
Container 2	827.74	831.45	3.71
Container 3	611.43	613.24	1.81
Container 4	861.5	873.36	11.86
Total (M)	3078.99	3112.73	33.74

Mass of water collected (M) = $\Sigma(Mc1_f-Mc1_i)....(Mci_f-Mci_i)$

Calculation of dry gas sample volume at STP (SV_{STP})

SV_{STP} = $SV_M \times (273/273 + T_M) \times (P_M/101.3)$

Volume of dry gas sampled at STP (SV_{STP})	m^3	0.8203

Calculation of water vapour content (H_2O_{dust})

H_2O_{dust} = $100 \times (M \times MV_{STP}/MW_{H2O})/[SV_{STP} + (M \times MV_{STP}/MW_{H2O})]$

where MV_{STP} molecular volume at STP (22.412 m^3/kgmole)

MW_{H2O} molecular weight of water (18 kg/kgmole)

Water vapour content (H_2O_{dust})	%	4.87 ± 0.35

Compliance with BS 14790

Uncertainty less than 20% of measured value (Clause 7.3)
Temperature is greater than 4oC based on calculated water dew point (Clause 6.4.2) - outside standard
Leak rate is no more than 2% of sample flow rate
Sampling duration is within minimum of 30 minutes (Clause 6.1)
Sampling volume is within minimum of 50l (Clause 6.1)
Residual water content at outlet is above 1.25% (Clause 5.8) - outside standard
Sampling temperature was within minimum of 120oC during sampling (Clause 5.2)

Uncertainty Budget (based on BS 14790 and Uncertainty Policy U25)

Volume of sampled gas	V	0.820 m^3
Average temperature of gas at meter	T	50.4 °C
Average barometric pressure at meter	P	986 mb
Sampling line leakage		0.00015 m^3/min
Duration of sampling	t	100 min
Total mass weighed	M	3112.73 g

Source of uncertainty		Value		Value of standard uncertainty		Relative standard uncertainty (%)	
Measurement of sample gas volume	$u_r V_m$	2.0 %	u_v	$u_v V_m = \frac{V \times}{\sqrt{3}}$	0.0095 m^3	$u_r V_m$	1.15
Measurement of sample gas temperature	$u_r T_m$	1.0 %	u_t	$u_t T_m = \frac{(T+273)}{\sqrt{3}}$	1.8672 K	$u_r T_m$	0.58
Measurement of absolute pressure	$u_r P_m$	1.0 %	u_p	$u_p P_m = \frac{\Delta P}{\sqrt{3}}$	5.6927 mb	$u_r P_m$	0.58
Leakage in sampling line	$u_r L$	1.0 %	u_l	$u_l L = \frac{MV}{\sqrt{3}}$	0.0087 m^3	$u_r L$	1.06
Measurement of weight - balance uncertainty	$u_r W_m$	0.01 %	u_{bun}	$u_{bun} W_m = \frac{W \times U}{2}$	0.1707 g		-
Measurement of weight - balance repeatability	$u_r W_r$	0.011 g	u_{br}	$u_{br} W_r = u_{br}$	0.0110 g		-
Total measurement of weight	$u_r W$	-	-	$u_r W =$	0.1907 g	$u_r W$	0.57

Total standard relative uncertainty	$u_r = \sqrt{u_r V_m^2 + u_r T_m^2 + u_r P_m^2 + u_r L^2 + u_r W^2 + Corr.}$	3.62 %
Total relative uncertainty	$U_r = 1.96 u_r$	7.10 %

SCIENTIFICS MONITORING REPORT FORM
TOTAL PARTICULATE MATTER to BS EN 13284-1/BS ISO 9096

Company	City of London	Test Ref	crem 7 (b)
Site	Crematorium		
Sample point	Cremator 7 run 2		
Test carried out by	S Huntley & T Swannack		

SAMPLING TIMES

Determination		TPM
Date		05-Jan-10
Time Start		14:20
Time End		15:55
Duration (t)	min	95

Sampling plane

Dimension traversed by sampling probe (D)	m	0.42
Cross sectional area of sampling plane (A)	m^2	0.18

Duct gas conditions

Determination		TPM
Ambient temperature (T_{Amb})	°C	9.0
Average duct gas temperature (T_{duct})	°C	327.1
Duct static gas pressure (P_{Static})	kPa	-0.05
Barometric pressure (P_{Baro})	kPa	98.60
Volume flow rate @ ref. conditions (Q_{Ref})	m^3/s	0.20
Gas compressibility correction (z)		0.995
Wet gas density (ρ_s)		0.57
Exhaust gas conditions measurements		crem 7 (b)

Reference conditions

Determination		TPM
Actual Duct Flow Conditions		
Average temperature (T_{duct})	°C	327.1
Total pressure (P_{duct})	kPa	98.55
Oxygen (O_{2duct})	% vol,dry	18.20
Water vapour (H_2O_{duct})	% vol	5.78
Reference Conditions		
Temperature (T_{Ref})	°C	0
Pressure (P_{Ref})	kPa	101.3
Oxygen (O_{2Ref})	% vol, dry	11
Water vapour (H_2O_{Ref})	% vol	0

Sampling conditions

Determination				TPM
Nozzle diameter (d)	TI24	Titanium	mm	6.280
Initial gas meter reading			m^3	623.216
Final gas meter reading			m^3	624.270
Sampled volume (SV_M)			m^3	1.054

Calculation of sample gas volume at reference conditions, SV_{Ref}

$$SV_{Ref} = SV_{Meter} \times Y \times [273 + T_{Ref}]/[273 + T_{Meter}] \times P_{Baro}/P_{Ref} \times [100-H_2O_{Meter}]/[100-H_2O_{Ref}] \times [20.9-O_{2Duct}]/[20.9-O_{2Ref}]$$

Corrections
Temperature
Pressure
Water vapour
Oxygen

Determination		TPM
Sampled volume @ ref. conditions (SV_{Ref})	m^3	0.219

SAMPLING DATA TPM

Test Ref crem 7 (b)

Initial gas meter reading: 623216 l Start Time: 14:20

Distance from Duct Wall Fraction of D	Port	Time of Day h:mm	Run time mm	Gas meter reading l	Pitot flooding (h) mm w.g.	Orifice ΔH mm w.g. Desired (ΔH_d) Hi x K x C_d^2	Orifice ΔH mm w.g. Actual (ΔH_a)	Isokinetic difference ($\Delta H_d/\Delta H_a$) %	Temperatures Gas (T_{duct}) °C	Probe (T_p) °C	Filter (T_f) °C	Meter (T_m) inlet °C	Meter (T_m) Outlet °C	Impinger (T_{imp}) °C	Oxygen Content % v/v, dry
0.500	A	14:20	0	623216	8.5	10.20	15	93	332	160	160	51.0		8	
		14:25	5	623287	4.2	10.46	9.7	93	333	160	160	50.0		8	
		14:30	10	623341	5.6	13.45	12.4	92	333	160	160	51.0		9	
		14:35	15	623417	4.2	10.46	9.7	93	333	160	160	51.0		11	
		14:40	20	623493	3	7.47	6.9	92	331	160	160	51.0		12	
		14:45	25	623562	2	4.98	4.6	92	331	160	160	51.0		12	
		14:50	30	623582	3	7.47	6.9	92	327	160	160	51.0		14	
		14:55	35	623517	4.2	10.46	9.7	93	325	160	160	50.0		14	
		15:00	40	623667	3.5	8.72	8	92	327	160	160	51.0		15	
		15:05	45	623717	3.2	7.97	7.4	93	324	160	160	51.0		16	
		15:10	50	623774	5.2	12.96	12	93	326	160	160	51.0		17	
		15:15	55	623839	3.8	9.47	8.8	93	323	160	160	51.0		18	
		15:20	60	623905	7.4	18.44	17	92	324	160	160	51.0		19	
		15:25	65	623948	3.5	8.72	8	92	325	160	160	52.0		9	
		15:30	70	623979	3.8	9.47	8.8	93	327	160	160	52.0		11	
		15:35	75	624032	4.4	10.96	10.1	92	326	160	160	52.0		12	
		15:40	80	624088	5.2	12.96	12	93	323	160	160	52.0		14	
		15:45	85	624152	3.6	8.97	8.3	93	321	160	160	52.0		15	
		15:50	90	624215	3.9	9.72	9	93	324	160	160	52.0		17	
		15:55	95	624270											
	Averages								327.1	160.0	160.0	51.2		13.2	n.m

Final gas meter reading: 624270 l End Time: 15:55

Equipment used

Item	Fle No.
Control box	P1382
Meter coefficient (γ)	0.926
K factor, (K_c Independent of C_p)	3.531
Orifice plate pressure units	mm w.g.
Pitot differential pressure units	mm w.g.
Pitot	S
Pitot coefficient (C_p)	0.84
Probe liner thermocouple Titanium	P1087
Duct gas thermocouple	P1611
Oven thermocouple	P1395
Impinger exit thermocouple	P1333
Timer	P1187

Leak check

		Start	End
Start Time		14:15	15:57
End Time		14:17	15:59
Initial meter reading	m^3	623.2157	624.2701
Final meter reading	m^3	623.216	624.2704
Duration of leak test	min	2	2
Pump vacuum	"Hg	-15	-15
Leak rate	l/min	0.15	0.15
Less than 2% of normal sampling rate?		Yes	Yes

Approach to isokinetic sampling

Average gas velocity (V_{duct})	10.0 m/s
Nozzle diameter (D_n)	6.280 mm
Sampling time (t)	95 min
Theoretical isokinetic sample volume SV_t	1781.95 l
Actual sample volume (SV_a)	1918.56 l
Approach to isokinetic sampling (\I)	108.9 %

where: V_{duct} is the average duct velocity based on the above measurements

$V_{duct} = C_p \times (1-\varepsilon) \times \sqrt{2 p_v \times h}$ (Reference BS 1042:Section 2.1:1983 (ISO 3966), pages 8&9)

SV_t is the theoretical isokinetic sample volume based on V_{duct} & D_n

$SV_t = V_{duct} \times \pi \times [D_n/2000]^2 \times t \times 60 \times 1000$

SV_a is the sample volume at duct conditions

$SV_a = SV_m \times \gamma \times [(273 + T_{duct})/(273 + T_m)] \times (P_{duct}/P_{duct}) \times (100 - H_2O_{duct})/(100 - H_2O_{duct})$

Determination of exhaust gas flow rate

based on measurements at sample points only

Flow rate at duct conditions (Q_{duct})	1.76 m^3/s
Flow rate at STP (Q_{STP})	0.78 m^3/s
Flow rate at reference conditions (Q_{ref})	0.20 m^3/s

where:

$Q_{duct} = V_{duct} \times A$

$Q_{STP} = Q_{duct} \times [(T_{ref} + 273)/(T_{duct} + 273)] \times (P_{duct}/P_{ref})$

$Q_{ref} = Q_{STP} \times [(20.9 - O_{2ref})/(20.9 - O_{2meas})] \times [(100 - H_2O_{ref})/(100 - H_2O_{ref})]$

PARTICULATE WEIGHINGS

Test Ref crem 7 (b)

Filters

Determination		Method Blank	Field Blank	TPM
Filter No.		xxxxxxx	012446	012455
Pre-sampling conditioning temperature (±5°C)	°C	180	180	180
Post-sampling conditioning temperature (±5°C)	°C	160	160	160
Diameter	mm	110	110	110
Material		Quartz	Quartz	Quartz
Pre-sampling weights				
after 1 min	g		0.7349	0.8341
after 2 min	g		0.7350	0.8341
after 3 min	g		0.7350	0.8341
Weight extrapolated to zero time (M_{f0})	g		0.7349	0.8341
Post-sampling weights				
after 1 min	g		0.7346	0.8624
after 2 min	g		0.7346	0.8624
after 3 min	g		0.7346	0.8624
Weight extrapolated to zero time (M_{f0})	g		0.7346	0.8624

Rinsings

Pre-sampling conditioning temperature (±5°C)	°C	180	180	180
Post-sampling conditioning temperature (±5°C)	°C	160	160	160
Pre-sampling weights (container only)				
after 1 min	g		64.8242	71.3238
after 2 min	g		64.8241	71.3238
after 3 min	g		64.8240	71.3238
Weight extrapolated to zero time (M_{r10})	g		64.8243	71.3238
Post-sampling weights (container and evaporated rinsings)				
after 1 min	g		64.8241	71.3339
after 2 min	g		64.8241	71.3339
after 3 min	g		64.8240	71.3339
Weight extrapolated to zero time (M_{r10})	g		64.8242	71.3339

Summary

Determination		Method Blank (M_{mb})	Field Blank	TPM
Mass collected on filter ($M_f = (M_{f0} - M_{f10} - M_{fmb})$)	g	0.0000	-0.0003	0.0283
Mass collected in rinsings ($M_r = (M_{r10} - M_{r10} - M_{rmb})$)	g	0.0000	-0.0001	0.0101
Total mass collected ($M = M_f + M_r$)	g	0.0000	0.0000	0.0384

Uncertainty Calculation Parameters

Standard uncertainty for gas volume measurement (U6)	2.9 %
Standard uncertainty for filter weighing (U17)	0.57 mg
Standard uncertainty for washings weighing (U17)	0.50 mg
Limit of detection for filter weighing (U17)	0.50 mg
Limit of detecion for washings weighing (U17)	0.50 mg
Standard uncertainty for oxygen correction (U11)	0.95 %
Standard uncertainty for gas flow measurement (U14)	5.7 %

Emission Limit Value

Emission limit value (ELV) at reference conditions	80 mg/m^3

SUMMARY OF MEASUREMENTS

Test Ref crem 7 (b)

Calculation of Particulate Concentration and Discharge Rate

Particulate concentration (C), mg/m^3 = M x 1000/ SV_{Ref}

Discharge rate, kg/h = C x Q_{Ref} x 0.0036

Determination		Field Blank	TPM
Particulate concentration at reference conditions	mg/m^3	0.00	175.52
Uncertainty	mg/m^3	0.00	12.07
Particulate concentration at duct conditions (raw)	mg/m^3	0.00	20.01
Particulate discharge rate	kg/h	0.00	0.13
Uncertainty	kg/h	#DIV/0!	0.01

Note: Field blank results based on average sampling conditions

Uncertainty budget

Uncertainties		Field Blank	TPM
Volume measurement (m_{vol})	mg	0.00	1.11
Filter weighings (m_f)	mg	-0.27	0.57
Rinsings weighings (m_w)	mg	-0.13	0.50
Total for uncorrected measurement (U_u)	mg	0.30	1.35
Correction to reference conditions (m_{corr})	mg	0.00	0.00
Total for corrected measurement (U_c)	mg	0.30	1.35
Concentration at 95% confidence interval (U_{95c})	mg/m^3	0.00	12.07

Based on Procedure 55 and Uncertainty Policies 11 & 17
(in accordance with requirements of BS EN ISO 14956:2002 and ENV 13005 (GUM))

$U_u = \sqrt{m_{vol}^2 + m_f^2 + m_w^2}$

$U_c = \sqrt{U_u^2 + m_{corr}^2}$

$U_{95c} = 1.96 \times U_c / SV_{Ref}$

COMPLIANCE WITH BS EN 13284-1:2002/BS ISO 9096 CONDITIONS

Flow conditions (BS EN 13284-1, 5.2 & BS ISO 9096, 5.3)

Standard	ISO 9096
Angle of gas flow less than 15°	Yes
No local negative gas flow	Yes
Minimum differential pressure greater than 5 Pa	Yes
Ratio of highest to lowest local gas velocites less than 3:1	No

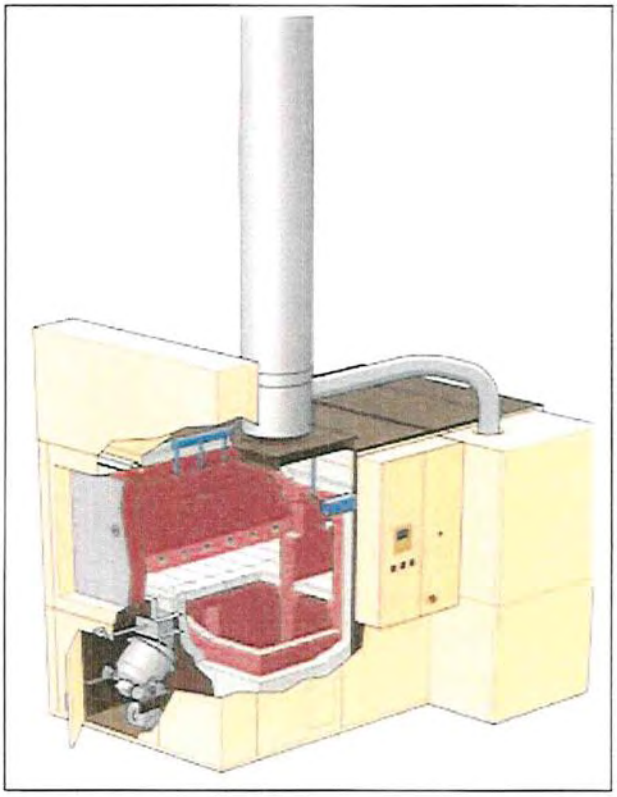
Compliance with BS ISO 9096

Blank value is less than 10% of ELV (Table 3)
Nozzle diameter greater than 4 mm (Clause 6.2.2)
Average sampling rate was within -5% and +15% of isokinetic conditions (Clause 7.3.5)
Leak rate is within 2% of sample rate (Clause 7.3.5)
Blank value is less than 2 mg/m3 (Table 3)

Facultatieve Technologies

Cremation & Incineration Equipment

TECHNICAL SPECIFICATION
FTII & FTIII CREMATOR
(UK SPECIFICATION)



Date: June 2010 | *FTII & FTIII* (S.E) | A.M.Brookes

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INDEX

1.0 INTRODUCTION

The *FTII & FTIII* Cremators have been specifically designed to cater for the specific needs of the modern day crematorium facility. The cremators enable the proper disposal of coffins and human remains whilst complying with the necessary flue gas emission requirements.

This cremator has been specifically designed after many years of experience and research in this very specialised field. In designing the cremator, we have minimised the necessary labour required to operate it, and the simplicity of its design ensures easy operation.

The design of this cremator is very capable of reducing the body to a high quality inert ash in a very efficient manner.

1.1 The Advanced Technical Features of the *FTII & FTIII* Cremator

- **Excellent environmental performance** - emissions conforming to current European and other World Standards.
- **Robust solid hearth** - providing single pass raking for ease of use.
- Excellent Extended Hearth Life.
- **Highest quality refractories** - including 63% Alumina in areas of heavy wear.
- **Robust construction** - a design capable of 6 or more cremations per day and cremations times around 60 to 80 minutes fully achievable.
- **One secondary combustion zone burner** to ensure a secondary zone temperature of 850°C, which can be maintained under all conditions of normal operation.
- Easily removable factory finished decorative outer casing.
- **Automatic control of air** - for both combustion and flue gas cooling purposes.
- **Advanced modern PLC control** features facility to ensure optimum combustion conditions by continuously monitoring throughout each cremation.
- **Automatic control of suction**.
- **Automatic temperature control** of both primary and post combustion zones.
- **Automatic fail safe** against over temperature and pressure.
- **Compact design**, enabling easy installation.

2.0 ENVIRONMENTAL PERFORMANCE

The design of this cremator provides a post combustion zone which maintains the flue gas temperature greater than 850°C for a time of greater than 2 seconds during operation, with an oxygen content of greater than 6%. Average over the cremation cycle and never falling below 3% (measured dry).

Tests on *FTII* & *FTIII* cremators in conjunction with our mercury abatement filtration system have been proven the equipment to comply and surpass the emission limits set out in PG5/2 (04) and AQ1(05). Independent tests conducted in the UK detailing the emissions into the atmosphere after the filtration process are available upon request.

Similarly emissions of Carbon Monoxide will be less than 100 mg/m^3 at all times, as measured at reference conditions of 11% O_2, 101.3 kPa, 0°C, dry.

3.0 PROPOSED INSTALLATION

The *FTII & FTIII* Cremators are of a modular design, which allows the user to pick and choose the options available.

The basic cremator will consist:

- *FTII* Cremator (Single end design).
- Dedicated combustion air fan.
- Dedicated draught control system comprising ejector air fan and ejector system.
- Automatic PLC based control system.
- Easy to use Human Machine Interface (HMI) in the form of a standard desktop PC.
- Flue gas monitoring equipment - utilising extractive gas analysis systems, and including O_2, CO analysers and indicative particulate monitor.
- Computer control station, complete with data logging system.
- Remote engineering support - via modem.
- Coanda ejector. (only on equipment not fitted with a filter).
- Industry leading flat *interactive* touch screen Human Machine Interface mounted on the machine.

In addition, the following ***options*** may be considered (at additional **cost**):

- Remote location of combustion air fan and ejector fan.
- Increase in primary chamber width to allow larger coffins to be cremated (upgrade to *FTIII* unit)
- Double end design.
- Automatic coffin loading systems.
- Increased refractory specification.

Facultatieve Technologies experienced staff are happy to discuss any additional requirements as necessary.

4.0 CREMATOR GENERAL DESCRIPTION

4.1 Principle of Operation

The cremator comprises a primary chamber of generous proportions into which the coffin is inserted and within which the primary combustion takes place. The hearth comprises flat sillimanite tiles. To keep the primary chamber entirely separate from the secondary chamber and avoid bypassing of the flue gases the hearth itself contains no openings, this ensures that all materials are retained for combustion in the primary chamber. The waste gas produced from this phase of the process exits the primary chamber via transfer ports in the chamber sidewall, descending below the solid hearth into the secondary combustion zone in which the gas phase combustion takes place.

The gases enter this zone and are then heated if necessary by the secondary zone burner and treated by the introduction of additional air. The flue gases make numerous passes within the secondary combustion zone, where the temperature is maintained at the required combustion temperature of 850°C, such that the two requirements of temperature and oxygen are met to ensure compliance to the local environmental requirements. Feedback to the control system from the emissions monitoring equipment ensures close control is always maintained, resulting in low pollutant emissions and excellent fuel economy.

4.2 Primary Combustion Chamber

The primary chamber is equipped with a single burner located in the end wall and two independently controlled sets of air jet comprising: -

- Air jets along the top of the arch.
- Side air along the sidewall of the cremator slightly above the hearth.

4.3 Secondary Combustion Zone

The FT cremator benefits from a generously designed secondary combustion zone, 3.2 m^3 in volume, and is sufficient sized to ensure a flue gas residence time of 2 seconds at all times during operation.

The FT cremator is designed with a secondary combustion zone comprising a series of passes below, and to one side of the primary chamber; one independently operated burner within this zone ensures that the temperature requirements are maintained while adequate supplies of secondary air and the tortuous flue path ensure high levels of turbulence to promote complete combustion.

The post combustion of the flue gases is completed within these high intensity areas, and thus all smells and smoke are eliminated. The design of the post combustion chambers ensures a lengthy, complex passage through the cremator prior to the flue gas exit.

4.4 Combustion System

The primary chamber burner has a maximum rating of 270 kW and this enables normal operating temperature in the range of 800 °C to be achieved in the primary chamber.

(The maximum allowable operating temperature is 1100 °C to 1150 °C).

The secondary combustion zone burner has a maximum rating of 350 kW which will enable temperatures of 850 °C to be achieved in the secondary chamber as required by the local Environmental Regulations.

The primary and secondary burners are mounted at the rear of the cremator facilitating easy access for maintenance and repair.

The burners are configured for ***fully modulating control,*** are ignited automatically and the burner system is protected against flame failure, thereby complying with the gas regulations and BS 5885 Part II.

4.5 Control Valves and Instrumentation

The addition of combustion air to the combustion process is effected by five modulating control valves, controlling individual supplies to each of the burners, primary chamber air supplies and the supply of air to the secondary combustion chamber.

The cremator primary chamber under pressure condition is controlled via a differential pressure transducer controller, controlling the eductor draught generation system, and also protecting against system overpressures.

The primary chamber and secondary chamber temperatures are measured via type K thermocouples, temperatures are all displayed on the PC control station.

4.6 Combustion Air System

The cremator installation is supplied with combustion air by a dedicated fan, with a design duty capable of providing the air pressure and flow requirements of the Cremator. For higher operational efficiencies and reduced operational costs the fan is controlled by an inverter this ensures that the minimum of power is used during the cremation process. The fan is located in an integrated enclosure within the cremator's decorative panelling, the enclosure is acoustically lined.

4.7 Induced Draught System
- Cremator Underpressure / Draught Generation

The cremator underpressure is constantly measured and controlled by the addition of a cooling air volume into the hot flue gases via a coanda ejector located shortly after the cremator waste gas outlet.

The volume of ejector air is constantly modulated by an inverter controlled ejector air fan motor, the speed of the fan (hence the level of draught) is controlled by the cremator's PLC control system.

The pressure sensor / controller also continually monitors any overpressure condition within the cremators primary chamber. On detection of overpressure the combustion air to cremator is automatically turned off such that the combustion rate within the cremator is rapidly reduced. On sustained overpressure, the cremator will go into abort mode until the cause of problem is identified (for example, this could be the failure of the ejector air supply).

This separate ejector fan is located in an integrated enclosure within the cremator's decorative panelling, which is acoustically lined.

Note: In systems fitted with a mercury abatement system this item is removed from the cremator and its function is replaced with the total system ID fan.

4.8 Cremator Process Control – PLC Based

The cremator is supplied with a dedicated **Programmable Logic Controller**, this controller supervises the operation of the cremator the combustion process and automated loading if the FDI loader is fitted to the unit.

The cremator's control panel design is based upon a modern "*compact design*" PLC, complete with 32 digital inputs and 32 digital outputs in standard configuration with a maximum of 48 dependant on options fitted to individual cremators. The programmable logic controller is supplied, preloaded with our dedicated control software programme.

Facultatieve Technologies utilises the Mitsubishi PLC and associated *Melsec* computer software for process control of the cremator.

Manufacturer:	Mitsubishi
Base unit Type:	FX 2 N – 64 MR

4.9 Personal Computer Based Control System Including Data Logging

The cremator, is supplied (as standard) with a personal computer (PC) with integrated modem, the operator interface comprises standard keyboard and mouse arrangement together with a standard TFT monitor and the following software pre installed.

- Microsoft Windows XP Pro operating system
- Opsoft for Windows
- Integrated graphics package
- Mitsubishi Melsec Medoc package
- Norton PC Anywhere

A quality colour inkjet printer is provided so enabling the cremator operator to print down the data logging reports when required.

The cremator (and optional filter system if installed by Facultatieve Technologies) is be controlled via the integrated computer system. This PC based control system detailed below provides an industry leading control graphics package, and offers the added benefit of data logging and remote engineering support via a computer link.

For the above control interface, the PLC design includes a serial data card, which, via a RS 232 or RS 485 connection communicates with the computer system. Allowing the use of our Windows based Optsoft graphics package to operate a **S**upervisory **C**ontrol **A**nd **D**ata **A**cquisition system – known as **SCADA.**

The software control program includes automatic data logging this information is used to automatically generate a report in a format agreed by the UK Environmental Authorities and requires no further manipulation by the operator.

The control enclosure, including the PLC system is located on the rear of the cremator. Within this enclosure the equipment is situated to minimise the effects of heat, and is adequately ventilated so ensuring trouble free operation.

The PLC based control system is capable of the total control of the cremator and all its functions in order to complete the cremation process once the primary chamber has been charged without the need for operator assistance so simplifying the day to day operation of the cremator.

The PLC control system automatically varies the combustion programme according to coffin type and body weight. The system monitors many signal inputs from thermocouples throughout the cremator, information form the gas analysers and sends output signals to control the combustion air levels, burner operation, draught control system controlling the cremator at its optimum performance level. Ensuring cremations times are reduced, fuel efficiently is increased and emission limits are adhered to.

The system also monitors for combustion and component faults, taking appropriate action as required and transmitting the alarms to the operator display as necessary. Should the need arise, provision has also been included for a manual override. Manual control of the cremator is logged by the control system. However the control system whilst under manual control will prevent a dangerous situation from arising from incorrect manual operation.

4.10 Cremator Process Control – Safety Features

The burner flame failure and burner safety systems are housed separately from the burners. They comprise flame failure safety relays connected to a flame rectification type probe, to monitor "start" flame and "main" flame, which automatically shut off gas and air supply valves in the event of flame failure of either the main burner or afterburner, and to prevent burner ignition if the safety circuits are not energised.

Separate gas and air pressure switches are set to shut off the burners if the air supply or gas pressure fall below pre-determined safety levels.

Electrical interlocks prevent the charging door being opened for the introduction of a coffin unless the temperature in the secondary combustion zone exceeds 850°C. For additional safety the charging door will only partially open for ashing out purposes.

The cremator is fitted with automatic suction control to maintain a pre-set suction condition within the primary chamber for all normal combustion conditions. This is achieved by either a dedicated ejector fan or system ID fan on filters installations.

4.11 Remote Engineering Support

In order to support the cremator from our technical centre, the standard cremator control system is supplied with a modem. This enables remote observation of cremator parameters, retrieval and analysis of cremator emission data. The system also allows the cremator to be interrogated by our expert technicians to resolve operating problems without the initial requirement to attend site to rectify the problem.

Such a modem facility, already operating at many crematorium throughout the UK and Europe enables offsite maintenance scheduling, installation management, remote monitoring of cremator performance and operator assistance should the need arise.

4.12 Flue Gas Monitoring

The cremator is supplied as standard with an extractive flue gas analysis system, comprising combined oxygen and carbon monoxide analyser – the Siemens Ultramat 23 with fast response electrochemical cell for Oxygen detection and Infra red for Carbon monoxide detection, an indicative flue gas particulate monitor such as the Skil 252 (Single Output) monitor is also provided. These flue gas analysers are located to enable the analyser readings to be on display to the operating staff at the most convenient points within the crematory, and are repeated on the PC control station.

The standard configuration provides for the continuous monitoring of:

- Oxygen
- Carbon monoxide
- Primary chamber temperature
- Secondary combustion chamber inlet / outlet temperature
- Flue gas particulate level
- High opacity alarm

Facultatieve Technologies qualified staff are happy to discuss any additional requirements as necessary.

4.13 Cremator Loader (Optional Item)

Facultatieve Technologies can offer numerous coffin loading systems, varying from simple manual transfer trolleys to fully automatic powered static loaders integrated into the design of the cremator as well as powered mobile coffin charging trolleys.

5.0 CREMATOR CONSTRUCTION DESCRIPTION

5.1 Casing and Framework

The casing and framework of the cremator is fabricated of steel plate and sectional steel construction, the whole braced for rigidity, so as to properly support the refractory and insulating materials with which the casing is lined.

The overall external dimensions of the cremator are:

	FTII Cremator		FTIII Cremator	
	Single end	Double end	**Single end**	Double end
Length (m)	3.86	3.73	3.86	3.73
Width (m)	2.12	2.12	2.15	2.15
Height (m)	2.45	2.45	2.45	2.45
Height over door gear (m)	3.30	3.30	3.30	3.30
Weight (kg)	12,600	12,600	13,500	13,500

The cremator size is generally as detailed by the *FTII & FTIII* brochure.

5.2 Cremator Charging Door

The refractory lined charge door is situated at the front of the cremator is counterbalanced and suspended on precision roller chains for ease of operation. Operation is by means of a single phase electric motor controlled by adjacent push buttons, interlocked to prevent charging unless the secondary combustion chamber temperature is above 850 °C. The door opens to the full dimensions of the primary chamber thus allowing for maximum coffin size.

The dimensions of the charging aperture are: -

	FTII Cremator		FTIII Cremator	
	Single end	Double end	**Single end**	Double end
Width (mm)	900	900	1100	1100
Height (mm)	800	800	800	800

The **recommended maximum** size of coffin which can be inserted into the machine is:

	FTII Cremator		FTIII Cremator	
	Single end	Double end	**Single end**	Double end
Length (mm)	2350	2350	2350	2350
Width (mm)	860	860	1050	1050
Height (mm)	700	700	700	700

5.3 Ash Removal

5.3.1 Single Ended Cremator

Access for raking on single ended units is through the charging door. At the end of the cremation, the door is opened to a safe, partially open position, which protects the operator from the radiated heat. The door is operated by a pushbutton and door height is controlled by PLC control system.

5.3.2 Double Ended Cremator

Access for raking on double ended units is through a dedicated rear ash door. At the end of the cremation the door is opened by pushbutton operation to its fully open position so giving the operator easy access to the calcined remains. This door is designed constructed and installed in a similar manner to the charging door. In the open position the aperture is 230mm high x 350mm wide.

In both of the above designs the ash then may be raked (using an ash rake) and removed directly via the integral ash chute into a refractory sump positioned below the ash out door. Whilst within this refractory lined ash box, the ashes can be cooled automatically by a flow of cold air. The cooled ashes can then be dropped into the attached stainless ash box, by manually opening a slide valve. The ashes can then be removed from the cremator and transported elsewhere for further processing if so desired.

5.4 Access for Maintenance

The need for access for maintenance has been carefully considered in the cremator design, and facilities have been provided for the cleaning out of accumulations of ash in any of the chambers and flue passages, access ports being provided for this purpose.

5.5 External Finish

Externally, the cremator casing is clad with pre-finished painted panels before leaving our production facility. Consequently, no additional finishing of these items is required and they are a distinctive feature of the cremator.

As well as giving the cremator a pleasing appearance, the panels ensure operator safety, by preventing any hot surfaces from being touched. The cladding panels ensure a gap of air between the internal cremator casing, and the external surfaces. This greatly reduces the external surface temperatures experienced.

The charging door at the front of the cremator is faced with stainless steel surrounded by a stainless steel bezel. The rear ashing out door on double ended units is also finished in stainless steel.

5.6 Refractory Materials – *FT* Cremator

5.6.1 Refractory Lining

Refractories are of high quality, comprising fire-brick, backed by calcium silicate insulation and microporous insulating materials.

Location of refractory in cremator	Quality of refractory (Alumina content)	Thermal conductivity (W/m °C)	Bulk density (g/cm^3)	Maximum operating temperature (°C)
Used in areas of high turbulence.	63%	2.0	2.25	1600
Used in cremator sidewalls.	42%	1.9	2.25	1400
Used in cremator hearth.	65%	1.62	2.45	1600
Castable refractories used for burner quarls, lintels and outlet port.	50%	N/A	2.37	1600
Ash chute.	50%	N/A	2.37	1400

- As an optional extra cost item, **all** the hot face brickwork of the cremator can be supplied in **63% alumina** content refractory (replacing the above 42% alumina material).

5.6.2 High Quality Insulation

Type and location of insulation	Insulation thickness (mm)	Thermal conductivity (W/m °C)	Bulk density (g/cm^3)	Maximum operating temperature (°C)
Calcium Silicate Insulation used in the areas around and between the refractories and the steel casing.	75	0.10	0.2	1050
High grade microporous insulation included within the insulation layers between the steel casing and the internal refractory.	25	0.3	0.3 to 0.35	950

The quality and thickness of the insulation materials used in the construction of the cremator are such that the exterior casing is kept at a safe temperature for the operators at all times.

6.0 TECHNICAL SPECIFICATION – *FT* CREMATOR

6.1 Cremator Primary Chamber Internal Dimensions

	FTII Cremator		FTIII Cremator	
	Single end	Double end	Single end	Double end
Length (mm)	2500	2500	2500	2500
Width (mm)	900	900	1100	1100
Height (mm) (To top of Arch)	960	960	960	960

6.2 Secondary Combustion Chamber

Secondary combustion chamber volume 3.2 m^3
Residence time in secondary combustion chamber > 2 seconds

The secondary combustion chamber is specifically designed to ensure a **flue gas residence time of 2 *seconds*** at a flue gas temperature of 850°C and oxygen content of 6%.

6.3 Burners

	Max fire	Min fire
Primary chamber burner (kW)	270	60
Secondary chamber burner (kW)	350	150

Burner fuel: Natural gas or LPG

Burner control mode: Continuous modulation of burner output, burners are low NOx design.

Burner controls:

Manufacturer	Kromschroeder
Model	BCU 370
Flame detector	Ionisation probe

Burner gas valves:
Primary and secondary chamber burners are fitted with fully modulating 240V gas safety control valves.

6.4 Utility / Fuel Consumption

Typical gas consumption of the cremator per cremation:
20 – 25 m^3 of Natural Gas
(Based upon five cremations per day, five days per week including preheat time. Natural Gas (net $CV_{nat\ gas}$> 34.82 MJ/m^3)).
Typical electrical consumption per hour under normal running conditions:
8.75 kWh

6.5 Cremation Capacity

This design of cremator is robust, and will perform up to **6 cremations per normal working day,** however, it is fully capable of operating for extended periods beyond "normal working hours", as required.

6.6 Air Requirements

	Flow (m^3_N/h)	Pressure (Pa)	Motor (kW)	Manufacturer	Model
Combustion Air Fan	1500 (Design)	6000	5.5	Fans and Blowers Ltd	QP 5615
Ejector Air Fan	500 (Min) 2500 (Max)	5500	5.5	Fans and Blowers Ltd	QP 5615

	Modulating flow	
	Max flow (m^3_N/h)	Min flow (m^3_N/h)
Combustion air to primary chamber	500	0
Secondary chamber air	900	0

Air fan frequency inverter variable speed controller:

Manufacturer Danfoss
Model HVAC 6000 Series With built in RFI filter

6.7 Cremator Process Data

	Temperatures (°C)		Pressure (Pa)	
	Max	Min	Max	Min
Primary chamber	1050	750	-10 mm	-70 mm
Secondary chamber	1150	850 (Design)	N/A	

Note: Primary chamber temperature and pressure varies with progress of cremation.

6.8 Flue Gas Conditions

	Condition
Flue gas temperature	850°C
Flue gas volume exit of secondary combustion chamber (Typical)	1270 m^3_N / h
Content of carbon monoxide Typical content over the cremation	<50 mg/Nm^3 (Using natural gas fuel)
Flue gas particulate content (Typically)	<80 mg/Nm^3

Gas sampling for combustion control of flue gases is made in the exit duct of the cremator.

All above figures are given at reference conditions of 273K, 101.3 kPa, dry, 11 % vol/vol oxygen

6.9 Cremator Heat Loss

Although fabricated from the highest quality refractories and insulating materials, the cremator will lose heat to its surrounding environment. This heat loss is via convection, from all its surfaces, and is calculated as 11 kW at maximum.

6.10 Cremator Control / Instruments

Thermocouples

Primary chamber	No 1	Type K - Ni / Cr Element
Secondary chamber inlet	No 1	Type K - Ni / Cr Element
Secondary chamber outlet	No 1	Type K - Ni / Cr Element
Chimney	No 1	Type K - Ni / Cr Element

	Manufacturer	Type
Primary chamber pressure controller	Skil Controls Ltd	222
Cremator air valve motors	Kromschroeder	ICW - 20

Each of the above probes is connected to an indicator mounted on the control panel for visual indication of all process values.

Facultatieve Technologies

Cremation & Incineration Equipment

Flue Gas Cooling and Filtration Equipment for Single Cremator Installation

UK Technical Specification

Date: Jan 11 | Single Cremator Installation | A.M.Brookes

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1.0 General System Description

To enable the flue gases to be filtered they must be first conditioned to a temperature (cooled) necessary for the cleaning within the filter system. For this reason thermal energy (heat) must be removed from the flue gases.

The flue gas from the cremator enters the air to water cooler (boiler) via a refractory lined duct, and is cooled down to the filter operating temperature range of 120°C to 150°C. The heat removed from the flue gas is transferred in the water / glycol circulation system to a dedicated air blast cooler located externally from the filter equipment.

Between the boiler and fabric filter, fresh reagent additive ***Factivate*** is added to the flue gases. The flue gases and the ***Factivate*** are homogeneously mixed within a reaction volume prior to entering the filter.

Within the fabric filter, a cake of additive and dust builds up on the filter bags, thus improving filter efficiencies and filter bag lifespan.

The special automatic control system for the fabric filter cleaning controls the operation of the filter (e.g. differential pressure) and ensures that there is sufficient additive ***(Factivate)*** on the filter bags during operation.

The adsorption of the mercury, dioxins and furans occurs with the ***Factivate*** in the air stream and in the dust/additive cake on the filter bags.

Furthermore, the concentration of acidic gases such as SO_2 and especially HF and HCl is reduced by reaction with the chemical reagent.

During the cleaning process of the filter, the released dust cake falls into the filter hopper. A motorised mechanical screw conveyor transports the dust and spent reagent to a container for waste disposal. Typically the automatic cleaning process occurs once a day – at shutdown, so ensuring that the filter is cleaned of "used additive" at the end of every operational day, and so starts operation the following day using only fresh additive. Such operation dramatically reduces the risk of filter fires, especially as the additive selected has natural fire retardant capabilities.

An induced draught fan draws the cleaned gas through the fabric filter, and passes it to atmosphere through the chimney stack. The control of this fan, via a frequency controller (inverter), ensures the correct cremator underpressure (as measured in the cremator) at all times. The induced draught fan is suitably sized to overcome all the resistances within the cremator, flue gas cooling and filter equipment.

A compressor is included to supply the compressed air requirements of the fabric filter cleaning system.

The premixed chemical reagent additive mixture will be supplied in easily manageable closed containers, which can be easily introduced into the automatic reagent feeding station. Under fully controlled conditions, the reagent is fed via a dosing screw into the filter system in the required amount necessary to ensure compliance with the local emission regulations.

2.0 Technical Design Data

Operating hours	:	Up to 24 hours per day
Temperature after Cremator	:	Normal.850 °C Max. 1100 °C Temporary 1200 °C for up to 10 minutes
Volume flow per Boiler	:	1550 Nm^3/h
Temperature before Filter	:	Approx. 150 °C Peaks up to 180 °C for max. 5% of the cremation
HCl Inlet Filter (Typically)	:	50 mg/Nm^3
SO_2 Inlet Filter (Typically)	:	70 mg/Nm^3
Dust content	:	~ 200 mg/Nm^3
Type of dust	:	Ash
Grain size	:	Fine / very fine
Dust density	:	700 to 800 kg/m^3
Mercury	:	1 mg/Nm^3
Place of erection	:	Inside a building
Climatic conditions	:	Western Europe
Height above sea level	:	< 300 m

3.0 Equipment Specification

3.1 Cremator Draught Control System

To ensure optimum process pressure conditions in the cremator oven, the under pressure (negative) in the cremator oven is constantly measured by pressure transducer controlling instruments. These control signals are used to constantly modulate the speed of the filter system's induced draught fan during the filter system operation.

3.2 Flue Gas Cooling – General Description

Heat removal from the flue gases is necessary only for conditioning of the gases to a temperature necessary for the correct operation of the flue gas cleaning system. In normal configuration the boiler system is supplied with an air blast cooler system normally located external to the building. The coolant fluid in the system is a water / glycol mix. As an option, if required, the recovered heat will be transferred to a heat accumulator system and / or district heating system.

The flue gas cooling plant is sized to accept the flue gases from the cremator and is designed to accept the wide thermal load variation of the flue gases exhausting from the cremator.

The hot water is recirculated around the water circuit by suitably sized recirculation pump. The recirculation circuit will also be fitted with a thermal expansion system comprising a vessel fitted with a pressurised diaphragm, system fill connections and safety pressure relief equipment.

3.2.1 Flue Gas Cooler (Boiler)
(Flue gas to water cooler)

The flue gas cooler is designed as a conventional waste heat boiler, of multi-pass design. The design of the boiler is such that the flue gases pass up the inside of the boiler tubes and water based coolant is pumped through the shell on the outside of the tubes.

Technical Data:

Maximum		
Flue Gas Volume	:	2850 Nm^3/h
Gas Temperature inlet	:	800 °C (normal)
Gas Temperature outlet	:	150 °C
Convective power	:	450 kW (design) 600 kW (max thermal)
Water Temperature inlet	:	75 °C
Water Temperature outlet	:	95 °C
Boiler pressure Design	:	6.0 Bar
Water volume	:	21.0 m^3/h

Differential Pressure gas	:	410 Pa (normal)
Differential Pressure gas	:	1170 Pa (max)
Differential Pressure water	:	400 mbar (normal)

3.2.2 Automatic Soot Cleaning System

The equipment proposed would be a **"DANBLAST"** system. This system relies upon an automatic shock blast to clean the inside of the flue gas tubes of solid deposits, and is often referred to as a "soot blowing system".

This system utilises a supply of compressed air, at a pressure of 8-bar maximum, which will be supplied from the air compressor system supplied in conjunction with the flue gas filter installation.

The process of soot cleaning is **automatically** controlled by the dedicated PLC control system. As part of the cremation plant's automatic shutdown sequence at the end of the operational day, the boiler "sootblowing" sequence would commence, this sequence typically lasting 30 to 60 minutes, in which time each nozzle would soot blow two times in sequence.

The soot and dirt removed from inside the boiler tubes would pass onto the filter unit entrained in the moving flue gases being drawn through the equipment by the filter's induced draught fan.

Essentially this system removes the requirement to **manually clean** the boiler, other than perhaps once a year, so that the boiler may also be inspected at the same time.

3.2.3 Air Blast Cooler (Re-cooler)

To remove heat from the system, the re-circulating hot water based coolant is passed to the air blast cooler, normally located externally to the process equipment. Ambient (cool) air is force ventilated over the tubes by fans located on the cooler, while the hot water / glycol mixture passes inside the finned cooling pipes.

Technical Data:

The heat exchanger (air blast cooler) consists of:

Finned pipe heat exchanger, consisting of aluminium finned copper tubes

Max. Temperature (design)	:	120 °C
Max. Excess pressure	:	6 bar
Number of Axial-fans	:	6 placed on the inlet side with protective grating.
Electric Motors	:	400 V / 50 Hz / 0.5 kW
Cooling power	:	450 kW (Design) 600 kW (Max Thermal)

Coolant Water volume	:	21.0 m³/h
Coolant Media	:	25% v/v ethylene glycol in water
Temperature inlet	:	95°C
Temperature outlet	:	75°C
Differential Pressure	:	Approx. 68 kPa
Sound Pressure Level axial fans	:	47 dB_A at 10 m

3.2.4 Water Control System

The system will be complete according to the relevant country standards. The water circulation pipework will include duty and standby circulation pumps, all necessary valving, insulation, and two (valved) connections to enable heat recovery from the water circuit as necessary.

3.2.5 Heat Recovery System

Note: For future heat recovery we can supply a dedicated plate heat exchanger within the water circuit to enable heat recovery, for connection into the crematorium's central heating systems (by others) as necessary.

Typically, the plate heat exchanger, complete with manual isolation valves on both primary and secondary circuits, will be as follows:

Type of Heat Exchanger	:	Plate Exchanger
Supplier	:	HRS Coolers or similar
Design Rating	:	120 kW
Flow rate	:	12 m³/h
Temperature of Water	:	55 to 65 C
Pressure Drop	:	32 Pa

3.2.6 Piping

Interconnecting pipework is included within our scope of supply, connecting the flue gas boiler to the externally located air blast cooler. All pipework will be thermally insulated and covered with a protective cladding.

3.4 Additive/Reagent - Dosing System

Factivate Reagent Additive Station

Consisting of charge unit with support structure to accept easily manageable ***Factivate*** reagent **15**kg containers. Each container is lifted into the charging station via the dedicated door which is closed and sealed before reagent transfer, so ensuring the automatic addition of reagent under controlled clean safe conditions.

Factivate Dosing unit

Consist of a frequency controlled dosing screw conveyor, and injection piece to inject reagent additive into the flue gas ductwork
Dosing range : 0,2 – 2,0 kg/h per cremator

3.5 Reaction Volume

For a thorough mixing of the gas stream and additive, a reaction volume is designed within the interconnecting ductwork, between the boiler and the filter. This reaction volume is complete with a reagent additive-distribution pipe, and inspection openings.

3.6 Compact Filter Unit

Filter Type: Dantherm FD 3 / 2.5 / 30 (or similar)

The filter is supplied complete with compressed air cleaning system configured for operation on the dirty gas side, and is delivered fully functional, with filter fabric elements and compressed air cleaning system installed.

The filter unit consists of:

- A filter housing in fully welded sheet steel construction with separate dirty gas and clean gas compartments.
- Inspection doors to allow easy access for maintenance and inspection work.
- Cleaning system with pressure reducer, compressed air tank, electromagnetic actuated diaphragm valves, injector nozzle and jet tubes.
- Connecting flanges for dirty gas connection and dust collecting hopper.

Technical Data:

Designed for negative pressure up to	:	60 mbar
Maximum number of filter cassettes	:	30 pcs.
Averaged compressed air consumption (During cleaning cycle)	:	12 Nm^3/h
Filter Element(s) (Consisting of filter bag and spacer mat.)	:	60 off

Technical Data:

Filter media	:	Aramid
Temperature resistant up to	:	190 °C
Self ignition temperature	:	>485 °C
Overall installed filtering area	:	55 m^2
Overall effective filtering area	:	55 m^2

3.6.1 Filter Dirty Flue Gas Inlet Transition

Arranged above the filter fabric elements, manufactured as a fully welded sheet steel construction with baffles for guiding the dirty gas flow, inspection doors and the connecting flange for the dirty gas ductwork.

3.6.2 Dust / Spent Product Collecting Hopper

Arranged under the filter fabric elements for the collection of the separated dust, manufactured as a fully welded sheet steel construction with connection flanges to the filter housing and the screw conveyor. Supplied with integral support structure in suitably designed structural steel section.

3.6.3 Spent / Reagent System

Consisting of a screw conveyor arranged under the filter for the conveyance of the separated dust in fully welded sheet steel construction with connecting flanges to the dust collecting hopper and to the discharge valve.

Including gear motor : 1.1 kW 22,5 rpm

Support structure in suitably designed structural steel construction.

3.6.4 Spent Reagent Storage Bin

Arranged under the waste product screw conveyor, to store the spent product from the filter hopper (above).

Capacity : **200** litre

3.7 Induced Draught Fan (for total Filter/Cremator Plant)

For the conveyance of the cleaned gas through the total integrated cremator and filter installation.

Fan Type: Single-stage, one-sided suction.

Impeller mounted directly on the fan shaft, overhang type, with two bearings.

Fan Design: Industrial fan in heavy-duty fully welded sheet steel construction.
Housing with cleaning opening and drainhole for condensate
Impeller with backwards inclined or radial blades.
Electrodynamically balanced in two planes.

Technical data:
(Design point)

Flow rate	:	3,800 Am^3/h
Total pressure at 150 °C	:	70 mbar
Power requirement at 150 °C	:	18.5 kW
Impeller speed	:	2930 rpm

Induced Draught Fan supplied with cooling disc for shaft cooling of the fan, arranged between fan housing and motor including protection against accidental contact.

Anti Vibration Mounts – 1 set for vibration-free erection on the fan including fastening plates.

Electric Motor for Induced Draught Fan
According to IEC norms

Designed for Frequency control via separate inverter system controlled using the system underpressure in the cremator.

3.8 Compressed Air Station

As an integral part of the filter installation, an air compressor is supplied, and will be of the rotary screw design type. The compressed system will be supplied complete with compressed air reservoir (pressure vessel), and necessary valving, automatic oil / moisture separators and interconnecting pipework from the installation to filter installation, soot blowing system and other compressed air users supplied as part of the filter installation.

Air Compressor Type: Screw Compressor – Atlas Copco GA 5 (or similar)

Technical:

Effective Air Volume by 7 bar	:	1 x 0,24 m^3/min
Max. Pressure	:	8 bar
Electric Motor	:	2,2 kW / 400 V / 50Hz
Compressed Air Receiver/Tank	:	1 off
Capacity	:	250 litres
Max. Pressure	:	11 bar
Max. Temperature	:	50 °C

3.9 Refractorised Flue Gas Ductwork

To convey the hot flue gases from the **single** cremator flue gas offtake, refractory lined ducting will be supplied, fabricated from mild steel, internally lined using 1400 °C grade castable refractory further insulated with calcium silicate insulation.

To ensure safe operation during emergency situations the above refractory duct is supplied with a by pass duct, fitted with a pneumatically actuated (fail

open) damper, which on the detection of emergency condition opens. The duct is fitted with a device to cool the gases prior to direct entry to the chimney stack.

3.9.1 Cool Flue Gas Ductwork

To convey the cooled flue gases from the flue gas cooler (boiler) to the filter installation and finally to the chimney, ducting is supplied from 3mm thick mild steel, of welded fabrication, supplied with flanged connections, designed for good flow characteristics.

The ducting will be supplied with all necessary flanges, fittings, connection pieces, screws and seals.

Flue Gas Ducting consisting of:

- Connecting duct from cooler (boiler) to filter
- Filter Preheat Bypass connecting duct
- Connecting duct from filter to induced draught fan
- Connecting duct from induced draught fan to chimney

3.9.2 Filter Bypass Valve

Placed in the ductwork to allow the flue gases to bypass the filter system, generally used to preheat the system prior to cremation, to protect the filter system against flue gas moisture.

Comprising pneumatically actuated twin butterfly valve arrangement, complete with system vent damper.

3.9.3 Filter Outlet Valve

Placed in the ductwork at the outlet of the filter, to ensure that the filter is isolated from the flue gases during bypass condition.

Comprising pneumatically actuated butterfly valve arrangement.

3.10 Thermal Insulation

For the exterior surfaces of the filter plant, thermal insulation is to be installed for contact (personnel) protection and to avoid the cooling of the plant parts during short standby periods.

Mineral wool Insulation thickness	:	50 to 100 mm
Mineral wool Insulation density	:	100 kg/m^3

Thermal Insulation areas addressed

- Insulation of the cooler

- Insulation of the filter housing, -hood, and -screw conveyor
- Insulation of the ductwork

3.11 Exterior Surface Treatment - Filter Unit

The exterior surfaces of the filter unit receive a single layer of two component epoxy resin prime coating, layer thickness at least 40 µm. These exterior surfaces are treated with a supplementary top coating on alkyd resin basis, layer thickness at least 40 µm.

The application of different types of paint may cause colour variances.

Any filter components supplied in special steel, galvanised steel or insulated surfaces are excluded from the above surface treatment.

3.12 Filter System Control and Electrical System

A dedicated control system is supplied for the automatic and integrated operation of the (cremator) flue gas boiler and filter system.

The control system will comprise of the following:

3.12.1 Control Enclosure

The enclosure will be designed conforming to European regulations; and comprise of a sheet steel cabinet, protected to IP 54. The enclosure will house power and control section, as well as wiring of devices in cable ducts. The control cabinet is designed with a minimum of fuses, completely wired on outlet clamps.

The control system will be based upon a "Mitsubishi" Programmable Logic Controller

The control enclosure also includes:

- 1 off Main Switch

as well as the following components:

- 1 off Control of the Induced Draught Fan utilising Frequency Inverter.
- 1 off Negative pressure control in connection with speed dependent induced draught fan
- 1 off Screw Conveyor control
- 1 off Control of the additive/ reagent dosing system
- 1 off Measurement of flue gas temperature after cooler
- 1 off Control of the cooler (boiler) water control system
- 1 off Control of the cooling fans from the re-cooler

The operator interface for the filter system will be via the SCADA based computer interface preloaded onto an IBM PC, supplied complete with a 17" TFT Flat Screen monitor.

3.12.2 Electric Cabling

The cabling between the plant and our control cabinet has been calculated with a medium cable length of 20 m. The electric cabling consists of:

- Cable
- Cable glands
- Galvanised cable tray
- Fastening material
- Accessories

The incoming power supply to the control panel is to be provided by the client. For actual Power requirements please refer to our electric motor schedule as listed within our engineering documentation / information package.

4.0 Equipment Documentation

Documentation will be supplied in the English language Two copies of the following will be supplied:

- Plant description
- Operation description
- Maintenance - and lubrication instructions
- Spare parts list

The information signs on the plant will be supplied in the English language.

5.0 OPERATIONAL PERFORMANCE

5.1 Dust emissions in Flue Gases

The residual dust content in clean gas is max. 10 mg/Nm³, referred to 11%O_2 v/v, measured according to VDI 2066.

5.2 Gaseous emissions

The concentration of the gaseous acidic and metallic pollutants will be abated by the flue gas treatment system. Based upon the inlet concentration of pollutants (as detailed in section 2.0 – Technical Design Data) and a ***Factivate*** reagent dosing rate of 300 grammes per hour, the flue gas emissions will be within the limits set down in the Process Guidance Note 5/2 (04) Issued September 2004: -

Emission	PG5/2 (04) Concentration Limit Value
Hydrogen Chloride excluding Particulate Matter	30 mg/m³
Total Particulate Matter from Cremator	20 mg/m³
Carbon Monoxide	100 mg/m³
Organic Compounds excluding Particulate Matter expressed as total carbon	20 mg/m³
Mercury	0.05 mg/m³
Dioxin	0.1 ng/ m³

Concentration values stated at standard gas reference conditions of 273 K. 1.013 Bar,11 % O_2, dry gas.

5.3 Sound emissions from the filter equipment.

The sound pressure level LAeq according to DIN 45635 - part 1 - at the plant is max. 70 dB_A in a distance of 1m. This is only valid for free field conditions without reflections.

The indicated sound pressure levels are valid for the non throttled operation of the plant, i.e. 100 % fan output.

Attenuation materials will be applied to the main ventilation fan to ensure compliance with the required 70 dB_A at 1metre distance, during normal operation hours.
Please note the other noise generating equipment will be supplied in normal (non silenced) format, both the Boiler Auto cleaning system and the filter cleaning produce noise during the shutdown process. This is after normal operating hours, and as such not considered for noise within our normal operational hours.

6.0 GUARANTEE

The filter installation, and its component parts (with the exception of those consumable items necessary for operation), are guaranteed for a period of **12** months from the date of hand over and a 3 year design liability, excepting fair wear and tear, subject to entering into a Service Contract with Facultatieve Technologies.

The design life of such equipment is taken as twenty years, this is of course dependant upon the equipment being operated and routinely maintained in accordance with supplied written instructions, and operated by trained personnel in possession of a Facultatieve Technologies Training Certificate. Replacement of all spares and consumable parts within such time must be with genuine components as approved by Facultatieve Technologies.

The above design life is offered in good faith, however Facultatieve Technologies cannot be held responsible for any changes within relevant legislation that may impact upon the above design life.

Conditions for unrestricted validity of our guarantee:

- The plant has to be operated according to our operating and maintenance instructions, and operated by trained personnel.
- The plant has to be operated within the established design parameters.
- The plant has to be commissioned by FTL nominated commissioning engineers.

Exclusion from guarantee

- Mechanical destruction of the equipment caused by handling malpractice.

The cleaned flue gas emission limits can only be assured, if sufficient addition of reagent is made to the system, and is in full accordance with the equipment's operating instructions.

In case of altered site conditions, the addition of the additive quantity may only be adjusted to the respective new requirement by agreement with FTL.

Consumable items are excluded from the scope of the guarantee

Proof of clean gas values:
The actual proof of achieving the required emission values of clean gas of the proposed filter plant can only be carried out by an authorised measuring institute.

Facultatieve Technologies

CONTROL AND MONITORING SYSTEMS FOR FT CREMATORS

Overview

The following document describes in detail the control and monitoring system proposed. As already advised this control system has already been supplied to the UK cremation industry and conform to the requirements of PG 5/2 (04).

The control package proposed is the product of many years of experience within the industry and represents our most sophisticated version of our **SCADA** control system yet.

This control system is designed by our "in house" specialist software engineers, using standard industry programme code. The actual control programme is downloaded onto propriety industrial grade PLC controllers, to which full access will be made to client via a password system local on site.

The PLC based control system utilises standard components, and interfaces with a simple, higher automated graphical control system, commonly referred to as **SCADA**. Graphical interfaces have been developed for both our FT cremators, and the Mercury Abatement Systems, all integrate seamlessly into one overall system, such that the cremators and filter systems can be controlled from one common place.

Additionally our integrated control system generates all the necessary reports as defined by the requirements of PG 5/2 (04), all automatically, and without HUMAN intervention.

A summary of our integrated SCADA control system is included, and described below.

SCADA Cremator Screen Description

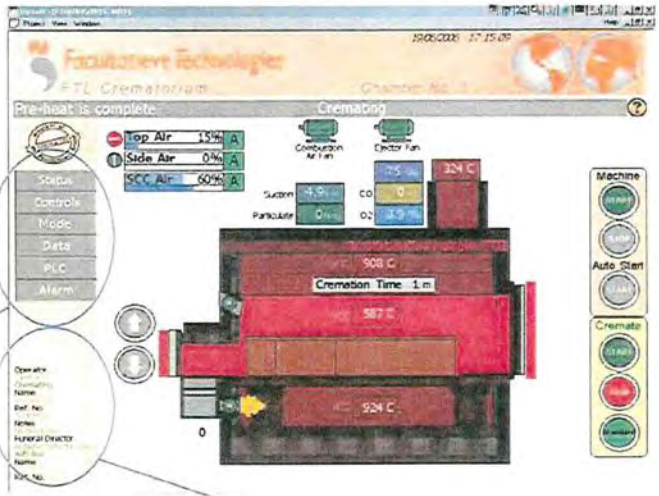
The control screens on the cremator are run under a **S**upervisory **C**ontrol **A**nd **D**ata **A**cquisition (SCADA) package called Wing. These screens will be automatically activated on PC start up. They can be closed down by clicking on the cross in the top right hand corner of the screen (this will stop all data logging, trending and will delete any stored user information). They can also be restarted from the Cremator icon.

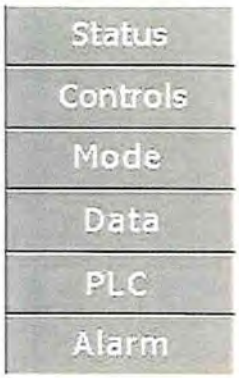
These screens communicate directly with the PLC and display various data items from the PLC. The screen can be closed and the PC shutdown without affecting the cremator control.

The screen has been developed over many years to make the cremation process as simple as possible for the operator.

The screen initially loaded is the main Status screen, shown below. All the main activities for normal running of the machine can be carried out from this screen.

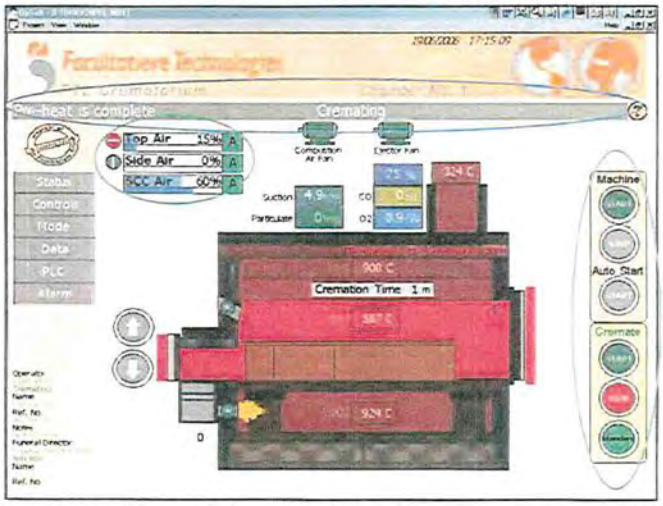
The screen has a navigation bar on the left hand side. This controls access to all screens on the system. Simply by clicking or touching (if a touch screen is fitted) on the appropriate button the desired screen will be displayed. This navigation bar will be displayed on every page.





Information about the cremation is entered at the bottom of the screen. This is reproduced automatically on the cremation report.

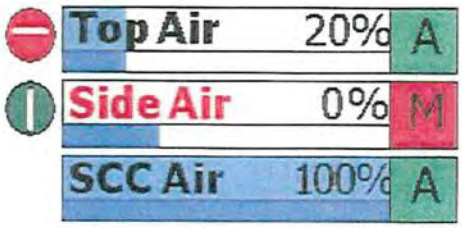
Operator
Operator
Cremating
Name
Deceased Name
Ref. No.
552634
Notes
Notes here
Funeral Director
Funeral Director name
Ash Box
Name
Previous Name
Ref. No.



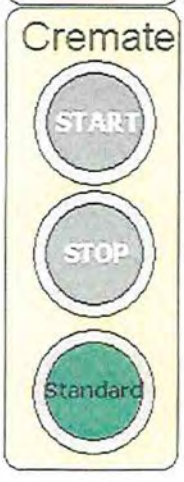
A Status bar is displayed at all times and on all screens, this gives various data about the status of the machine.

The controls most used are also displayed on this screen.

The air controls display the current levels and targets of the various air dampers on the machine. The dark blue line at the bottom of the bar is the target automatically set by the PLC. The lighter blue bar is the actual position of the damper. The top and side air dampers have limit switches fitted to detect their fully closed position. This is for safety reasons so that the operator cannot open the charge door with an combustion air on. This limit switch position is indicated by the symbol to the left of the air status bar. A red symbol indicates that the air is open, a green symbol indicates that the air is closed. In the picture above the side air is selected to manual and closed. The actual target position can be seen by the dark blue bar.



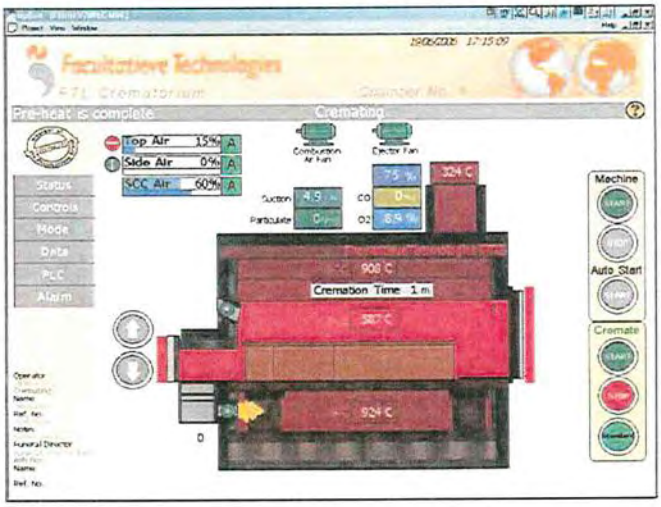
The controls on the right of the screen are used to start and stop the machine, both automatically and manually. The lower controls are used to start and stop cremation and to select the desired profile for cremation.

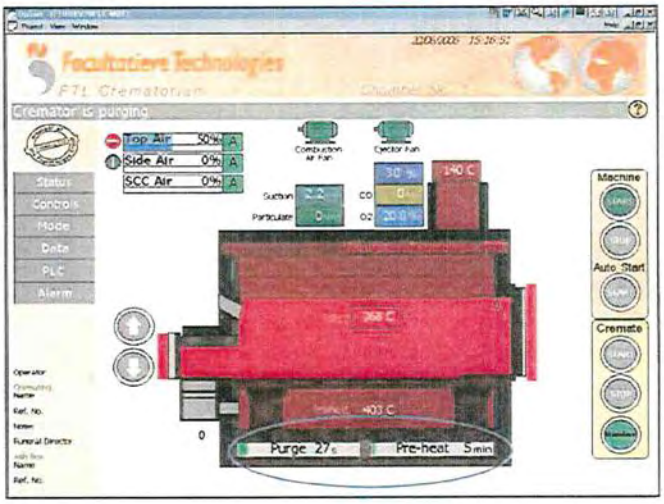


If fitted, a motorised ash door can also be operated from the status screen, using the open and close buttons to the left of the ash door.

The ash cool can also be operated from the status screen, by simply clicking on the ash cool box the ash cool can be turned on and off.

Various other data is displayed on the screen, including the temperatures and analytical data. The boxes that this data is displayed in will change colour to indicate that a parameter is out of normal operating range. This does not indicate an alarm condition but is designed to bring the operators attention to the parameter that is out of range.





Before the machine is started the estimated pre-heat time is displayed at the bottom of the cremator.

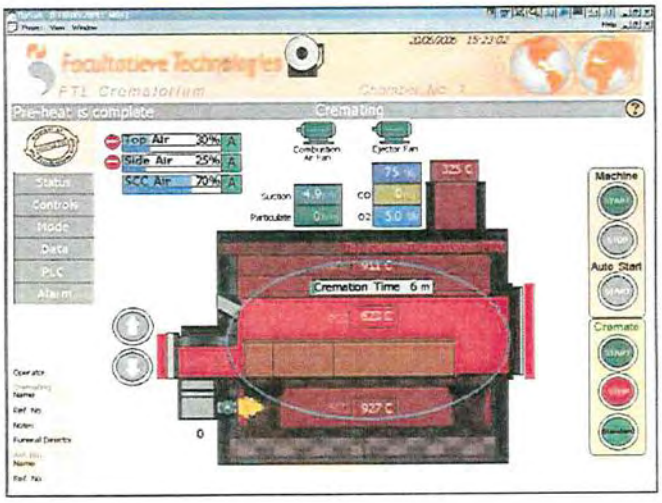
When the machine is started the purge time is displayed at the bottom of the screen.

The pre-heat time will then start to decrement.

Once cremating the coffin icon and the cremation time are shown in the main chamber.

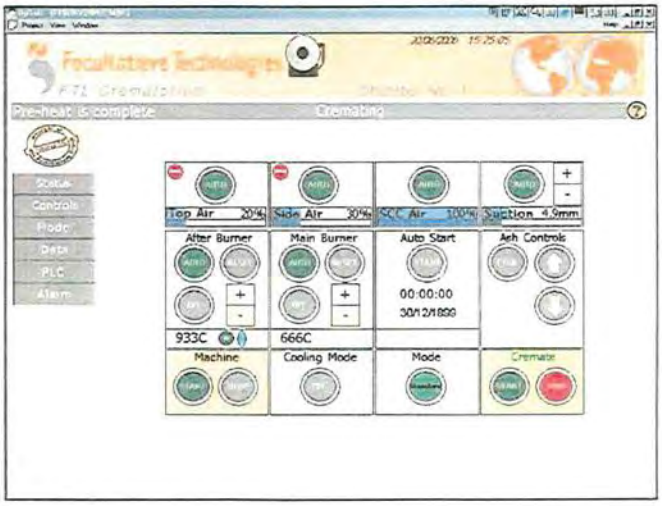
The cremation count is automatically incremented after each charge.

The next button on the Navigation bar is the controls page.



The Controls Page

This page contains all the cremator controls and allows for manual operation of each component on the cremator.



The air controls, mode and the start and stop controls are all duplicated on this page. In addition the burners and suction can be manually operated.

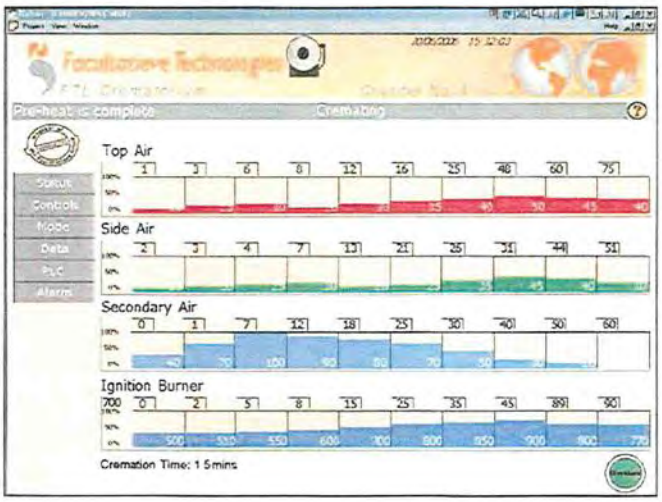
There is also a cooling mode selection. This is to allow the machine to be cooled for maintenance purposes.

Each part of the machine has 2 modes, auto and manual. In auto, the machine will cremate with minimal operator intervention required. Manual mode allows the operator to intervene as their experience dictates. All of the more safety critical controls are password protected to prevent their use by untrained personnel. Even in manual mode all safety functions are still active and the cremator will still take corrective action if an unsafe situation should occur in manual mode.

The next button on the Navigation bar is the Mode page.

The Mode Page

This page displays the selected profile. These are used to determine the combustion air during a cremation. The operator can select which profile they wish to use depending on the size of the charge to be inserted into the machine. Thus the machine controls can adapt very easily to different sizes of coffin. The profiles also provide a backup mechanism for secondary air control, in case a fault is detected with the oxygen readings.



The numbers above the air levels indicate the time in the cycle when the air levels will change. The coloured levels are the values to which the air will automatically move.

The Main burner also has a profile this is based on the desired temperature in the main chamber.

Very Heavy Charges

On screen version 30+, a new features has been added to aid with the cremation of very large charges, i.e. charges over 150kg.

If the heavy profile is selected then the operator will be prompted with a message box - *"Is the charge > 150kg"*. If he selects no, then the heavy profile will run normally. The message *"Max charge temperature 550°C"* will also appear. This is an automatic feature to cool the main chamber prior to charging. If the operator selects yes, then he will be prompted with the message *"Enter weight in kg"*. He should enter the known or estimated weight in kg's. A message box will then appear stating, for example *"Estimated Cremation Time 2 hours 8 minutes"*. The heavy profile will then be automatically modified to increase it time range over the estimated cremation time. The message *"Max charge temperature 550°C"* will also appear as mentioned earlier.

The next button on the Navigation bar is the Data page.

The Data Page

The Data page displays all the data required for the reporting requirements.

The data displayed is currently updated during/and at the end of each cremation. The operators can keep a check as to the performance of the machine against the requirements of PG5/2 (04) at any time.

The reporting package for the FTII/FTIII is currently designed to meet the requirements of PG5/2 (04). However, provision has been made to allow change over to the future requirements.

All the reports listed below are all automatically generated, these are all stored on the hard disk in a directory called *C:\Report*.

Reports can be selected to print (from the analytical screen) automatically as well as being stored on disk. Each month the reports are automatically collated ready to archive to CD. Simply click on the desired report. When a cross is shown the report will be print enabled.

The actual reports generated by the control system are listed below: -

Cremation report

Crematorium
Cremator Number: 1
Cremation Number: 1
Operators Name: FGT
Deceased Name: Test
Notes: Notes
Cremation Reference Number: 12345
Cremation time 75 minutes
Possible instrumentation Faults: -SCC Outlet Thermocouple-

	Min	Ave	Max	
Carbon Monoxide	0	5	45	mg/M3 at 11% Oxygen
Indicative Particulate Matter	4	35	55	mg/M3 at 11% Oxygen
Oxygen	4	7.5	15	%
PCC Temperature C	620	780	950	
SCC inlet Temperature C	880	920	980	C
SCC outlet Temperature C	858	870	900	C
Cremation Gas Usage (If Fitted)		0 M3		

Operator _____

Notes :

==========

The cremation report is not a requirement of PG5/2 04, but it is useful as a record of each individual charge and as management data. This report is automatically generated at the end of the cremation cycle, when the operator selects cremate stop.
It records all the following information: -

- The chamber number
- The cremation number
- Cremation data entered by the operator.
- The cremation duration.
- Possible instrumentation faults

On the cremation report a possible instrument fault is recorded under the following circumstances: -

Oxygen	If the Oxygen is outside the expected limits for a fixed period during the cremation cycle. These are O_2>18% or O_2<0.5%.
CO	If the Oxygen is high and the CO is high for a fixed period, this would tend to indicate that there was a leak in the air sampling system. This is activated if – O_2>5% and CO>950Nmg/m3.
Particulate	If the Particulate is outside the expected limits for a fixed period during the cremation cycle. This is activated if the particulate >195Nmg/m3.

SCC Temperature — If the Secondary chamber temperature is outside the expected limits for a fixed period during the cremation cycle. This would indicate the possible failure of the thermocouple or temperature instrument. This is activated if the SCC temperature>1200°C or <850°C.

These faults are logged and counted and reported on the monthly report

- The minimum, average and maximum values of CO, Oxygen, Particulate and secondary chamber temperatures. The maximum and minimum values are instantaneous values. The average is calculated over the first 60 minutes of the cremation.
- Cremation gas is recorded if a meter is fitted.
- The Cremation mode is recorded. The profile selected on charge and any subsequent changes during the cycle.
- There is an area left for the operator to sign and make notes if desired.

Daily report

Crematorium
Cremator number 1
Start Temperatures

Main Chamber	300 C
Secondary Inlet Chamber	320 C
Secondary Outlet Chamber	315 C
Flue	120 C
Pre-heat Time	58 Minutes
Pre-heat Gas Usage	0 M3
Waiting Time	63 Minutes
Waiting Time Gas Usage (if fitted)	0 M3
Total Cremation Time	150 Minutes
Number of Cremations	2
Average Cremation Time	75 Minutes
Time efficiency	58 %

Visual & Olfactory test carried out at:_____ Result:_____

Carried out by Sign:_____ Print:_____
Notes :

The daily report is also not a requirement of PG5/2 04, but it is useful as a record of the days cremation data and as management data. This report is automatically generated when the operator selects cremator stop.
It records all the following information: -

- The chamber number
- Machine start temperatures
- Fuel usage data if a meter is fitted
- Total cremation time
- The total number of cremations
- Average cremation time
- Time efficiency

  This is a calculation based on the ration of wasted (standing time, between cremations) and the actual time per cremation.

  $$Eff_T\ (\%) = \frac{\text{Crem Time - Stand Time}}{\text{Crem Time}} \times 100$$

- There is an area left for the operator to sign and make notes if desired.

Excessive CO report

Crematorium
Cremator Number 1
This report must be handed to the relevant environmental authorities.
The last cremation 60 minute mean emission of Carbon Monoxide
= 105 mg/m3
This report forms the list of excursions as required PG5/2(04)
and should handed to the relevant environmental authorities.

Operator:_____
Supervisor:_____
Notes:

Excessive CO report (Twice Limit)

Crematorium
Cremator Number 1
This report must be handed to the relevant environmental authorities immediately
The last cremation 60 minute mean emission of Carbon Monoxide exceeded twice the required limit
= 210 mg/m3
This report forms the list of excursions as required PG5/2(04)
and should handed to the relevant environmental authorities.

Operator:_____

Supervisor:_____
Notes:

Excessive Particulate report

Crematorium
Cremator Number 1
This report must be handed to the relevant environmental authorities.
The cremation 60 minute mean emission of indicative Particulate matter
= 110 mg/m3
This report forms the list of excursions as required PG5/2(04)
and should be handed to the relevant environmental authorities.

Operator:_____
Supervisor:_____
Notes:

Excessive Particulate report (Twice Limit)

Crematorium
Cremator Number 1
This report must be handed to the relevant environmental authorities.
The last cremation 60 minute mean emission of indicative Particulate matter
= 215 mg/m3
This report forms the list of excursions as required PG5/2(04)
and should handed to the relevant environmental authorities.

Operator:_____
Supervisor:_____
Notes:

The excessive emission reports are a requirement of PG5/2 04. These reports are automatically generated if the emissions exceed the levels set in the guidance note.
It records all the following information: -

- The chamber number
- The emission level.

Monthly report

Monthly Report for Crematorium
Cremator number: 1 FTII Cremator
Report for month period starting 01 April 2005
Total number of cremations: 103
Number of cremations with results not reported: 0
Number of cremations with possible instrumentation faults: 2

Parameter	PG5/2 criteria for peroid	Ave Value	Min Value	Max Value
SCC inlet C	>850C	920	875	1080 C
SCC outlet C	>850C	860	865	975 C
O2 % (Dry)	Ave >6% Min >3%	8.0	3.0	15.0 %
CO	mg/m3	34	0	76 mg/M3 at 11% Oxygen
Particulate	mg/m3	25	0	54 mg/M3 at 11% Oxygen

	PG5/2 criteria	CO	Particulate
% of cremations over the limit	<5%	1	0
No. of cremations over the limit		1	0
No. of cremations over 2 x the limit	Nil	0	0

Monthly 95 percentile of cremation values

Parameters	95 Percentile Nmg/m3
Particulates	27
CO	21

Reporting to PG5/2 2004
This report should be forwarded to the relevant environmental authority.

Cremations Exceeding 100% limits (CO 200mg, Particulate 160mg)
Cremations Above the 95%% limits (CO 100mg, Particulate 80mg)
CO 105mg, 12/06/06, Ref: 12654

Operator Name:_____
Notes:

The monthly report is a requirement of PG5/2 04. This report is automatically generated on the first day of the month.
It records all the following information: -

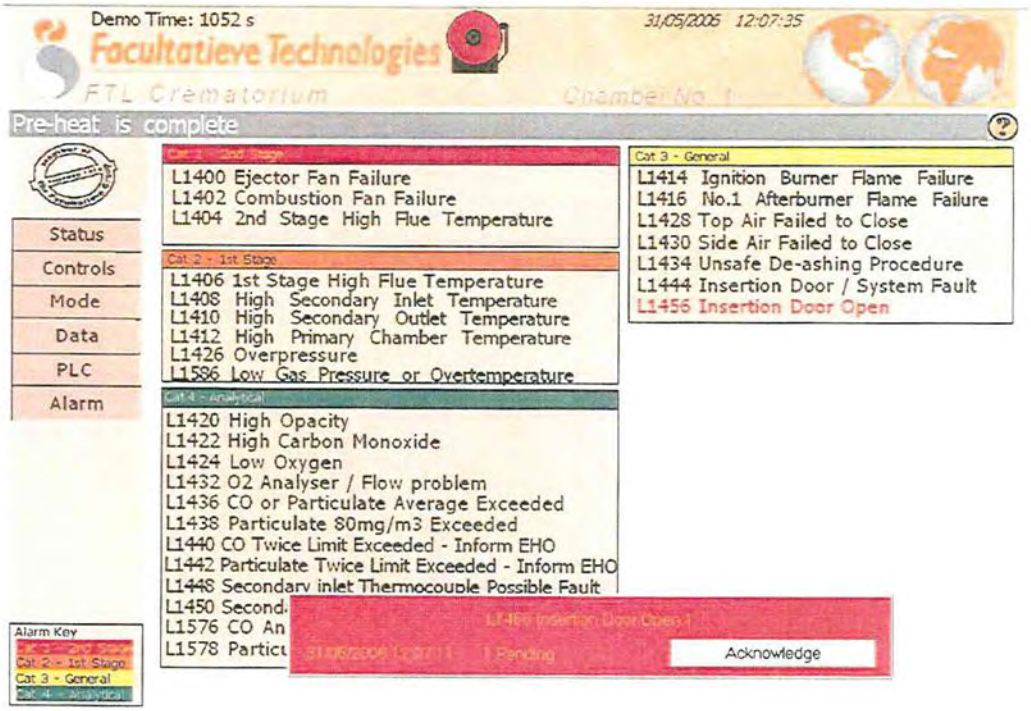
- The chamber number and machine type
- The start date for the data that the report covers
- The total number of cremations in the month
- The total number of cremations with results not reported. This is a comparison between the number of cremations counted and the number of reports generated.
- The total number of cremations with possible instrumentation faults (see the description under cremation report).
- The minimum, average and maximum values of CO, Oxygen, Particulate and secondary chamber temperatures. The maximum and minimum values are instantaneous values, over the entire month. The average is the sum of all the 60 minute cremation averages divided by the number of

cremations.

- The percentage of cremations <5% over the limit. This is the percentage of total cremations over the emission limit.
- The number of cremations over the limit. This is the total number of cremations that have exceeded the limit (including those twice the limit).
- The number of cremations over twice the limit. This is the number of cremations that have exceeded twice the limit.
- Monthly 95 percentile of cremation values. This is the 95 percentile of the cremation 60 minute averages.
- List of excessive emissions.
- List of twice the limit excessive emissions.

The Alarm Screen

This screen lists all the alarms and displays their current status.



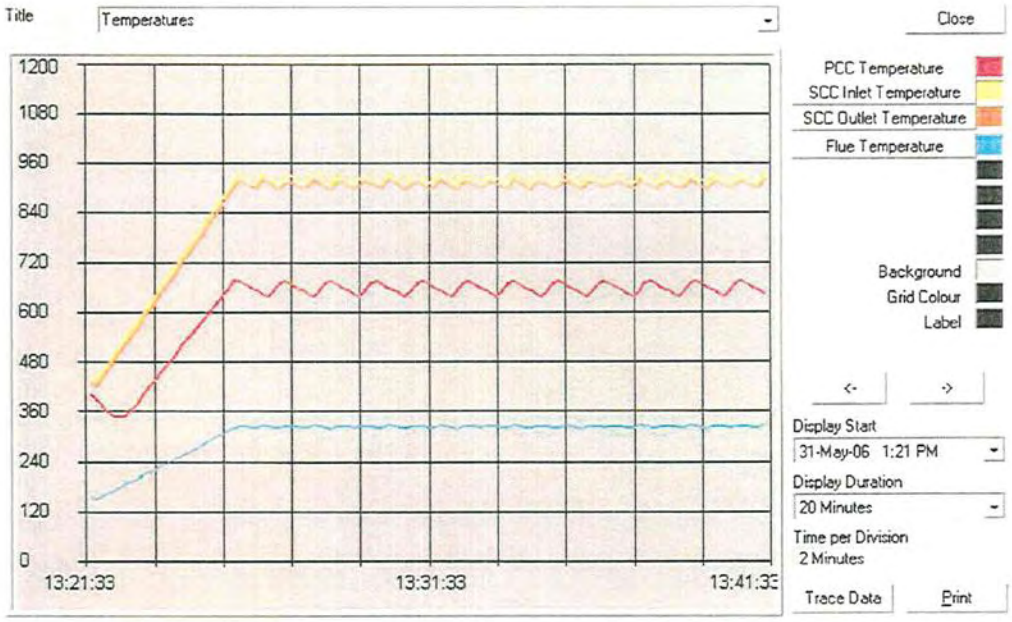
The alarms are grouped into categories due to their relevant severity. This is to make fault finding by an operator an easier task.

The alarm text is also colour coded depending on the importance of the alarm.

- If the alarm is clear then the text will be black
- If an alarm is active the text will go red.
- If an alarm is acknowledged then the text will appear blue.

Trending

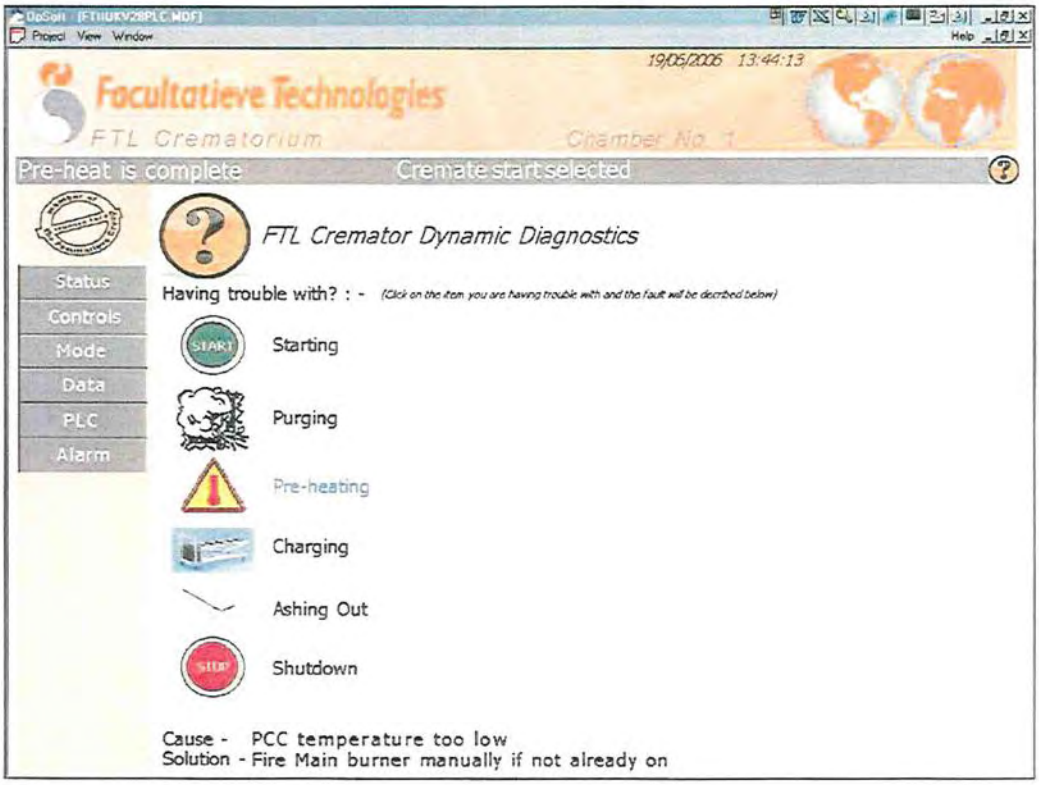
The system can trend all analytical information in real-time. The trend graphs can be viewed in real-time by the operator. Or they can be taken away and used for diagnostic purposes by an FTL engineer. All trend graphs can provide historical data and are automatically backed up with the reports at the end of each month.



Dynamic Diagnostics (V28+)

A dynamic diagnostics screen has been added. This is accessed by clicking on the question mark on the right hand side of the status bar.

If you are having problems with any of the modes listed on the left hand side, then by simply clicking on the icon a Cause and Solution will be displayed at the bottom of the screen.

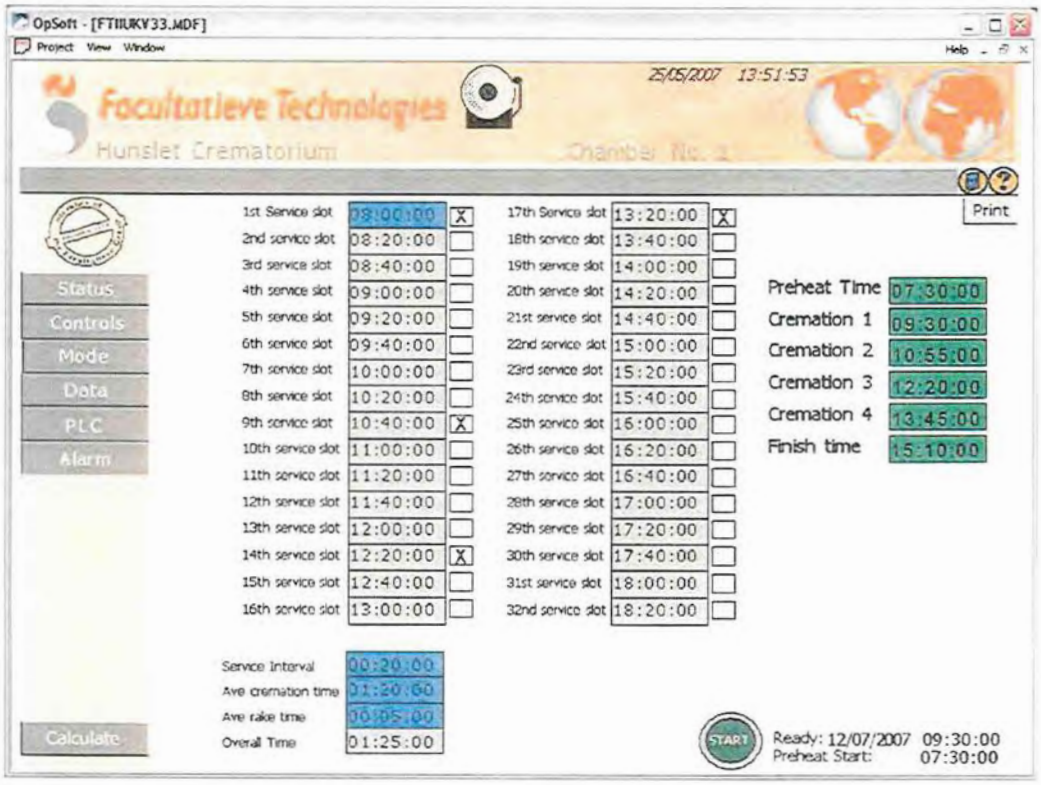


Facultatieve Technologies

Cremation Planning Calculator

On FTII screen V33+ a new feature has been added, a cremation planning calculator. This has been added as an aid to the efficient planning of cremations.

This is very simple to use. To access the calculator simply click on the calculator icon on the top right of any screen.



Set up

Firstly the individual crematorium data should be set, this only needs to be set once. The service interval should be entered; this is the time between the chapel services. Simply click on the blue box and enter the time, i.e. 00:45:00 for 45 minutes. The average cremation time should then be set; this would probably be around 80 minutes. Again, click on the blue box and enter the time, i.e. 01:20:00 for 80 minutes. Then the rake time can then set as per the other data. Finally set the 1st service time. The service slots will then automatically calculate. The calculator is now set up; these settings will now be remembered in the event of the PC being restarted.

Using the calculator

Click on the box to the right of the services you have for the day, a cross will appear to confirm the selection. Then press the calculate button. Green boxes will appear on the right to show the most efficient cremation times. A prompt

will appear asking if the calculated times are to be used to automatically start the preheat. If yes is selected you will be prompted to enter the date for starting, click on the date button when it appears and put in the date i.e. 06/08/07. Finally a prompt will appear to select the autostart button. This can be selected or just left and set manually later as normal. The print button can be pressed to print out the calculated times. This gives a report with the times and space for comments and tick boxes so that the cremations can be checked off when complete.

A new calculation can be carried out at any time.

Mercury Abatement System SCADA Screen Description

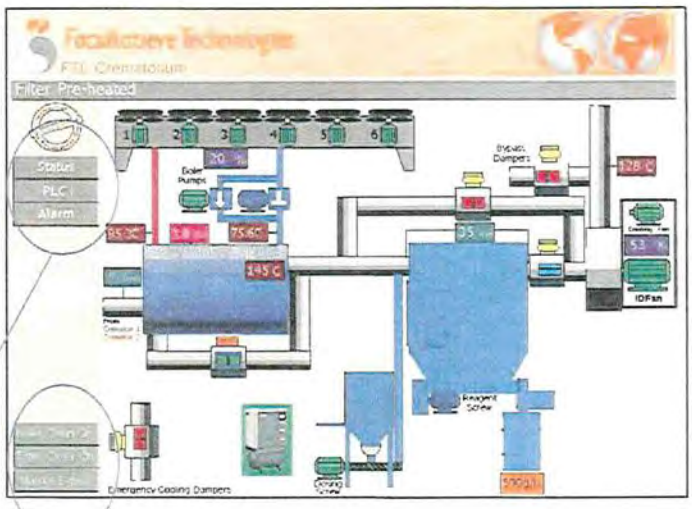
The control screens on the cremator and filter system are run under a **S**upervisory **C**ontrol **A**nd **D**ata **A**cquisition (SCADA) package called Wing. These screens will be automatically activated on PC start up. They can be closed down by clicking on the cross in the top right hand corner of the screen (this will stop all data logging, trending and will delete any stored user information). They can also be restarted from the Cremator icon.

These screens communicate directly with the PLC and display various data items from the PLC. The screen can be closed and the PC shutdown without affecting the cremator control.

The screen has been developed over many years to make the cremation process as simple as possible for the operator.

The screen initially loaded is the main Status screen, shown below. All the main activities for normal running of the machine can be carried out from this screen.

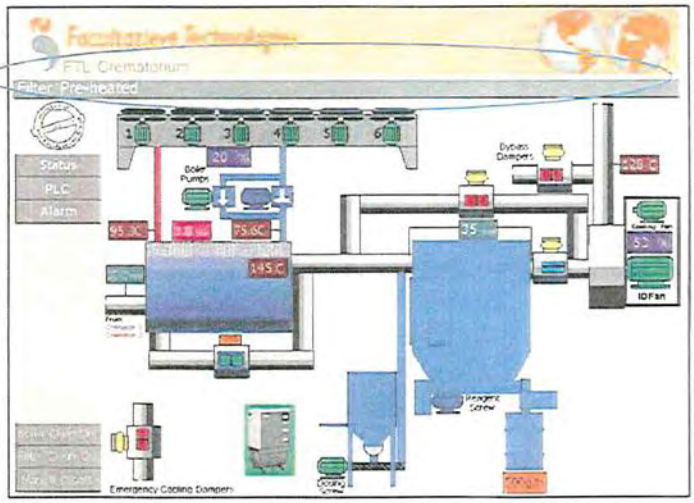
The screen has a navigation bar on the left hand side. This controls access to all screens on the system. Simply by clicking or touching (if a touch screen is fitted) on the appropriate button the desired screen will be displayed. This navigation bar will be displayed on every page.



The filter does not have a control page, all controls are automatic. The machine is started when the cremator start is selected. There are 3 buttons these allow the operator to select the boiler and Filter cleaning on or off and allow for the selection of filter bypass.

A Status bar is displayed at all times and on all screens, this gives various data about the status of the machine.

Various other data is displayed on the screen, including the temperatures and analytical data. The boxes that this data is displayed in will change colour to indicate that a parameter is out of normal operating range. This does not indicate an alarm condition but is designed to bring the operators attention to the parameter that is out of range.



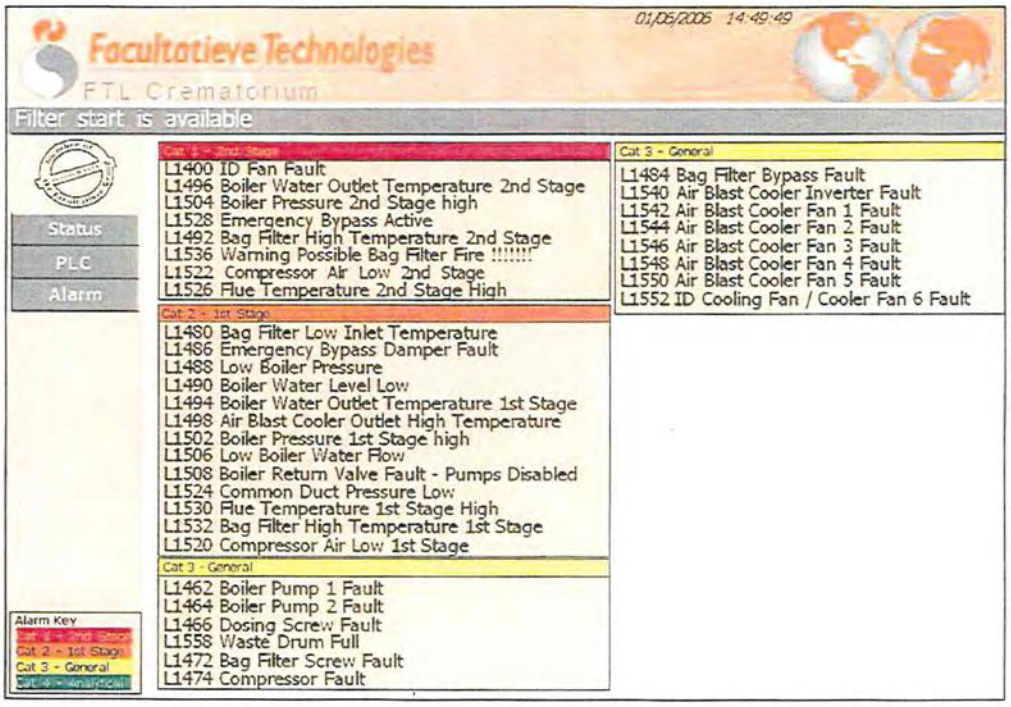
The next button on the Navigation bar is the PLC page.

This screen is used purely for remote diagnostics.

The next button on the Navigation bar is the Alarm page.

The Alarm Screen

This screen lists all the alarms and displays their current status.



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The alarm text is also colour coded depending on the importance of the alarm.

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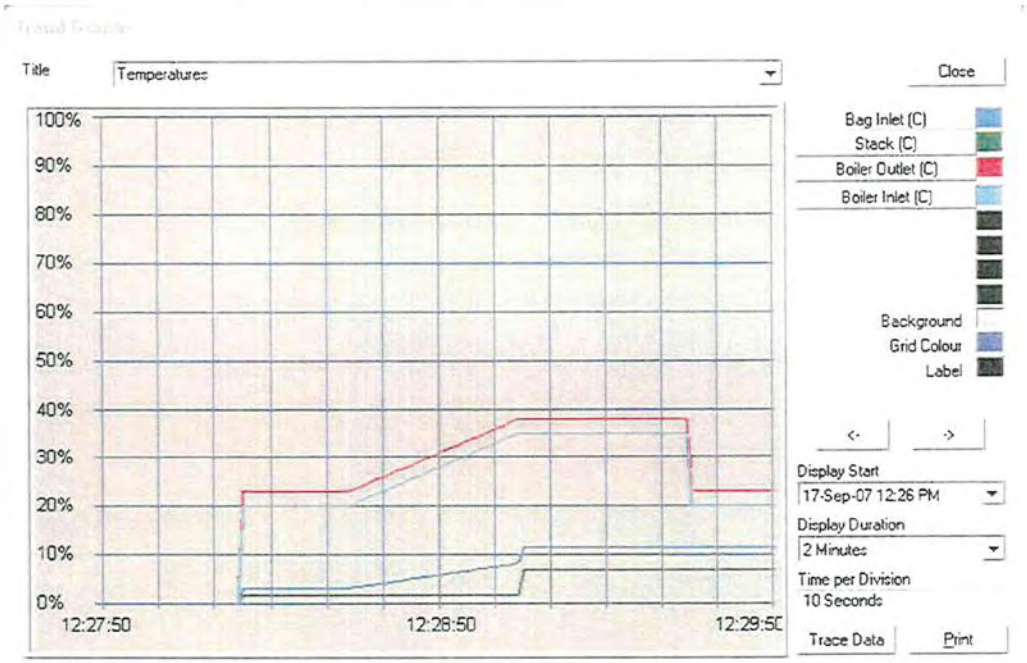


Facultatieve Technologies

FACULTATIEVE TECHNOLOGIES LTD

TECHNICAL SPECIFICATION

High Speed Cremulator

Facultatieve Technologies

TECHNICAL SPECIFICATION

High Speed Cremulator

INTRODUCTION

The Facultatieve Technologies ***High Speed*** Cremulator has been specifically designed to cater for the specific needs of the modern day crematorium facility. The ***High Speed*** Cremulator is an advanced and reliable ash processor, designed for the exacting standards of today.

The ash cremulator's design **minimises** the human input to the ash processing, and is designed to minimise all dust emissions, so contributing to a **safer**, **healthier** and **cleaner** work place for all crematorium staff.

The Advanced Technical Features of the *High Speed* Cremulator include:-

- **Fast** and **efficient** ash **processing** times – **2 Minutes (repeated operation)**
- Separates **metal** parts **automatically**.
- The ***High Speed*** Cremulator ensures **100% of ashes 3.2** mm or less.
- Readily **accepts metal** components normally difficult to remove from the cremated remains.
- Accepts cremated remains directly from the cremator.
- Highly **Automated** Design.
- **Computerised** controls.
- **Minimum handling** of ash, cremator **ash pan** straight to **urn.**
- **Robust** fabrication, with a pleasing **aesthetic appearance.**
- **Low Noise** design.
- Designed for **ease of maintenance**, all moving parts and electric motors positioned for ease of access.

- *Facultatieve Technologies Ltd recommends that the cremulator be supplied with an **integrated dust suppression** system, such as is fitted to our cremulated remains transfer cabinet. This cabinet comprises a high efficiency air **filter**, so ensuring that the equipment meets the health and safety requirements of current European regulations.*

TECHNICAL PERFORMANCE

The design of the ***High Speed*** Cremulator gives rise to a highly automated ash cremulating process, requiring the minimum of operator input.

During operation, the ***High Speed*** Cremulator offers **fully automatic** operation. Typically the cremated remains can be taken directly utilising the cremator's stainless steel ash pan and placed directly into the ***High Speed*** Cremulator. From this point, the High Speed Cremulator **automatically separates all metallic** objects and processes the cremated remains. All the separated metallic objects are automatically deposited (returned) to the empty stainless ash pan. Facultatieve Technologies Ltd can achieve a separation efficiency of greater than 99.9%, resulting in less than 0.1% of the ash remaining with the metallic debris within the ash pan. At the end of the automatic process, the ash pan can be manually removed, and the metallic objects therein disposed of.

The design of the High Speed Cremulator ensures that 100% of all the cremated remains is 3.2mm or less in size.

Note Facultatieve Technologies would recommend manual removal of any large medical prosthetic instrument for improved equipment life, and reduced wear – however the *High Speed* cremulator will operate if charged (in error) with such a component.

TECHNICAL DESCRIPTION

Construction Description

The cabinet and housing of the cremulator is fabricated from powder coated steel, to give an easily maintained cabinet finish.

General Specification of the cremulator :

Overall Dimensions

Height	**1.875** metres
Width	**1.10** metres
Depth (max)	**0.77** metres
Framework	Painted mild steel
Cabinet Finish	Powder coated mild steel
Inner Cabinet Finish	Brushed Stainless steel

The total weight of the equipment is approximately 550 kg.

For further information please refer to our detailed technical brochure

The cremulator housing is a purposed designed enclosure, fully lined with acoustic absorbent materials, to reduce noise emissions during operation.

If desired the cremulator cabinet can be supplied with low level storage for empty stainless steel ash pans.

Electrical Control System

The cremulator is supplied with a dedicated control system, based on an industrial standard Programmable Logic Controller, and is supplied fully wired and ready for operation.

The control of the *High Speed* Cremator is controlled via an easy to use **H**uman **M**achine **I**nterface (**H.M.I.**), comprising an alpha – numeric liquid crystal display and tactile push buttons for extremely simple and highly efficient operation.

The equipment need only be connected to the local single phase (domestic) 220-240 Volt electrical supply via the supplied electrical fly lead.

Dust Suppression System - (Optional Additional Supply)

The dust suppression is based upon a high volume low suction handling unit incorporating a bag filter. No external air vent or chimney is required, all re-circulated air is filtered by a terylene needlefelt filter system, so ensuring low levels of dust emission from the equipment.

The filter system fitted is rated as 98% efficient at 10 micron particle sizing. Typically this performance gives rise to a dust emission from the equipment significantly lower than all current European legislation and requirements

The cremulator cabinet incorporates both low and high level extraction points, so ensuring efficient entrainment of dust particles within the extracted air volume. The movement of the air within the cabinet is from front to back, thus ensuring any dust is always drawn away from the operator.

Access for Maintenance

The need for access for maintenance has been carefully considered in the cremulator design, all moving parts, wear parts and electrical motors are positioned for ease of maintenance.

Facultatieve Technologies has a policy of continuous improvement, and therefore reserves the right to amend this technical specification without prior notice.

Facultatieve Technologies

FACULTATIEVE TECHNOLOGIES LTD

TECHNICAL SPECIFICATION

Cremated Remains Transfer Cabinet

Facultatieve Technologies

TECHNICAL SPECIFICATION

Cremated Remains Transfer Cabinet

The Facultatieve Technologies Ltd Cremated Remains Transfer Cabinet generally is designed to protect operating staff from inhalation of excessive dust during ash handling operations and minimise dust entering the working environment.

The unit comprises an open-fronted, ventilated hood positioned at an operating height available for use in the standing position with a dust filter unit housed beneath it in an integrated free-standing unit.

General Specification of the Cremated Remains Transfer Cabinet:

Overall Dimensions

Height	1.630 mm
Width	750 mm
Depth (max)	775 mm

The unit is constructed of powder coated mild steel in light grey (RAL 7047). The inner working surface is of brushed finish stainless steel and is to be provided with a 50mm diameter hole and flush fitting spigot complete with cover to allow any spillage of ash to be brushed through the hole and into a receptacle held below.

The front operating aperture is approximately 600mm wide and 500mm high with its lower edge approximately 980mm from the floor level. The lower cabinet, housing the filter unit is provided with double doors hinged on the outer edge and held closed with a suitable latch.

The ventilated hood is fitted with an internal light to illuminate the work area controlled by a combined switch mounted on the outside of the hood, which also controls the filter unit. The unit is wired for 240v single phase with a 13amp plug for use with a normal socket.

The noise level of the unit has been measured at around 75dB(A) at 1 meter in a free field situation. The fully integrated freestanding unit incorporates a high volume extraction system using bag filter technology, which provides a face velocity of 0.5m/sec to allow for the open-fronted working area. A manually operated mechanical shaker is incorporated for dust removal.

The Cabinet is compliant with all relevant Health & Safety legislation including the following:

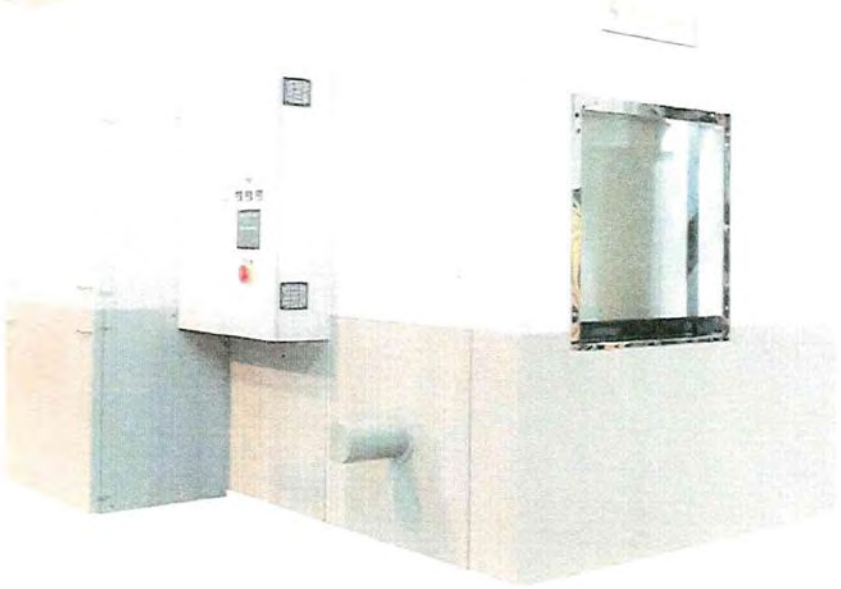
- Section 63 of The Factories Act 1961
- Section 2 of The Health & Safety at Work Act 1974
- HSE Guidance Note EH40 "Occupational Exposure Limits"
- HSE Guidance Note EH44 "Dust in the Workplace: General Principles of Protection."

Facultatieve Technologies
Cremation & Incineration Equipment

Technical Information

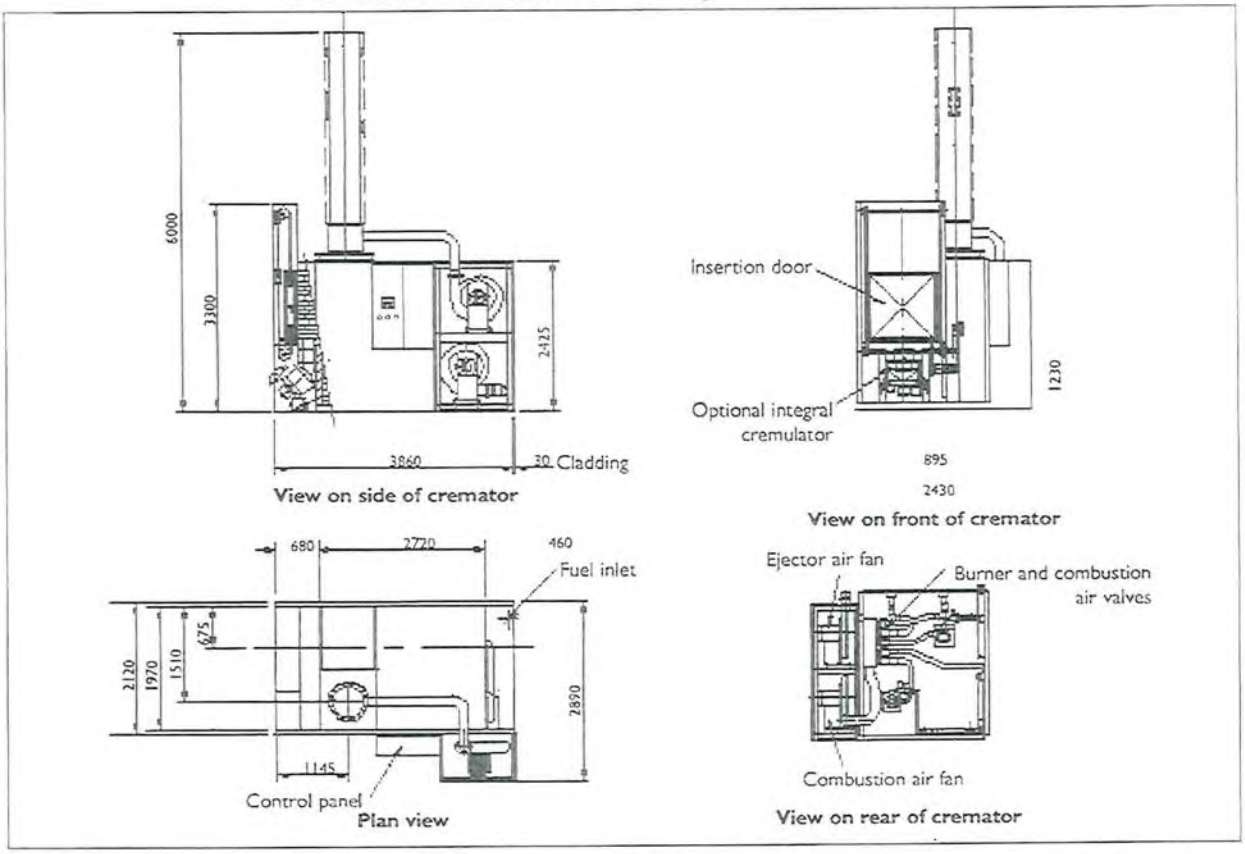
FT II - CREMATOR

member of founded 1874 The Facultatieve Group



- ✔ Compact and quiet
- ✔ High capacity
- ✔ Fully automatic
- ✔ Modem link for on-line maintenance analysis and fault-finding
- ✔ Integrated ash cremulator (optional)
- ✔ Excellent environmental performance
- ✔ Low maintenance, with easy access to components
- ✔ Good price, high quality

Please refer to technical drawing for further details



FT II CREMATOR

Specifications

Height	3 300 mm
Width	2 120 mm
Length	3 860 mm
Weight	12 600 kg
Fuel	Natural Gas / LPG
Opening for installation	2 650 mm wide x 2 650 mm high

Electrical Characteristics

Combustion air fan	2 000 m³/h at 20 °C, 5,5 kW
Ejector air fan	2 000 m³/h at 20 °C, 5,5 kW
Control System	1,5 kW
Electrical Supply	50 Amps (Motor rated) 3 x 400 Volts + neutral + earth - 50Hz

Fuel Consumption

Burner Ratings

Primary Burner	250 kW
Secondary Burner	300 kW
Natural Gas usage typically	20m³ / cremation (excludes pre-heating of cremator)

LPG usage on request
Also available in double end format

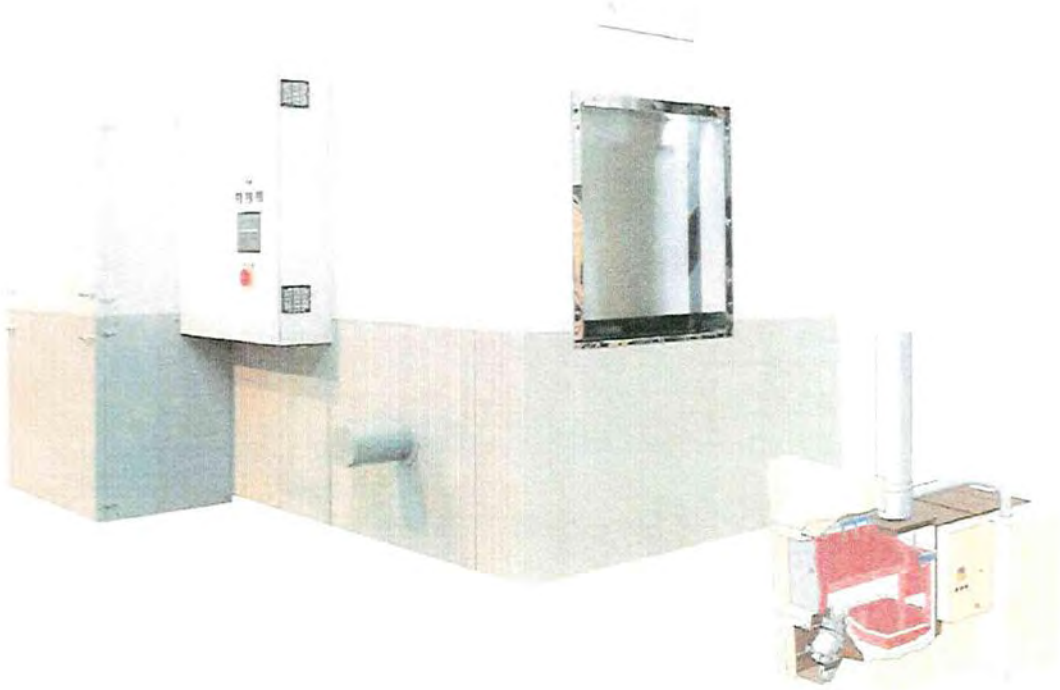
www.facultatieve-technologies.com

Facultatieve Technologies
Cremation & Incineration Equipment

Technical Information

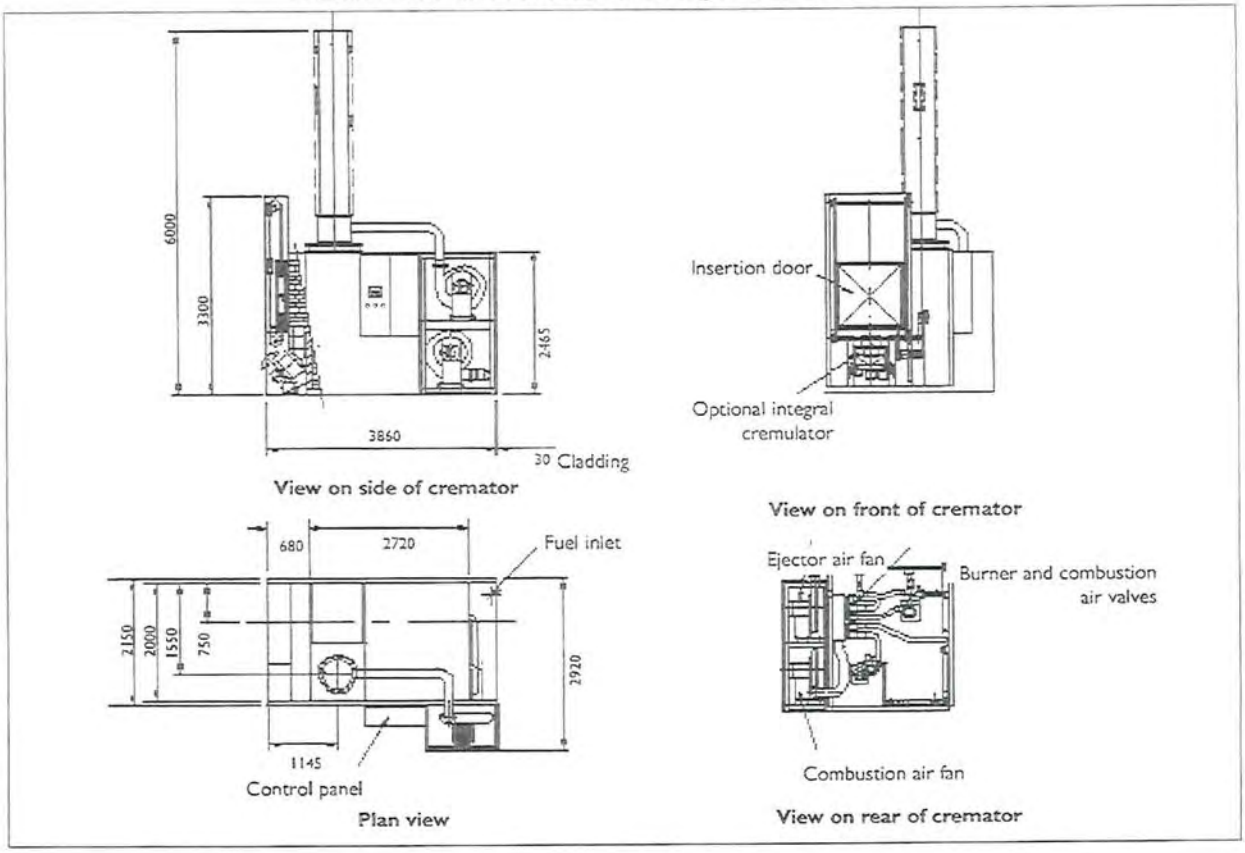
FT III - CREMATOR

member of the Facultatieve Group founded 1874



- ✔ Excellent Environmental Performance
- ✔ High Operational Capacity
- ✔ Accepts the largest of coffins – up to 1050 mm (43 inches) wide
- ✔ Fully Automatic – PLC based controls
- ✔ Modem Link – Remote Technical Support – on line fault diagnostics
- ✔ Highest Quality Design – Competitively priced
- ✔ Low Maintenance Requirements - Higher productivity
- ✔ Integrated Ash Cremulator available
- ✔ Compact, space saving design

Please refer to technical drawing for further details



FTIII Cremator
Specifications

Height	3300 mm
Width	2150 mm
Length	3860 mm
Weight	13 500 kg
Fuel	Natural gas / LPG / Oil
Opening for installation	2650 mm x 2650 mm high

Electrical Characteristics

Combustion Air Fan	2000 m³/h at 20°C, 5.5 kW
Ejector Air fan	2000 m³/h at 20°C, 5.5 kW
Control Panel	1.5 kW
Electrical Supply	50 Amps (motor rated) 3 x 400 Volts+neutral+earth 50 Hz

Fuel Consumption

Burner ratings

Primary Burner	250 kW
Secondary Burner	350 kW
Natural Gas usage	20 m³ / cremation (excludes pre-heating of cremator)

LPG usage available on request.
Also available in double end format.

www.facultatieve-technologies.com

Facultatieve Technologies
Cremation & Incineration Equipment

Technical Information

FT Cremated Remains Transfer Cabinet

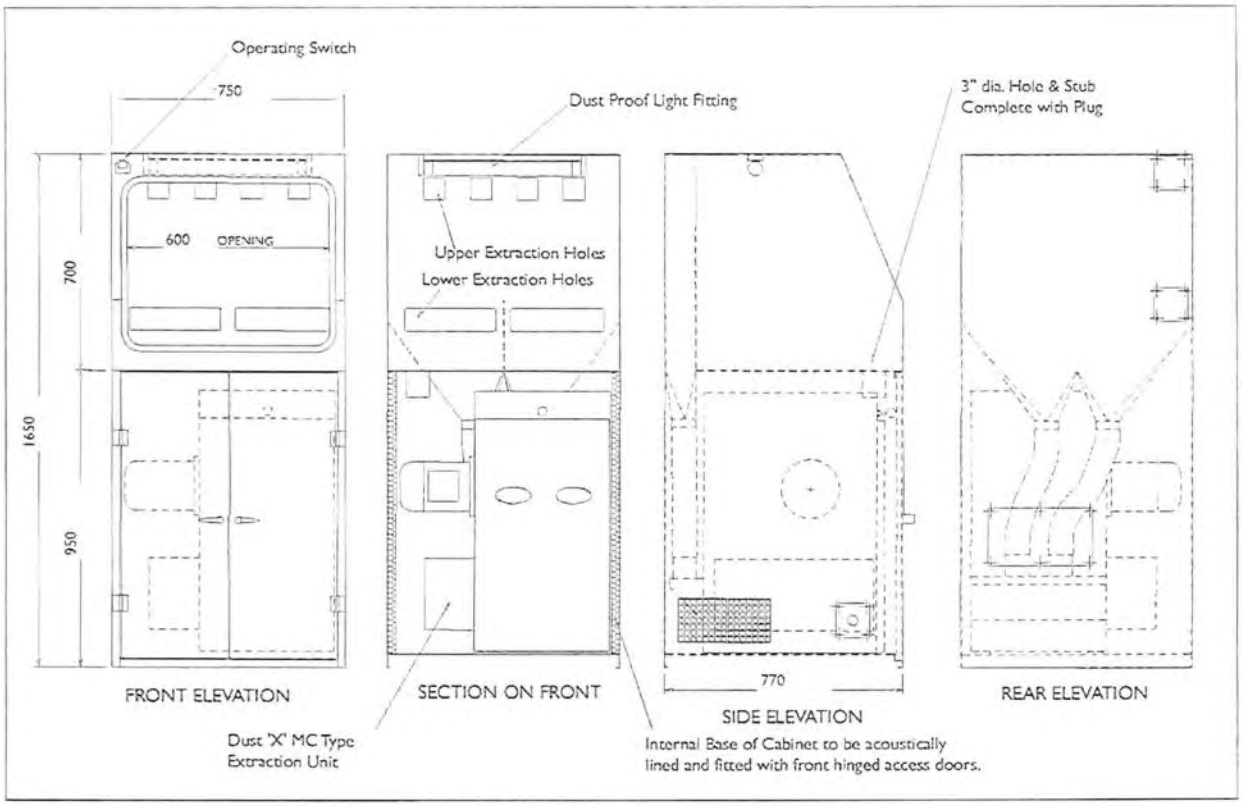
member of the Facultatieve Group founded 1874

The FT Cremated Remains Transfer Cabinet is a new and highly efficient unit which virtually eliminates fugitive airborne dust emissions created by normal ash handling operations. The high volumetric extract rate allows for an open-fronted working area without the restriction of gloves or arm slots. The unit – which of course complies with the relevant European standards and regulations – therefore contributes in an important way to a safe, healthy and pleasant working environment.

FT Cremated Remains Transfer Cabinet

- ✔ Excellent environmental performance
- ✔ High volume extraction system
- ✔ Industrial bag filter application
- ✔ Simple and quick to install
- ✔ Complies with relevant European standards
- ✔ No maintenance
- ✔ Compact and modern design
- ✔ Good price, high quality

Please refer to technical drawing for further details



FT Cremated Remains Transfer Cabinet

Basic dimensions:

Width:	750 mm
Depth:	775 mm
Height:	1,630 mm

Technical data:

Fan motor size:	1.1 kW, 220v, single phase
Nominal air volume extracted:	825 m³/hr
Filter media & area:	Terylene Needlefelt, 2.5 m²

The Cremated Remains Transfer Cabinet is constructed from steel and finished with light grey (RAL 7047) powder coating, with a hardwearing brushed stainless steel inner work surface.

Facultatieve Technologies gives advice and support on the whole cremation process. Our product range is extensive and we are therefore able to supply the ideal product in any situation. Facultatieve Technologies provides excellent support and maintenance services anywhere in the world.

Facultatieve Technologies is an international market leader in the design, construction and maintenance of cremators and incinerators and can supply reliable and fully automated equipment through its offices located in the Americas, China, the Czech Republic, France, Germany, The Netherlands and the UK as well as through a world-wide network of agents. Our products meet the most stringent environmental legislation.

www.facultatieve-technologies.com

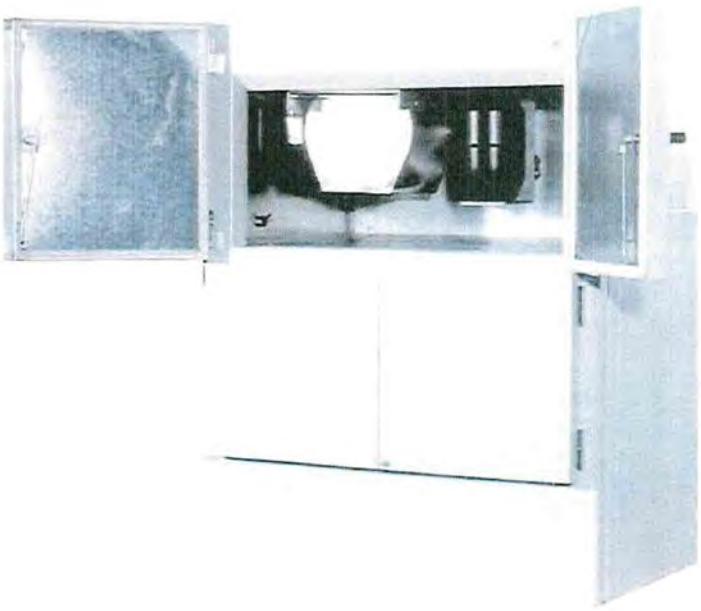
09/08-ABU-E

Facultatieve Technologies

Technical Information

High Speed Cremulator

member of the Facultatieve Group founded 1874

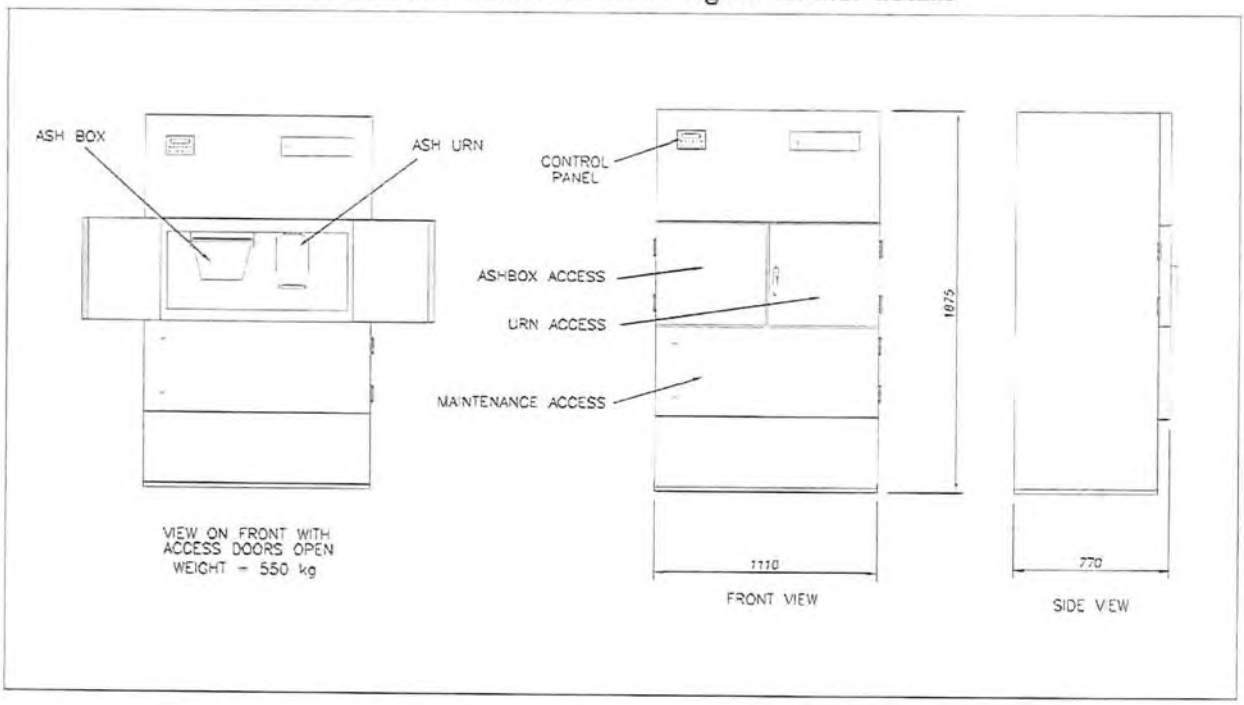


The Facultatieve Technologies High Speed Cremulator has been specifically designed to cater for the specific needs of the modern day crematorium facility. The High Speed Cremulator is an advanced and reliable ash processor, designed for the exacting standards of today.

THE ADVANCED TECHNICAL FEATURES OF THE HIGH SPEED CREMULATOR INCLUDE:

- ✔ Fast and efficient ash processing times – 2 Minutes (repeated operation)
- ✔ Minimum handling of ash, cremator ash pan straight to urn
- ✔ Separates metal parts automatically
- ✔ The High Speed Cremulator ensures 100% of ashes 3.2 mm or less
- ✔ Accepts cremated remains directly from the cremator
- ✔ Highly Automated Design
- ✔ Computerised controls
- ✔ Robust fabrication, with a pleasing aesthetic appearance
- ✔ Low Noise design
- ✔ Designed for ease of maintenance
- ✔ Readily accepts metal components normally difficult to remove from the cremated remains

Please refer to technical drawing for further details



Technical Performance

During operation, the High Speed Cremulator offers fully automatic operation. Typically the cremated remains, can be taken directly from the cremator's stainless steel ash pan and placed directly into the High Speed Cremulator. From this point, the High Speed Cremulator automatically separates all metallic objects and processes the cremated remains. All the separated metallic objects are automatically deposited (returned) to the empty stainless ash pan. At the end of the automatic process, the ash pan can be manually removed, and the metallic objects therein disposed of.

Technical Data

Height	1.875 metres
Width	1.11 metres
Depth (max)	0.77 metres
Framework	Painted mild steel
Cabinet Finish	Powder coated mild steel
Inner Cabinet Finish	Brushed Stainless steel
Electrical Supply	220-240 V domestic supply
Controls	Programmable Logic Controller
Operated	via dedicated Human Machine Interface

The cremulator housing is a purposed designed enclosure, fully lined with acoustic absorbent materials, to reduce noise emissions during operation. The cremulator is supplied fully wired and ready for operation. The need for access for maintenance has been carefully considered in the cremulator design, all moving parts, wear parts and electrical motors are positioned for ease of maintenance.

Dust Suppression System - (Optional Additional Supply)
As an option, the cremulator can be supplied with our Cremated Remains Transfer Cabinet complete with an integrated dust suppression system, comprising a high efficiency air filter, meeting the requirements of current European regulations.

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09/08-Model HSC-E

Facultatieve Technologies
Cremation & Incineration Equipment

Technical Information

member of the Facultatieve Group founded 1874

Automatic Insertion System Type FDI

Fixed insertion table

Push Capacity = ca. 300 kg
E-motor = 0,9 kW

The automatic insertion system is perfectly designed for cremators with a flat hearth. Therefore it is not necessary to make use of the so-called support brick.

It is also possible to insert coffins with "feet".

The insertion table is installed in front of the insertion door and is fixed to the floor (Pic. 1). However it is also possible to design the insertion table in such a way that it can be moved laterally along the front of the cremators and in this way can be used for more then one cremator. (Pic. 2).

The system is clad with stainless steel panels equipped with isolation materials.

Mobile insertion table

The push system is equipped with three modules of a different length. With the use of these modules every type of coffin can be placed into the cremator to the right spot on the hearth.

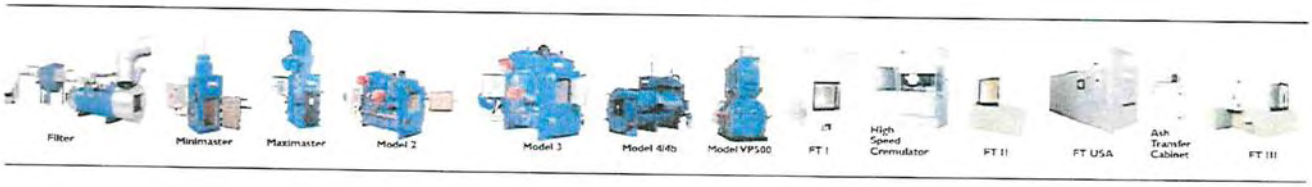
The insertion cycle can be interrupted manually at any time in case of an unexpected failure.

The E-motor moves a chain, to which the insertion module is mounted.

Positioning switches permanently control the movement of the insertion pusher head.

The insertion process is (of course) synchronised with the opening of the insertion door.

The complete insertion cycle takes about 15 seconds.



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EMISSIONS MONITORING TEST REPORT

East Devon Crematorium
London Road
Strete Ralegh
Whimple
Exeter
EX5 2PT

12th – 13th July 2011

Report Authorised by [redacted]

Mr S P Atherton
Business Manager
EA MCertS Level 2 + TE1,2,3
MM 03 336

Date 11th August 2011

ST/DEM0508/12.07.11

CONTENTS

1. INTRODUCTION

The cremator and associated flue gas treatment system at East Devon Crematorium was monitored between the 12th & 13th July 2011 to the requirements given in Process Guidance Note PG5/2 (2004) for emission releases to atmosphere for abated plant.

The work involved monitoring a range of flue gas components with the plant operating normally.

The plant comprises one Cremator of model type FTIII which has a wide hearth capable of accepting large coffin sizes. The cremator is fitted with two nozzle mix burners utilising propane as the support fuel.

The waste gases from the cremator are ducted to a flue gas treatment plant. The treatment plant comprises of a shell and tube boiler to cool the flue gases, a reagent feeder station that introduces a blend of activated carbon/sodium bicarbonate to react with the cooled gases, and a bag filter to clean the treated gases. The waste heat from the boiler in the form of warm water is dissipated to atmosphere via a finned tube air blast cooler situated outside the crematory.

The plant operates under full microprocessor based automatic control that requires little manual intervention.

The cremator and flue gas clean up system were manufactured, installed and commissioned by Facultatieve Technologies Limited to meet the requirements of the Environmental Permitting (England and Wales) Regulations 2007 – (EPR 2007) as relevant to cremators, summarised in the Secretary of State's Process Guidance Note PG 5/2 (2004).

The flue ducting and test points were in accordance with the requirements of EA TGN M1.

Measurements were undertaken to enable comparisons to be made of the operation of the cremator and associated flue gas treatment system with the requirements of the Guidance Note in terms of emission releases to air.

This report details the monitoring procedures used and the results obtained from this test work along with comparisons with the Guidance Note requirements and comments where appropriate.

Relevant procedures were followed to enable quality control to be maintained throughout the test preparation, site test work, laboratory analysis, calculations and reporting.

2. PROCEDURES

2.1 Total Particulate Matter

A flue gas sample was extracted and filtered to collect total particulate matter. A Whatman QM-A filter paper was used with a particle retention of not less than 99.5% at a particle size of 0.3 micron. The flue gas extraction employed techniques given in BS EN 13284 Part 1. The sampling was conducted using apparatus in accordance with the requirements of BS EN 13284 Part 1.

Sampling was undertaken at the centre point in the flue gas duct in accordance with the protocols and standards given that the duct is 250 mm in diameter.

This consisted of a heated known dimension Pyrex glass nozzle, heated Pyrex glass probe liner, heated Pyrex glass filter housing with Titanium filter support containing quartz microfibre filter (all heaters set to 160°C), PTFE sample line, dreschel absorption bottles, gas dryer (silica gel), sample line to pump, pump, gas meter, rotameter, pitot and impulse lines, electronic manometer, type K thermocouple, balance (for gravimetric moisture) and datalogger. Settings tables were pre-prepared to enable isokinetic flow to be maintained (based on online measurements of flue gas velocity and temperature to set nozzle flow / pump rate (l/min)).

Particulate matter analysis was carried out by weighing the filter and probe rinse collection on a calibrated balance, with the media being dried and weighed prior to and following the test.

The tests reported herein were conducted to prove the performance of the cremators relative to PG5/2(04).

2.2 Hydrogen Chloride

A flue gas sample was extracted and filtered. The gas sample was then passed through an absorption medium of de-ionised water to collect hydrogen chloride.

The method employed was BS EN 1911 Parts 1-3.

Laboratory analysis for hydrogen chloride was carried out on the absorption medium using Ion Chromatography (IC).

2.3 Mercury

A flue gas sample was extracted and filtered to collect solid phase mercury.

A Whatman QM-A filter paper was used with a particle retention of not less than 99.5% at a particle size of 0.3 micron. The flue gas extraction employed techniques given in BS EN 13284 Part 1.

The gas sample was then passed through an absorption medium of acidified potassium dichromate to collect vapour phase mercury.

The method employed was BS EN 13211.

Laboratory analysis for solid and vapour phase mercury was carried out on the filter and absorption medium using cold vapour atomic fluorescence spectroscopy (CVAFS).

2.4 Dioxins and Furans

A flue gas sample was extracted and filtered to collect total particulate matter and hence solid phase dioxins and furans. A Whatman QM-A filter paper was used with a particle retention of not less than 99.5% at a particle size of 0.3 micron. The flue gas extraction employed techniques given in BS EN 13284 Part 1.

The gas sample was then cooled by means of a water-cooled condenser before being passed through a pre-spiked XAD trap along with condensate collection to collect vapour phase dioxins and furans.

The method employed was BS EN 1948 Parts 1, 2 & 3, and BS EN 13284 Part 1.

Laboratory analysis for dioxins and furans was carried out on the filter, XAD trap and condensate / washings collection using high-resolution gas chromatography and high-resolution mass spectrometry (GC/MS (HR)).

2.5 Carbon Monoxide

A flue gas sample was continuously extracted, filtered and dried before being passed through a pre-calibrated Siemens Ultramat 21/O_2 infrared analyser for the on-line measurement of carbon monoxide. The analyser has a fixed range of 0-1250 mg/Nm^3 and was zeroed with air and calibrated with a nominal 800 ppmv carbon monoxide in balance nitrogen gas.

The method employed was BS ISO 12039.

The analyser output was continuously recorded using a Grant 'Squirrel' data logger.

For these tests a relatively high range analyser was used due to the typical pattern of carbon monoxide concentration emissions from cremators being very low (often indicated as zero) for most of the cycle, but with occasional, high, short duration spikes of CO being emitted. The convention since non-continuous emissions monitoring became a mandatory requirement for cremators during 1990, has been to attempt to monitor the magnitude of spikes, as these are often the main contributor to total CO emissions. If the mean one minute emission of CO was say 200 mg/Nm^3, it would be expected that the peak concentration during that one minute averaging period would be considerably higher than this. It follows that utilising a lower range analyser would frequently understate CO emissions, despite increasing sensitivity at low CO concentrations.

2.6 Volatile Organic Compounds

A flue gas sample was continuously extracted and filtered before being passed via a heated line through a pre-calibrated Signal 3030PM Flame Ionisation Detection (FID) analyser for the on-line measurement

of volatile organic compounds. The analyser was ranged 0-100 ppmv total hydrocarbons and was zeroed with air passed through a catalytic converter and calibrated with a nominal 50 ppmv propane in balance air gas.

The method employed was BS EN 12619.

The analyser output was continuously recorded using a Grant 'Squirrel' data logger.

Similar comments apply to VOC's as CO, in that the analyser scaling is set to quantify the peaks that are the nature of the emission.

2.7 Oxygen

A flue gas sample was continuously extracted from the same position in the flue as the other pollutants extraction, filtered and dried before being passed through a pre-calibrated Siemens Ultramat 21/O_2 electrochemical cell analyser for the on-line measurement of flue oxygen.

An analogue output was taken from the plants own oxygen analyser for monitoring the oxygen content at the outlet of the secondary combustion chamber. This instrument measures the oxygen wet, and the readings were corrected to a dry basis for use in the secondary combustion chamber gas residence time calculations.

The method employed was BS ISO 12039.

The analysers were calibrated using a standard reference gas in the laboratory before and after the site visit, and with nitrogen "zero" gas and air at the start and end of each day's testing on site. It was assumed that calibration linearity was maintained during sampling, and the post checks indicated that this was the case.

The outputs of the analysers were continuously recorded using a Grant 'Squirrel' data logger.

2.8 Moisture

A flue gas sample was extracted and filtered. The gas sample was then passed through an absorption medium to collect any water vapour.

The method employed was BS EN 14790.

Flue gas moisture was determined gravimetrically by weighing the absorption medium and final gas drier prior to and following the test.

This was carried out alongside testing for hydrogen chloride and mercury.

2.9 Temperature

The cremator secondary chamber exit and flue (filter outlet) temperatures were measured by the use of calibrated Type K thermocouples.

The method employed was BS EN 13284 Part 1.

The gas temperatures were continuously recorded using a Grant 'Squirrel' data logger.

2.10 Velocity and Volumetric Flow

Flue gas velocity was found from inserting a calibrated s-type pitot tube into the flue. The pitot head pressure was then measured using a calibrated electronic manometer.

The method employed was BS EN 13284 Part 1.

The electronic manometer output was continuously recorded using a Grant 'Squirrel' data logger.

Flue gas velocity was then calculated from Bernoulli's equation as the density of the flue gas was known (from measurements of flue gas moisture and temperature).

Flue gas volumetric flow rate was found from the measurement of the flue duct size and hence its area and corrected to normalised conditions (again from measurements of flue gas moisture and temperature).

2.11 Secondary Combustion Chamber Gas Residence Time

The stated secondary chamber volume (provided by the cremator manufacturer) divided by the calculated gas volumetric flow exiting the secondary combustion zone gives the secondary combustion zone gas residence times, which are expressed as one-minute averages.

The test fitments are located in the outlet from the FGT Plant, downstream of the induced draught fan. The volumetric flow at this point is a combination of the waste gases from the operational cremator along with air drawn into the system via the reagent feeder system and other minor in-leakage.

In order to calculate the gas volume from the cremator, the oxygen content of the gases is monitored at the point of flow measurement and the outlet of the cremator. An oxygen balance calculation is performed to subtract the additional air contribution from the waste gas volume of the working cremator in order to calculate the secondary combustion chamber gas residence time.

An example of the calculation used is given in Appendix 1.

3. RESULTS

The results are summarised in Tables 1 to 3.

Total Particulate Matter, Hydrogen Chloride, Carbon Monoxide and Volatile Organic Compound determinations are given in Table 1.

Mercury determinations are given in Table 2.

Dioxin & Furan determinations are given in Table 3.

Secondary Combustion Chamber Residence Time is given in Plots 1 & 2.

Moisture determinations were made on all tests.

Carbon Monoxide, Volatile Organic Compounds, Oxygen, Temperature and Velocity and Volumetric Flow were continuously monitored.

Secondary Combustion Chamber Gas Residence Time was continuously monitored during Tests 2 & 3.

All values in the tables are corrected to the reference conditions of 273K, 101.3kPa, 11%v/v oxygen and dry gas as given in PG5/2(04) where required.

All the data logs and calculations can be seen in Appendix 1.

All the analysis reports can be seen in Appendix 2.

TABLE 1
East Devon Crematorium Abatement System Outlet
Emissions Monitoring 12th July 2011
Total Particulate Matter & Hydrogen Chloride Sampling

		Test 1	Test 2	Test 3	Average	Requirement to PG5/2 (2004)
Total Particulate Matter	- mg/Nm^{3}c.	0.64 ± 1.02	0.82 ± 1.50	1.13 ± 1.61	**0.86**	<20
Hydrogen Chloride	- mg/Nm^{3}c.	7.50 ± 0.79	10.63 ± 1.42	20.30 ± 1.13	**12.81**	<30
Carbon Monoxide	- mg/Nm^{3}c.	3.46 ± 0.17	2.97 ± 0.15	4.87 ± 0.24	**3.77**	<100
Organic Compounds	- mg/Nm^{3}c.	0.01 ± 0.00	0.01 ± 0.00	0.05 ± 0.00	**0.03**	<20
Flue Oxygen	- %v/v dry	12.90 ± 0.10	14.28 ± 0.10	14.02 ± 0.10	**13.74**	
Flue Moisture	- %v/v	6.9 ± 0.7	6.6 ± 0.7	7.0 ± 0.7	**6.9**	
	- %w/w	4.4 ± 0.4	4.2 ± 0.4	4.5 ± 0.4	**4.4**	
Flue Temperature	- Deg C	116 ± 2	116 ± 2	114 ± 2	**115**	
Volumetric Flow	- Nm^3/h dry	1658 ± 33	1491 ± 30	1366 ± 27	**1505**	

Note 1: All emissions as concentration levels are given as mg/Nm^3 corrected to 11%v/v oxygen and dry gas

Note 2: All uncertainties (±) are calculated to a 95% confidence interval
Uncertainties estimated using the procedure suggested in the STA Quality Guidance Note QGN001-01

TABLE 2
East Devon Crematorium Abatement System Outlet
Emissions Monitoring 12th July 2011
Mercury Sampling

		Test 4	Test 5	Test 6	Average	Requirement to PG5/2 (2004)
Mercury	- µg/Nm^{3}c.	8.46 ± 16.29	22.22 ± 21.23	17.44 ± 16.65	**16.04**	<50
Flue Oxygen	- %v/v dry	14.22 ± 0.10	14.43 ± 0.10	14.71 ± 0.10	**14.45**	
Flue Moisture	- %v/v	6.6 ± 0.7	9.7 ± 1.0	6.7 ± 0.7	**7.7**	
	- %w/w	4.2 ± 0.4	6.2 ± 0.6	4.3 ± 0.4	**4.9**	
Flue Temperature	- Deg C	113 ± 2	115 ± 2	113 ± 2	**114**	
Volumetric Flow	- Nm^3/h dry	1263 ± 25	1295 ± 26	1278 ± 26	**1279**	

Note 1: All emissions as concentration levels are given as µg/Nm^3 or mg/Nm^3 corrected to 11%v/v oxygen and dry gas

Note 2: All uncertainties (±) are calculated to a 95% confidence interval
Uncertainties estimated using the procedure suggested in the STA Quality Guidance Note QGN001-01

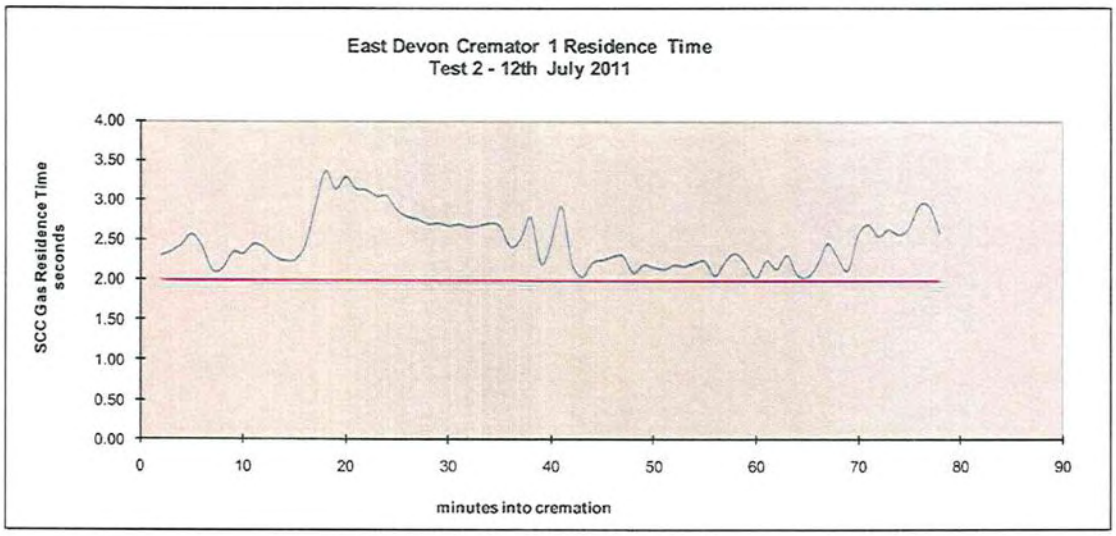
TABLE 3
East Devon Crematorium Abatement System Outlet
Emissions Monitoring 13th July 2011
Dioxins Sampling

		Test 7	Requirement to PG5/2 (2004)
Dioxins and Furans			
(Using Lower Bound Value)	- ng/Nm^{3}c.	0.0032 ± 0.0002	<0.1
(Using Upper Bound Value)	- ng/Nm^{3}c.	0.0058 ± 0.0003	
Flue Oxygen	- %v/v dry	14.08 ± 0.10	
Flue Moisture	- %v/v	5.5 ± 0.6	
	- %w/w	3.5 ± 0.4	
Flue Temperature	- Deg C	115 ± 2	
Volumetric Flow	- Nm^3/h dry	1348 ± 27	

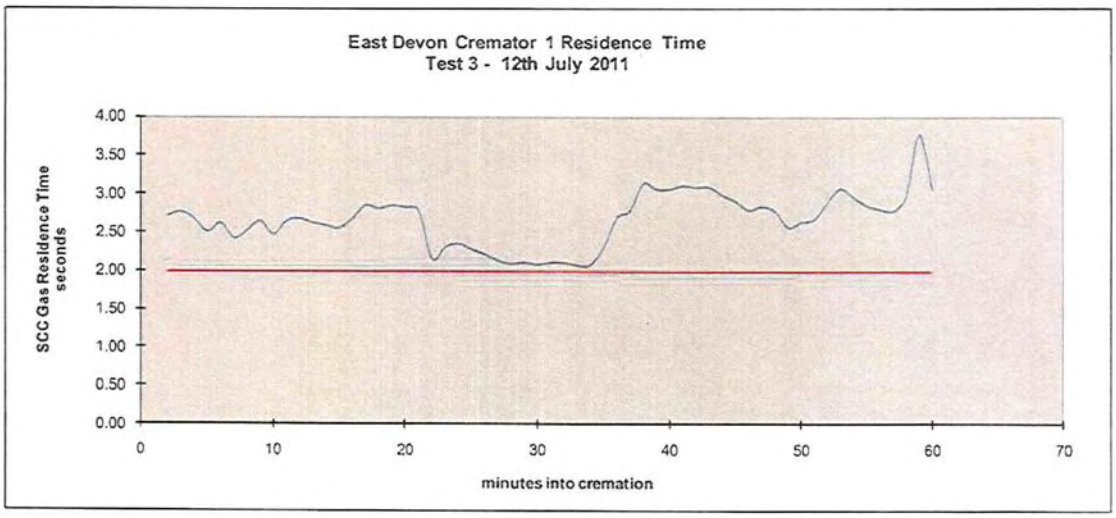
Note 1: All emissions as concentration levels are given as ng/Nm^3 corrected to 11%v/v oxygen and dry gas

Note 2: All uncertainties (±) are calculated to a 95% confidence interval
Uncertainties estimated using the procedure suggested in the STA Quality Guidance Note QGN001-01

PLOT 1


East Devon Cremator 1 Residence Time
Test 2 - 12th July 2011
SCC Gas Residence Time seconds
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0
10
20
30
40
50
60
70
80
90
minutes into cremation

PLOT 2


East Devon Cremator 1 Residence Time
Test 3 - 12th July 2011
SCC Gas Residence Time seconds
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0
10
20
30
40
50
60
70
minutes into cremation

4. COMMENTS

The results from these series of tests demonstrate that the plant satisfies the requirements of PG5/2(2004) for the releases to air of particulate matter, mercury, hydrogen chloride, carbon monoxide and volatile organic compounds.

The reported results for dioxins and furans are the calculated results using both the Lower and Upper Bound values from the Laboratory analysis report.

Lower bound: This represents the value of all samples for which the congeners found present at levels below their detection limits are represented as being at a level of zero.

Upper bound: This represents the value of all samples for which the congeners found present at levels below their detection limits are represented as being at a level of their detection limits.

The true emission value will lie between the Upper and Lower Bound results reported. The test gives a result well below the compliance limit of <0.1 ng/Nm^3 on the basis of Upper Bound value.

The oxygen content of the gases at the outlet of the secondary combustion zone was above 3% at all times, and mean concentrations were in excess of 6%.

The residence time of the gases in the Secondary Combustion Chamber of the Cremator was above 2 seconds at all times, and the temperature in excess of 800°C in accordance with the requirements.

Combustion within the cremator secondary combustion chamber was good as is indicated by the low emissions of CO and VOC's.

No visible chimney emissions were observed throughout the test work other than the expected steam plume during preheat.

5. QUALITY CONTROL

All the tests performed were carried out to the methods given in the appropriate listed Standards using calibrated equipment. The gas analysers were calibrated prior to use using suitable calibration gases.

Analysis of the filters and absorbers was carried out in-house and at an external laboratory.

For this test work the following external laboratory was used for the given determinations:

Scientific Analysis Laboratories (SAL)	}	Hydrogen Chloride Mercury Dioxins & Furans

APPENDIX 1

Data Logs and Calculations

Explanation of Data Logs

Data is taken from a Grant Squirrel data logger.

Time is from logger clock.
SCC Out Temp is direct from installed SCC thermocouple.
Flue Gas Temp is direct from test flue thermocouple.
Meter Temp is direct from gas meter.
(The stated meter temperature is that of the sampled gas at the meter, and is not the room ambient temperature. The temperature always increases during a test due to the heat gain from the sample pump that is contained in an enclosed box along with the gas meter, and this is quite normal).
SCC O2 is from the plants Fuji oxygen analyser corrected from wet to dry.
Flue O2 is from the Siemens Ultramat U21/O2 analyser.
CO is from the Siemens Ultramat U21/O2 analyser.
VOC is from the Signal 3030PM FID analyser expressed as carbon equivalent.
Sample Point Pa is from the pitot tube to an Airflow Developments electronic manometer.
Duct Mean Pa is Sample Point Pa corrected for average position from traverse logs included.

The room temperature was typically 20°C, and there were no issues with the analysers overheating. Functional and calibration checks at the start and end of each test confirmed correct operation of the analysers.

All values in the tables are corrected to the reference conditions of 273K, 101.3kPa, 11%v/v oxygen and dry gas as given in PG5/2(04) where required.

Example of Residence Time Calculation

CALCULATION PROCEDURE TO OBTAIN RESIDENCE TIME OF GASES IN CREMATOR SECONDARY CHAMBERS

From site measurements during a test the following values are known:

SCC Temperature	Deg C	919 }	
SCC Oxygen	% v/v dry	5.5 }	1 minute
Flue Temperature	Deg C	113 }	logs
Flue Oxygen	% v/v dry	14.94 }	
Flue Pitot Head	Pa	51.6 }	
Flue Gas Moisture Content	% v/v	6.17 }	1 measurement
Flue Gas Moisture Content	%w/w	3.93 }	
Flue Duct Size	mm	350 }	
Flue Duct Area	m2	0.0962 }	

Also known from design calculations is the SCC Volume:

SCC Volume 3.21 m3

Residence Time can found as given below:

Density of Flue Gas kg/m3

((Density of air x % dry gas)+(Density of water x %moisture) /100) x 273/(273+Flue T)

Where: Density of air = 1.2928 kg/m3 @ 273 K & 101.3 kpa
Density of water = 0.8039 kg/m3 @273 K & 101.3 kpa

Therefore Flue Gas Density = 0.90074603 kg/m3

Velocity of Flue Gas Am/s

Sqrt ((2 x h x g) / Flue Gas Density)

Devived from Bernoulli's Flow Equation
Where h x g = Pa

Therefore Flue Gas Velocity = 10.7038169 Am/s

Volumetric Flow Rate of Flue Gas

Velocity x Cross Sectional Area of Duct x 3600

Therefore Volumetric Flow Rate = 3707.38033 Am3/h

With H2O = 6.17 %

Volumetric Flow Rate Dry = 3478.63496 Am3/h

Volumetric Flow Rate Wet = 228.745366 Am3/h

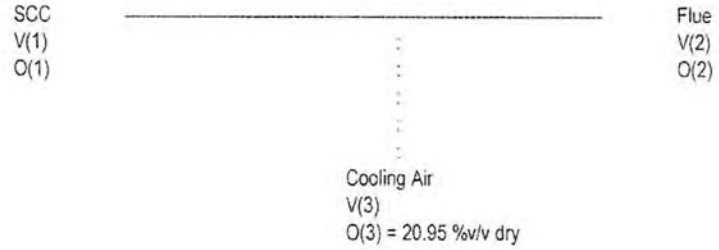
Corrected to Normal Conditions:

Nm3/h = Am3/h x 273 / (273 + Flue T)

Volumetric Flow Rate Dry = 2460.27809 Nm3/h

Volumetric Flow Rate Wet = 161.781049 Nm3/h

Using a dry oxygen balance calculate proportions of flue gas originating from SCC and from cooling air respectively:



From the above $V(2) = V(1) + V(3)$

$V(3) = V(2) - V(1)$ [1]

$(V(2) \times O(2)) = (V(1) \times O(1)) + (V(3) \times O(3))$ [2]

Substituting [1] into [2] gives:

$V(1) = V(2) \times (O(2) - O(3)) / (O(1) - O(3))$

Therefore $V(1) = V(2) \times (O(2) - 20.95) / (O(1) - 20.95)$

Assume V(2) = 100%

V(1) dry Nm3/h = 38.8996764 % of Volumetric Flowrate Dry

Therefore SCC Volumetric Flowrate Dry = 957.040216 Nm3/h

Assuming all cooling air is dry therefore all water in flue gas is from SCC:

SCC Volumetric Flowrate = 1118.82127 Nm3/h

This can then be corrected to actual SCC temperature:

Am3/h = Nm3/h x (273 + SCC T) / 273

SCC Volumetric Flowrate = 1.35697492 Am3/s

Therefore with SCC Volume = 3.21 m3

Residence Time = SCC Volume / SCC Volumetric Flowrate

= 2.36555588 seconds

The residence time of the gas in the SCC is 2.37 seconds

East Devon Crematorium Abatement System Outlet

Data Log 12/07/11

Test 1

Time	Flue Gas °C	Meter °C	Flue Oxygen %v/v dry	CO mg/Nm³ c.	VOC mg/Nm³ c.	Sample Point Pa	Sample Point Used	Factor	Duct Mean Pa
08:54	107	23.7	12.83	13.17	0.22	99.1	1C	0.9087	90.1
08:55	108	23.8	12.03	9.98	0.12	96.6	1C	0.9087	87.8
08:56	108	24.0	12.42	7.12	0.00	90.7	1C	0.9087	82.4
08:57	108	24.2	12.26	6.77	0.00	84.8	1C	0.9087	77.1
08:58	108	24.5	11.51	6.45	0.00	81.5	1C	0.9087	74.0
08:59	108	24.8	10.78	6.72	0.00	105.0	1C	0.9087	95.4
09:00	110	25.1	11.10	7.43	0.00	132.7	1C	0.9087	120.6
09:01	112	25.5	10.86	7.98	0.00	157.1	1C	0.9087	142.7
09:02	113	25.9	12.64	12.64	0.00	171.4	1C	0.9087	155.7
09:03	114	26.4	12.96	8.19	0.00	147.8	1C	0.9087	134.3
09:04	114	27.0	12.07	6.50	0.00	136.9	1C	0.9087	124.4
09:05	114	27.5	11.45	5.88	0.00	134.4	1C	0.9087	122.1
09:06	114	28.0	12.10	7.27	0.00	118.4	1C	0.9087	107.6
09:07	114	28.5	11.69	5.16	0.73	113.4	1C	0.9087	103.0
09:08	114	29.0	11.93	5.55	0.22	104.2	1C	0.9087	94.6
09:09	114	29.5	11.74	5.20	0.01	112.6	1C	0.9087	102.3
09:10	114	30.0	12.13	5.54	0.00	100.8	1C	0.9087	91.6
09:11	114	30.6	12.09	4.28	0.00	96.6	1C	0.9087	87.8
09:12	114	31.0	12.38	5.34	0.00	80.6	1C	0.9087	73.3
09:13	114	31.5	11.63	4.27	0.00	84.0	1C	0.9087	76.3
09:14	114	32.0	12.52	4.86	0.00	92.4	1C	0.9087	84.0
09:15	115	32.4	10.16	4.39	0.00	120.1	1C	0.9087	109.1
09:16	115	32.8	10.24	3.97	0.00	135.2	1C	0.9087	122.9
09:17	116	33.2	13.09	5.76	0.00	140.3	1C	0.9087	127.5
09:18	116	33.7	12.74	4.97	0.00	113.4	1C	0.9087	103.0
09:19	116	34.1	13.05	6.23	0.00	96.6	1C	0.9087	87.8
09:20	116	34.5	10.16	3.97	0.00	85.7	1C	0.9087	77.9
09:21	115	34.8	13.29	4.78	0.00	89.0	1C	0.9087	80.9
09:22	115	35.2	12.17	4.05	0.00	93.2	1C	0.9087	84.7
09:23	115	35.6	11.55	3.47	0.00	86.5	1C	0.9087	78.6
09:24	115	35.9	13.43	4.13	0.00	89.9	1C	0.9087	81.7
09:25	115	36.3	11.68	3.62	0.00	102.5	1C	0.9087	93.1
09:26	116	36.6	10.83	2.43	0.00	114.2	1C	0.9087	103.8
09:27	116	36.9	11.45	2.34	0.00	125.2	1C	0.9087	113.7
09:28	116	37.1	11.62	3.55	0.00	112.6	1C	0.9087	102.3
09:29	116	37.5	12.93	3.82	0.00	99.1	1C	0.9087	90.1
09:30	117	37.8	11.94	2.14	0.00	111.7	1C	0.9087	101.5
09:31	116	38.2	12.29	2.62	0.00	79.8	1C	0.9087	72.5
09:32	116	38.5	12.97	4.18	0.00	105.8	1C	0.9087	96.2
09:33	116	38.8	12.02	3.60	0.00	94.9	1C	0.9087	86.3

09:34	116	39.2	13.18	3.20	0.00	96.6	1C	0.9087	87.8
09:35	117	39.5	12.87	3.28	0.00	121.8	1C	0.9087	110.7
09:36	117	39.9	12.62	2.57	0.00	120.1	1C	0.9087	109.1
09:37	117	40.2	12.82	2.01	0.00	118.4	1C	0.9087	107.6
09:38	117	40.5	12.93	2.26	0.00	121.0	1C	0.9087	109.9
09:39	118	40.8	13.38	2.46	0.00	138.6	1C	0.9087	125.9
09:40	118	41.1	13.92	2.21	0.00	140.3	1C	0.9087	127.5
09:41	118	41.4	14.03	2.59	0.00	139.4	1C	0.9087	126.7
09:42	118	41.6	14.10	2.64	0.00	124.3	1C	0.9087	113.0
09:43	118	41.9	13.76	2.68	0.00	123.5	1C	0.9087	112.2
09:44	118	42.2	13.72	1.90	0.00	123.5	1C	0.9087	112.2
09:45	119	42.5	13.73	2.32	0.00	126.0	1C	0.9087	114.5
09:46	119	42.8	13.98	2.88	0.00	121.0	1C	0.9087	109.9
09:47	119	43.0	14.03	3.02	0.00	131.0	1C	0.9087	119.1
09:48	119	43.1	14.34	2.50	0.00	127.7	1C	0.9087	116.0
09:49	119	43.3	14.38	2.71	0.00	130.2	1C	0.9087	118.3
09:50	119	43.4	14.45	1.94	0.00	126.8	1C	0.9087	115.3
09:51	119	43.7	14.37	2.46	0.00	118.4	1C	0.9087	107.6
09:52	119	43.9	14.22	2.97	0.00	108.4	1C	0.9087	98.5
09:53	119	44.0	14.13	1.93	0.00	113.4	1C	0.9087	103.0
09:54	119	44.2	14.30	2.12	0.00	108.4	1C	0.9087	98.5
09:55	119	44.4	14.22	1.97	0.00	110.0	1C	0.9087	100.0
09:56	119	44.6	14.29	1.46	0.00	107.5	1C	0.9087	97.7
09:57	119	44.7	14.31	1.56	0.00	107.5	1C	0.9087	97.7
09:58	119	44.9	14.15	1.67	0.00	100.8	1C	0.9087	91.6
09:59	118	45.1	14.19	1.75	0.00	95.8	1C	0.9087	87.0
10:00	118	45.3	13.75	1.59	0.00	81.5	1C	0.9087	74.0
10:01	118	45.4	13.31	0.94	0.00	77.3	1C	0.9087	70.2
10:02	117	45.5	13.20	1.49	0.00	77.3	1C	0.9087	70.2
10:03	117	45.7	13.22	0.91	0.00	76.4	1C	0.9087	69.5
10:04	117	45.8	13.19	1.06	0.00	75.6	1C	0.9087	68.7
10:05	117	45.8	13.17	1.60	0.00	75.6	1C	0.9087	68.7
10:06	117	45.9	13.18	1.43	0.00	74.8	1C	0.9087	67.9
10:07	117	46.1	13.16	1.37	0.00	74.8	1C	0.9087	67.9
10:08	117	46.3	13.13	1.84	0.00	72.2	1C	0.9087	65.6
10:09	116	46.4	13.04	1.92	0.00	78.1	1C	0.9087	71.0
10:10	117	46.6	13.78	1.65	0.00	91.6	1C	0.9087	83.2
10:11	116	46.7	13.80	2.25	0.00	81.5	1C	0.9087	74.0
10:12	116	46.8	13.57	1.63	0.00	78.1	1C	0.9087	71.0
10:13	116	46.8	13.09	2.06	0.00	64.7	1C	0.9087	58.8
10:14	116	46.9	12.77	1.41	0.00	73.1	1C	0.9087	66.4
10:15	116	47.0	13.08	2.14	0.00	73.1	1C	0.9087	66.4
10:16	116	47.2	13.12	1.93	0.00	72.2	1C	0.9087	65.6
10:17	116	47.3	13.17	0.88	0.00	71.4	1C	0.9087	64.9
10:18	116	47.4	13.23	1.70	0.00	72.2	1C	0.9087	65.6
10:19	116	47.6	13.35	1.51	0.00	71.4	1C	0.9087	64.9
10:20	115	47.6	13.62	1.59	0.00	66.4	1C	0.9087	60.3
10:21	115	47.6	13.57	1.52	0.00	66.4	1C	0.9087	60.3
10:22	115	47.7	13.31	1.19	0.00	66.4	1C	0.9087	60.3
10:23	115	47.8	13.37	1.80	0.00	67.2	1C	0.9087	61.1

10:24	115	47.8	13.38	1.01	0.00	65.5	1C	0.9087	59.5
10:25	115	47.9	13.40	1.15	0.00	66.4	1C	0.9087	60.3
10:26	114	47.6	15.03	1.01	0.00	63.8	1C	0.9087	58.0
Average	**116**	**38.9**	**12.90**	**3.46**	**0.01**	**101.2**			**92.0**

East Devon Crematorium Abatement System Outlet

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Test 2

Time	Flue Gas °C	Meter °C	Flue Oxygen %v/v dry	CO mg/Nm³ c.	VOC mg/Nm³ c.	Sample Point Pa	Sample Point Used	Factor	Duct Mean Pa
10:35	118	45.6	15.20	12.27	0.00	120.1	1C	0.9087	109.1
10:36	118	45.6	14.32	10.30	0.23	98.3	1C	0.9087	89.3
10:37	118	45.5	14.12	4.72	0.01	87.4	1C	0.9087	79.4
10:38	118	45.3	13.65	3.50	0.00	85.7	1C	0.9087	77.9
10:39	118	45.2	12.37	2.19	0.00	93.2	1C	0.9087	84.7
10:40	118	45.1	12.01	1.65	0.00	92.4	1C	0.9087	84.0
10:41	118	45.1	13.68	2.31	0.00	85.7	1C	0.9087	77.9
10:42	118	45.1	15.20	1.44	0.00	89.9	1C	0.9087	81.7
10:43	118	45.2	15.11	0.90	0.00	82.3	1C	0.9087	74.8
10:44	118	45.2	14.80	1.39	0.00	93.2	1C	0.9087	84.7
10:45	118	45.3	14.15	1.08	0.00	84.8	1C	0.9087	77.1
10:46	118	45.3	14.15	0.56	0.00	95.8	1C	0.9087	87.0
10:47	118	45.4	13.83	0.91	0.00	97.4	1C	0.9087	88.5
10:48	118	45.4	14.16	1.19	0.00	101.6	1C	0.9087	92.4
10:49	118	45.5	14.04	0.71	0.00	82.3	1C	0.9087	74.8
10:50	117	45.5	13.88	0.70	0.01	67.2	1C	0.9087	61.1
10:51	117	45.6	12.56	0.62	0.55	48.7	1C	0.9087	44.3
10:52	116	45.7	11.83	0.58	0.13	47.0	1C	0.9087	42.7
10:53	116	45.7	12.09	0.48	0.00	44.5	1C	0.9087	40.5
10:54	116	45.7	12.20	0.68	0.00	50.4	1C	0.9087	45.8
10:55	116	45.8	11.99	0.64	0.00	50.4	1C	0.9087	45.8
10:56	116	45.8	11.71	0.57	0.00	49.6	1C	0.9087	45.0
10:57	115	45.8	12.13	0.68	0.00	48.7	1C	0.9087	44.3
10:58	115	45.8	12.64	0.75	0.00	53.8	1C	0.9087	48.9
10:59	115	45.9	13.19	0.24	0.00	63.0	1C	0.9087	57.2
11:00	115	45.9	12.97	0.72	0.00	63.0	1C	0.9087	57.2
11:01	115	45.9	13.06	0.53	0.00	62.2	1C	0.9087	56.5
11:02	115	46.0	13.18	0.22	0.00	62.2	1C	0.9087	56.5
11:03	115	46.1	13.38	0.00	0.00	61.3	1C	0.9087	55.7
11:04	115	46.2	13.66	0.78	0.00	60.5	1C	0.9087	55.0
11:05	115	46.2	13.97	0.46	0.00	60.5	1C	0.9087	55.0
11:06	115	46.2	14.37	0.57	0.00	60.5	1C	0.9087	55.0
11:07	115	46.2	14.59	0.74	0.00	60.5	1C	0.9087	55.0
11:08	115	46.4	14.96	1.21	0.00	73.1	1C	0.9087	66.4
11:09	115	46.7	13.47	0.53	0.00	72.2	1C	0.9087	65.6
11:10	115	47.0	14.73	1.31	0.00	60.5	1C	0.9087	55.0
11:11	115	47.1	15.62	2.78	0.00	73.9	1C	0.9087	67.2
11:12	116	47.0	13.44	1.29	0.00	84.0	1C	0.9087	76.3

11:13	116	47.0	15.08	2.90	0.00	60.5	1C	0.9087	55.0
11:14	116	47.1	16.00	3.48	0.00	77.3	1C	0.9087	70.2
11:15	117	47.1	13.41	2.26	0.00	104.2	1C	0.9087	94.6
11:16	117	47.0	12.92	2.02	0.00	100.8	1C	0.9087	91.6
11:17	116	47.0	13.85	3.99	0.00	92.4	1C	0.9087	84.0
11:18	117	46.9	14.23	5.91	0.00	94.1	1C	0.9087	85.5
11:19	117	46.9	14.39	4.85	0.00	92.4	1C	0.9087	84.0
11:20	117	46.8	14.43	5.94	0.00	91.6	1C	0.9087	83.2
11:21	117	46.7	14.58	6.79	0.00	101.6	1C	0.9087	92.4
11:22	117	46.7	15.02	7.67	0.00	100.0	1C	0.9087	90.8
11:23	117	46.7	15.12	7.49	0.00	101.6	1C	0.9087	92.4
11:24	117	46.6	15.36	6.91	0.00	117.6	1C	0.9087	106.9
11:25	117	46.5	14.42	3.00	0.00	103.3	1C	0.9087	93.9
11:26	117	46.3	14.61	5.27	0.00	85.7	1C	0.9087	77.9
11:27	117	46.3	15.27	8.22	0.00	105.0	1C	0.9087	95.4
11:28	117	46.2	14.49	4.68	0.00	102.5	1C	0.9087	93.1
11:29	117	46.1	14.09	3.19	0.00	96.6	1C	0.9087	87.8
11:30	117	46.0	15.01	7.05	0.00	86.5	1C	0.9087	78.6
11:31	117	46.0	15.31	7.78	0.00	103.3	1C	0.9087	93.9
11:32	117	45.9	14.18	3.59	0.00	95.8	1C	0.9087	87.0
11:33	117	45.8	14.14	2.19	0.00	104.2	1C	0.9087	94.6
11:34	117	45.7	14.83	5.07	0.00	90.7	1C	0.9087	82.4
11:35	117	45.6	15.73	9.04	0.00	96.6	1C	0.9087	87.8
11:36	117	45.6	15.64	7.01	0.00	107.5	1C	0.9087	97.7
11:37	117	45.5	14.67	4.61	0.00	104.2	1C	0.9087	94.6
11:38	117	45.4	14.67	3.55	0.00	105.8	1C	0.9087	96.2
11:39	117	45.4	14.77	2.67	0.00	95.8	1C	0.9087	87.0
11:40	117	45.2	15.82	7.20	0.00	90.7	1C	0.9087	82.4
11:41	117	45.2	15.90	8.53	0.00	108.4	1C	0.9087	98.5
11:42	117	45.1	14.78	4.27	0.00	100.8	1C	0.9087	91.6
11:43	117	45.0	14.34	2.92	0.00	69.7	1C	0.9087	63.4
11:44	116	44.9	14.42	4.89	0.00	57.1	1C	0.9087	51.9
11:45	116	44.9	14.87	5.55	0.00	75.6	1C	0.9087	68.7
11:46	116	44.8	13.98	2.26	0.00	71.4	1C	0.9087	64.9
11:47	116	44.8	13.39	2.46	0.00	65.5	1C	0.9087	59.5
11:48	115	44.7	13.89	2.25	0.00	52.1	1C	0.9087	47.3
11:49	115	44.7	14.63	1.95	0.00	51.2	1C	0.9087	46.6
11:50	115	44.8	14.65	1.85	0.00	51.2	1C	0.9087	46.6
11:51	115	44.7	14.77	1.32	0.00	68.0	1C	0.9087	61.8
11:52	115	44.7	14.30	0.57	0.00	80.6	1C	0.9087	73.3
11:53	115	44.7	14.69	1.03	0.00	78.1	1C	0.9087	71.0
11:54	115	44.7	15.98	1.48	0.00	96.6	1C	0.9087	87.8
11:55	115	44.7	14.91	0.91	0.00	90.7	1C	0.9087	82.4
11:56	115	44.8	14.67	1.51	0.00	89.9	1C	0.9087	81.7
11:57	115	44.8	14.66	1.82	0.00	89.9	1C	0.9087	81.7
11:58	115	44.7	14.69	0.87	0.00	86.5	1C	0.9087	78.6
11:59	115	44.7	15.67	2.98	0.00	89.9	1C	0.9087	81.7
12:00	116	44.7	15.67	1.55	0.00	91.6	1C	0.9087	83.2
12:01	116	44.6	14.79	2.71	0.00	89.9	1C	0.9087	81.7
12:02	115	44.6	14.76	1.56	0.00	73.1	1C	0.9087	66.4

12:03	114	43.5	18.36	2.54	0.00	49.6	1C	0.9087	45.0
Average	**116**	**45.7**	**14.28**	**2.97**	**0.01**	**81.5**			**74.1**

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Test 3

Time	Flue Gas °C	Meter °C	Flue Oxygen %v/v dry	CO mg/Nm³ c.	VOC mg/Nm³ c.	Sample Point Pa	Sample Point Used	Factor	Duct Mean Pa
12:12	115	41.8	14.84	6.33	2.28	98.3	1C	0.9087	89.3
12:13	115	42.0	13.46	10.68	0.20	65.5	1C	0.9087	59.5
12:14	114	42.0	13.26	11.68	0.00	62.2	1C	0.9087	56.5
12:15	115	41.9	14.22	12.46	0.00	81.5	1C	0.9087	74.0
12:16	115	41.8	13.09	4.66	0.00	85.7	1C	0.9087	77.9
12:17	115	41.9	11.57	4.71	0.00	78.1	1C	0.9087	71.0
12:18	115	41.9	11.75	4.78	0.00	78.1	1C	0.9087	71.0
12:19	114	41.9	11.74	2.60	0.00	69.7	1C	0.9087	63.4
12:20	115	42.0	11.56	2.23	0.00	77.3	1C	0.9087	70.2
12:21	115	42.0	12.36	2.10	0.00	71.4	1C	0.9087	64.9
12:22	114	42.1	12.27	2.19	0.00	68.0	1C	0.9087	61.8
12:23	114	42.3	12.53	2.39	0.00	70.6	1C	0.9087	64.1
12:24	114	42.3	12.56	2.10	0.00	75.6	1C	0.9087	68.7
12:25	114	42.3	12.51	2.12	0.00	74.8	1C	0.9087	67.9
12:26	114	42.3	12.67	2.01	0.00	71.4	1C	0.9087	64.9
12:27	114	42.4	12.18	2.52	0.00	62.2	1C	0.9087	56.5
12:28	114	42.5	12.02	1.91	0.16	62.2	1C	0.9087	56.5
12:29	114	42.6	11.99	1.90	1.77	61.3	1C	0.9087	55.7
12:30	114	42.6	11.94	2.44	0.01	62.2	1C	0.9087	56.5
12:31	114	42.6	11.80	2.23	0.00	66.4	1C	0.9087	60.3
12:32	114	42.7	11.44	1.63	0.00	97.4	1C	0.9087	88.5
12:33	115	42.8	12.48	2.67	0.00	95.8	1C	0.9087	87.0
12:34	114	42.8	12.02	2.80	0.00	89.0	1C	0.9087	80.9
12:35	115	42.9	11.99	2.17	0.00	93.2	1C	0.9087	84.7
12:36	115	43.0	11.93	2.64	0.00	100.0	1C	0.9087	90.8
12:37	116	43.0	11.68	3.05	0.00	109.2	1C	0.9087	99.2
12:38	116	43.0	11.62	2.79	0.00	108.4	1C	0.9087	98.5
12:39	116	43.1	11.78	2.82	0.00	107.5	1C	0.9087	97.7
12:40	116	43.2	11.79	2.85	0.00	107.5	1C	0.9087	97.7
12:41	117	43.2	12.04	3.05	0.00	107.5	1C	0.9087	97.7
12:42	117	43.2	12.00	2.51	0.00	108.4	1C	0.9087	98.5
12:43	117	43.2	11.89	3.01	0.00	107.5	1C	0.9087	97.7
12:44	117	43.2	12.15	2.76	0.00	105.8	1C	0.9087	96.2
12:45	117	43.3	12.38	2.48	0.00	88.2	1C	0.9087	80.1
12:46	116	43.3	12.41	2.14	0.00	67.2	1C	0.9087	61.1
12:47	116	43.3	12.28	1.97	0.00	58.8	1C	0.9087	53.4
12:48	115	43.3	12.36	1.62	0.00	48.7	1C	0.9087	44.3
12:49	115	43.4	12.24	1.63	0.00	46.2	1C	0.9087	42.0

12:50	115	43.5	12.81	1.72	0.00	46.2	1C	0.9087	42.0
12:51	114	43.5	13.32	1.37	0.00	45.4	1C	0.9087	41.2
12:52	114	43.5	13.57	1.28	0.00	44.5	1C	0.9087	40.5
12:53	114	43.6	13.92	1.60	0.00	43.7	1C	0.9087	39.7
12:54	114	43.6	14.23	1.38	0.00	47.0	1C	0.9087	42.7
12:55	114	43.7	14.47	1.67	0.00	51.2	1C	0.9087	46.6
12:56	114	43.7	14.58	1.97	0.00	52.1	1C	0.9087	47.3
12:57	114	43.7	14.95	3.15	0.00	50.4	1C	0.9087	45.8
12:58	114	43.8	15.28	3.77	0.00	51.2	1C	0.9087	46.6
12:59	114	43.8	15.77	7.26	0.00	55.4	1C	0.9087	50.4
13:00	113	43.8	16.13	9.76	0.00	56.3	1C	0.9087	51.1
13:01	114	43.8	16.25	9.70	0.00	53.8	1C	0.9087	48.9
13:02	113	43.9	16.41	10.10	0.00	44.5	1C	0.9087	40.5
13:03	113	43.7	16.51	10.51	0.00	42.8	1C	0.9087	38.9
13:04	113	43.6	16.42	11.80	0.00	42.8	1C	0.9087	38.9
13:05	112	43.5	16.57	9.40	0.00	42.8	1C	0.9087	38.9
13:06	112	43.5	16.89	12.35	0.00	42.8	1C	0.9087	38.9
13:07	112	43.4	17.19	14.71	0.00	42.0	1C	0.9087	38.2
13:08	112	43.4	17.52	14.74	0.00	44.5	1C	0.9087	40.5
13:09	112	43.4	16.46	12.34	0.00	42.0	1C	0.9087	38.2
13:10	112	43.3	15.72	8.79	0.00	37.0	1C	0.9087	33.6
13:11	112	43.3	17.56	14.68	0.00	51.2	1C	0.9087	46.6
13:12	113	43.2	16.32	12.53	0.00	59.6	1C	0.9087	54.2
13:13	112	43.2	15.34	8.64	0.00	42.8	1C	0.9087	38.9
13:14	112	43.1	18.00	20.34	0.00	55.4	1C	0.9087	50.4
13:15	112	43.1	15.33	5.52	0.00	58.8	1C	0.9087	53.4
13:16	112	43.0	16.24	7.88	0.00	42.8	1C	0.9087	38.9
13:17	112	43.0	18.24	16.67	0.00	75.6	1C	0.9087	68.7
13:18	113	43.0	13.83	1.84	0.00	69.7	1C	0.9087	63.4
13:19	112	43.0	16.81	6.63	0.00	52.1	1C	0.9087	47.3
13:20	113	43.0	16.99	5.88	0.00	89.9	1C	0.9087	81.7
13:21	114	42.9	13.65	0.75	0.00	83.2	1C	0.9087	75.6
13:22	114	43.1	14.52	2.21	0.00	78.1	1C	0.9087	71.0
13:23	114	43.2	14.61	2.34	0.00	77.3	1C	0.9087	70.2
13:24	114	43.3	14.79	1.81	0.00	77.3	1C	0.9087	70.2
13:25	114	43.3	14.93	1.79	0.00	74.8	1C	0.9087	67.9
13:26	113	43.4	14.92	1.86	0.00	70.6	1C	0.9087	64.1
13:27	113	43.4	14.94	0.84	0.00	71.4	1C	0.9087	64.9
13:28	113	43.5	15.12	0.73	0.00	71.4	1C	0.9087	64.9
13:29	113	43.4	15.18	0.93	0.00	69.7	1C	0.9087	63.4
13:30	113	43.4	15.25	0.70	0.00	68.9	1C	0.9087	62.6
13:31	113	43.4	15.30	1.04	0.00	69.7	1C	0.9087	63.4
13:32	113	43.3	15.92	0.61	0.00	69.7	1C	0.9087	63.4
Average	**114**	**43.0**	**14.02**	**4.87**	**0.05**	**68.5**			**62.2**

East Devon Crematorium Abatement System Outlet

Total Particulate Matter and Hydrogen Chloride

Contract	East Devon Crematorium, DEM0508
Date	12th July 2011
Location	Flue Gas Abatement System Outlet
Engineer(s)	JB & ST
Absorbent	H_2O

Test Log	Test 1	Test 2	Test 3
Barometric Pressure(kPa)	101.7	101.7	101.7
Gas Meter Temperature(Deg C)	38.9	45.7	43.0
Oxygen Concentration(%v/v dry)	12.90	14.28	14.02
Flue Gas Volumetric Flow(Nm^3/h dry)	1658	1491	1366

	Start	End	Start	End	Start	End
Time	08:54	10:26	10:35	12:03	12:12	13:32
Gas Meter Reading(Am^3 dry)	256.618	257.572	257.572	258.206	258.206	258.918
Absorber Weight(g)	3407.2	3457.2	3512.8	3544.0	3434.3	3471.8
Filter Reference	ED120711F1		ED120711F2		ED120711F3	
Filter Weight(g)	0.54954	0.54986	0.54839	0.54861	0.54712	0.54748
Probe Rinse Reference	ED120711R1		ED120711R2		ED120711R3	
Probe Rinse Weight(g)	79.5023	79.5024	79.5024	79.5025	79.5025	79.5026
Sample Reference HCl	ED120711HA1		ED120711HA2		ED120711HA3 A&B	
Absorbent Volume(ml)	500		500		250	250
Absorbent(mg/l as HCl)	11		8.6		35	0.76
Blank(mg/l as HCl)	0.83		0.83		0.83	0.83

Calculation: General

Barometric Pressure(kPa)	101.7	101.7	101.7
Gas Meter temperature(Deg C)	38.9	45.7	43.0
Gas Volume Sampled(Am^3 dry)	0.954	0.634	0.712
Gas Volume Sampled(Nm^3 dry)	0.8382	0.5453	0.6175
Mass of Dry Gas(g @ 1292.8 g/Nm^3)	1083.66	704.94	798.29
Change in Absorber Weight(g)	50.0	31.2	37.5
Water Vapour Volume(Nm^3 @ 803.9 g/Nm^3)	0.0622	0.0388	0.0466
Gas Volume(Nm^3 wet)	0.9004	0.5841	0.6641
Mass of Wet Gas(g)	1133.66	736.14	835.79
Moisture Concentration(%v/v)	**6.9**	**6.6**	**7.0**
Moisture Concentration(%w/w)	**4.4**	**4.2**	**4.5**

Calculation: Particulate

Increase In Filter Weights(g)	0.00043	0.00030	0.00049
Particulate Emission(mg/Nm^3 dry)	0.52	0.55	0.79
Oxygen Concentration(%v/v dry)	12.90	14.28	14.02
Particulate Emission (mg/Nm^3 @ 11 %v/v Oxygen dry)	**0.64**	**0.82**	**1.13**
Flue Gas Volumetric Flow(Nm^3/h dry)	1658	1491	1366
Particulate Emission(g/h)	**0.86**	**0.82**	**1.08**
Required Sample Velocity(Nm/s)	9.85	8.85	8.11
Nozzle Used(mm)	4.5	4.0	4.5
Area of Nozzle(m^2)	0.00001590	0.00001257	0.00001590
Test Duration(mins)	92	88	80
Actual Sample Velocity(Nm/s)	9.55	8.22	8.09
Isokinetic Closure(%)	97	93	100
		97	

Calculation: HCl

Absorbent(mg/l as HCl)	11.00	8.60	35.76
Blank(mg/l as HCl)	0.83	0.83	0.83
Chloride Absorbed(mg/l as HCl)	10.17	7.77	34.93
Chloride Absorbed(mg as HCl)	5.09	3.89	8.73
HCl(mg)	5.09	3.89	8.73
HCl Emission(mg/Nm^3 dry)	6.07	7.12	14.14
Oxygen Concentration(%v/v dry)	12.90	14.28	14.02
HCl Emission (mg/Nm^3 @ 11 %v/v Oxygen dry)	**7.50**	**10.63**	**20.30**
Flue Gas Volumetric Flow(Nm^3/h dry)	1658	1491	1366
HCl Emission(g/h)	**10.06**	**10.62**	**19.31**

East Devon Crematorium Abatement System Outlet

Flue Gas Volumetric Flow

Contract	East Devon Crematorium, DEM0508
Date	12th July 2011
Location	Flue Gas Abatement System Outlet
Engineer(s)	JB & ST

Test Log	Test 1	Test 2	Test 3
Flue Gas Temperature(Deg C)	116	116	114
Flue Gas Pitot Head Sample Points(Pa)	101.2	81.5	68.5
Flue Gas Pitot Head Duct Mean(Pa)	92.0	74.1	62.2
Flue Gas Moisture(%v/v)	6.9	6.6	7.0
Flue Gas Moisture(%w/w)	4.4	4.2	4.5
Flue Gas Duct Dimensions(mm)	250 mm Diameter Circular Stack		
Flue Gas Duct Area(m^2)	0.0491		

Calculation

Flue Gas Density(kg/m^3)	0.8930	0.8921	0.8966
Sample Points			
Flue Gas Velocity(Am/s)	15.06	13.52	12.36
Flue Gas Volumetric Flowrate(Am^3/h)	2660	2389	2184
Flue Gas Volumetric Flowrate(Am^3/h dry)	2477	2230	2031
Flue Gas Volumetric Flowrate(Nm^3/h dry)	1740	1564	1433
Duct Mean			
Flue Gas Velocity(Am/s)	14.35	12.89	11.78
Flue Gas Volumetric Flowrate(Am^3/h)	2536	2277	2082
Flue Gas Volumetric Flowrate(Am^3/h dry)	2361	2126	1936
Flue Gas Volumetric Flowrate(Nm^3/h dry)	**1658**	**1491**	**1366**

East Devon Crematorium Abatement System Outlet

Preliminary Pitot Traverse

Traverse Position	Plane 1 / Top Pa	Root(Pa)	Probe Position	Plane 2 / Side Pa	Root(Pa)	Probe Position
1 Near	64	8.00		63	7.94	
2	71	8.43		69	8.31	
3	75	8.66		76	8.72	
4	80	8.94		82	9.06	
5	83	9.11	1C	83	9.11	2C
6	82	9.06		83	9.11	
7	79	8.89		81	9.00	
8	76	8.72		78	8.83	
9	73	8.54		75	8.66	
10 Far	68	8.25		70	8.37	
Sum		86.59			87.10	

Overall Total Root(Pa)	173.69
Average Root(Pa)	8.68
Equivalent Pa	75.4

Duct Mean Correction Factor	0.9087	1C	**Velocity Within 3:1 (9:1 Pa)**
			Flow > 5 Pa All Points
	1.0930	2C	**No Negative Flow**
			Swirl < 15°

East Devon Crematorium Abatement System Outlet

Data Log 12/07/11

Test 4

Time	Flue Gas °C	Meter °C	Flue O_2 %v/v dry	Sample Point Pa	Sample Point	Factor	Duct Mean Pa
13:42	114	41.1	14.92	61.3	1C	0.9087	55.7
13:43	114	41.0	14.36	69.7	1C	0.9087	63.4
13:44	114	40.9	15.07	76.4	1C	0.9087	69.5
13:45	114	40.9	14.63	76.4	1C	0.9087	69.5
13:46	115	40.8	14.62	83.2	1C	0.9087	75.6
13:47	115	40.8	14.04	87.4	1C	0.9087	79.4
13:48	115	40.8	12.57	89.9	1C	0.9087	81.7
13:49	116	40.8	10.66	117.6	1C	0.9087	106.9
13:50	116	40.8	12.80	98.3	1C	0.9087	89.3
13:51	116	40.8	12.49	77.3	1C	0.9087	70.2
13:52	116	40.9	11.73	85.7	1C	0.9087	77.9
13:53	116	40.9	11.82	91.6	1C	0.9087	83.2
13:54	116	41.0	11.60	89.9	1C	0.9087	81.7
13:55	116	41.0	12.54	73.9	1C	0.9087	67.2
13:56	115	41.1	12.13	62.2	1C	0.9087	56.5
13:57	115	41.2	12.46	52.9	1C	0.9087	48.1
13:58	114	41.2	12.25	46.2	1C	0.9087	42.0
13:59	114	41.3	12.11	42.8	1C	0.9087	38.9
14:00	114	41.3	12.70	40.3	1C	0.9087	36.6
14:01	113	41.4	12.59	37.8	1C	0.9087	34.3
14:02	113	41.5	12.15	36.1	1C	0.9087	32.8
14:03	113	41.6	12.64	33.6	1C	0.9087	30.5
14:04	113	41.7	12.94	36.1	1C	0.9087	32.8
14:05	113	41.8	13.86	39.5	1C	0.9087	35.9
14:06	112	41.8	14.20	43.7	1C	0.9087	39.7
14:07	112	41.9	14.09	43.7	1C	0.9087	39.7
14:08	112	41.9	14.41	42.8	1C	0.9087	38.9
14:09	112	41.9	14.66	41.2	1C	0.9087	37.4
14:10	112	42.0	14.78	41.2	1C	0.9087	37.4
14:11	112	42.0	14.85	42.0	1C	0.9087	38.2
14:12	112	42.1	14.88	42.8	1C	0.9087	38.9
14:13	112	42.2	14.92	42.0	1C	0.9087	38.2
14:14	112	42.2	15.28	41.2	1C	0.9087	37.4
14:15	112	42.2	15.44	41.2	1C	0.9087	37.4
14:16	111	42.2	15.47	41.2	1C	0.9087	37.4
14:17	111	42.3	15.80	40.3	1C	0.9087	36.6
14:18	111	42.3	16.18	39.5	1C	0.9087	35.9
14:19	111	42.2	16.57	38.6	1C	0.9087	35.1
14:20	111	42.2	16.99	43.7	1C	0.9087	39.7
14:21	112	42.3	17.20	72.2	1C	0.9087	65.6
14:22	112	42.3	13.98	73.1	1C	0.9087	66.4

14:23	112	42.4	13.74	74.8	1C	0.9087	67.9
14:24	113	42.4	13.94	74.8	1C	0.9087	67.9
14:25	113	42.5	14.10	73.9	1C	0.9087	67.2
14:26	113	42.7	14.21	73.1	1C	0.9087	66.4
14:27	113	42.7	14.34	72.2	1C	0.9087	65.6
14:28	113	42.8	14.44	73.1	1C	0.9087	66.4
14:29	113	42.9	14.59	73.1	1C	0.9087	66.4
14:30	113	42.9	14.72	71.4	1C	0.9087	64.9
14:31	113	42.9	14.67	62.2	1C	0.9087	56.5
14:32	113	43.0	14.42	63.0	1C	0.9087	57.2
14:33	112	43.1	14.58	61.3	1C	0.9087	55.7
14:34	112	43.2	14.63	62.2	1C	0.9087	56.5
14:35	112	43.2	14.72	62.2	1C	0.9087	56.5
14:36	112	43.2	14.78	61.3	1C	0.9087	55.7
14:37	112	43.2	14.89	58.8	1C	0.9087	53.4
14:38	112	43.2	14.71	58.0	1C	0.9087	52.7
14:39	112	43.3	14.75	56.3	1C	0.9087	51.1
14:40	112	43.4	14.77	56.3	1C	0.9087	51.1
14:41	112	43.4	14.82	57.1	1C	0.9087	51.9
14:42	112	43.4	14.87	57.1	1C	0.9087	51.9
14:43	112	43.5	14.92	56.3	1C	0.9087	51.1
14:44	112	43.4	14.99	52.1	1C	0.9087	47.3
14:45	111	43.4	14.68	47.9	1C	0.9087	43.5
14:46	111	43.4	14.38	33.6	1C	0.9087	30.5
14:47	110	43.5	16.60	36.1	1C	0.9087	32.8
14:48	111	43.5	18.52	52.9	1C	0.9087	48.1
14:49	110	43.6	14.90	32.8	1C	0.9087	29.8
14:50	110	43.6	13.23	31.9	1C	0.9087	29.0
14:51	110	43.7	13.12	31.9	1C	0.9087	29.0
Average	**113**	**42.2**	**14.22**	**57.9**			**52.6**

East Devon Crematorium Abatement System Outlet

Data Log 12/07/11

Test 5

Time	Flue Gas °C	Meter °C	Flue O_2 %v/v dry	Sample Point Pa	Sample Point	Factor	Duct Mean Pa
15:04	114	41.2	14.93	85.7	1C	0.9087	77.9
15:05	113	41.2	13.88	58.0	1C	0.9087	52.7
15:06	114	41.1	13.97	60.5	1C	0.9087	55.0
15:07	114	41.0	14.50	60.5	1C	0.9087	55.0
15:08	114	40.9	14.33	67.2	1C	0.9087	61.1
15:09	114	40.9	14.03	69.7	1C	0.9087	63.4
15:10	114	40.9	13.11	65.5	1C	0.9087	59.5
15:11	114	40.9	13.82	59.6	1C	0.9087	54.2
15:12	114	40.9	14.74	59.6	1C	0.9087	54.2
15:13	114	41.0	14.02	68.9	1C	0.9087	62.6
15:14	115	41.1	9.84	106.7	1C	0.9087	96.9
15:15	117	41.1	11.11	142.8	1C	0.9087	129.8
15:16	118	41.2	11.87	150.4	1C	0.9087	136.6
15:17	119	41.4	12.75	142.8	1C	0.9087	129.8
15:18	119	41.5	12.88	118.4	1C	0.9087	107.6
15:19	118	41.6	12.56	94.9	1C	0.9087	86.3
15:20	118	41.7	12.61	77.3	1C	0.9087	70.2
15:21	117	41.8	12.60	58.0	1C	0.9087	52.7
15:22	117	41.8	12.20	47.9	1C	0.9087	43.5
15:23	117	42.0	12.20	47.9	1C	0.9087	43.5
15:24	116	42.1	11.88	47.0	1C	0.9087	42.7
15:25	116	42.1	12.05	41.2	1C	0.9087	37.4
15:26	115	42.2	12.01	39.5	1C	0.9087	35.9
15:27	115	42.3	12.21	37.8	1C	0.9087	34.3
15:28	115	42.3	12.64	43.7	1C	0.9087	39.7
15:29	115	42.3	12.98	42.8	1C	0.9087	38.9
15:30	115	42.3	13.54	42.8	1C	0.9087	38.9
15:31	115	42.4	13.87	42.8	1C	0.9087	38.9
15:32	114	42.4	14.26	42.8	1C	0.9087	38.9
15:33	114	42.4	14.77	42.0	1C	0.9087	38.2
15:34	114	42.5	15.09	42.0	1C	0.9087	38.2
15:35	114	42.5	15.43	40.3	1C	0.9087	36.6
15:36	114	42.6	15.64	40.3	1C	0.9087	36.6
15:37	114	42.6	15.86	39.5	1C	0.9087	35.9
15:38	113	42.6	16.13	39.5	1C	0.9087	35.9
15:39	113	42.6	16.35	39.5	1C	0.9087	35.9
15:40	113	42.7	16.65	39.5	1C	0.9087	35.9
15:41	113	42.7	16.88	40.3	1C	0.9087	36.6
15:42	113	42.7	17.08	39.5	1C	0.9087	35.9
15:43	113	42.7	17.38	39.5	1C	0.9087	35.9
15:44	112	42.7	17.50	39.5	1C	0.9087	35.9
15:45	113	42.7	17.76	58.8	1C	0.9087	53.4

15:46	114	42.7	15.51	72.2	1C	0.9087	65.6
15:47	114	42.7	13.75	73.1	1C	0.9087	66.4
15:48	115	42.7	13.92	73.9	1C	0.9087	67.2
15:49	115	42.7	14.09	72.2	1C	0.9087	65.6
15:50	114	42.8	17.13	57.1	1C	0.9087	51.9
15:51	114	42.9	17.42	72.2	1C	0.9087	65.6
15:52	115	42.8	14.67	91.6	1C	0.9087	83.2
15:53	115	42.8	15.04	86.5	1C	0.9087	78.6
15:54	115	42.9	15.01	77.3	1C	0.9087	70.2
15:55	115	42.9	15.01	76.4	1C	0.9087	69.5
15:56	115	43.0	15.15	74.8	1C	0.9087	67.9
15:57	115	43.0	15.21	75.6	1C	0.9087	68.7
15:58	115	42.9	15.30	75.6	1C	0.9087	68.7
15:59	115	42.9	15.37	74.8	1C	0.9087	67.9
16:00	114	42.9	15.43	70.6	1C	0.9087	64.1
16:01	114	42.9	15.34	69.7	1C	0.9087	63.4
16:02	114	42.9	15.41	69.7	1C	0.9087	63.4
16:03	114	41.6	15.68	69.7	1C	0.9087	63.4
16:04	114	40.5	16.03	67.2	1C	0.9087	61.1
Average	**115**	**42.1**	**14.43**	**65.0**			**59.0**

East Devon Crematorium Abatement System Outlet

Data Log 12/07/11

Test 6

Time	Flue Gas °C	Meter °C	Flue O_2 %v/v dry	Sample Point Pa	Sample Point	Factor	Duct Mean Pa
16:14	116	39.3	17.71	82.3	1C	0.9087	74.8
16:15	115	40.0	14.16	52.9	1C	0.9087	48.1
16:16	115	39.9	14.22	55.4	1C	0.9087	50.4
16:17	115	39.9	14.90	56.3	1C	0.9087	51.1
16:18	115	39.9	14.46	64.7	1C	0.9087	58.8
16:19	116	39.9	11.44	80.6	1C	0.9087	73.3
16:20	116	40.0	10.12	67.2	1C	0.9087	61.1
16:21	116	40.0	12.06	63.8	1C	0.9087	58.0
16:22	116	40.1	12.07	73.1	1C	0.9087	66.4
16:23	116	40.1	11.58	72.2	1C	0.9087	65.6
16:24	116	40.2	12.06	72.2	1C	0.9087	65.6
16:25	116	40.3	12.23	63.8	1C	0.9087	58.0
16:26	116	40.5	12.00	68.0	1C	0.9087	61.8
16:27	116	40.6	12.46	66.4	1C	0.9087	60.3
16:28	115	40.6	13.10	65.5	1C	0.9087	59.5
16:29	115	40.7	13.40	61.3	1C	0.9087	55.7
16:30	115	40.8	13.04	47.0	1C	0.9087	42.7
16:31	114	40.9	12.11	38.6	1C	0.9087	35.1
16:32	114	41.0	12.26	35.3	1C	0.9087	32.1
16:33	113	41.0	12.19	33.6	1C	0.9087	30.5
16:34	113	41.1	12.26	36.1	1C	0.9087	32.8
16:35	113	41.1	12.07	33.6	1C	0.9087	30.5
16:36	113	41.1	12.64	32.8	1C	0.9087	29.8
16:37	112	41.1	13.06	32.8	1C	0.9087	29.8
16:38	112	41.2	13.48	39.5	1C	0.9087	35.9
16:39	112	41.2	14.35	42.8	1C	0.9087	38.9
16:40	112	41.1	14.79	42.0	1C	0.9087	38.2
16:41	112	41.1	15.41	42.0	1C	0.9087	38.2
16:42	112	41.1	15.78	40.3	1C	0.9087	36.6
16:43	112	41.1	15.98	39.5	1C	0.9087	35.9
16:44	112	41.1	16.24	40.3	1C	0.9087	36.6
16:45	112	41.1	16.39	40.3	1C	0.9087	36.6
16:46	111	41.0	16.56	40.3	1C	0.9087	36.6
16:47	111	41.0	16.83	41.2	1C	0.9087	37.4
16:48	111	41.1	17.06	40.3	1C	0.9087	36.6
16:49	111	41.1	17.28	39.5	1C	0.9087	35.9
16:50	111	41.1	17.25	39.5	1C	0.9087	35.9
16:51	111	41.2	17.28	40.3	1C	0.9087	36.6
16:52	111	41.2	17.58	52.9	1C	0.9087	48.1
16:53	112	41.3	14.24	75.6	1C	0.9087	68.7
16:54	113	41.4	12.71	77.3	1C	0.9087	70.2

16:55	112	41.6	16.07	54.6	1C	0.9087	49.6
16:56	112	41.6	16.28	68.9	1C	0.9087	62.6
16:57	113	41.6	13.11	84.0	1C	0.9087	76.3
16:58	112	41.7	16.93	58.8	1C	0.9087	53.4
16:59	113	41.8	16.05	79.0	1C	0.9087	71.7
17:00	113	41.8	13.70	87.4	1C	0.9087	79.4
17:01	114	41.9	14.26	86.5	1C	0.9087	78.6
17:02	113	42.0	18.22	66.4	1C	0.9087	60.3
17:03	114	42.0	15.67	89.9	1C	0.9087	81.7
17:04	113	42.1	14.46	79.0	1C	0.9087	71.7
17:05	113	42.1	14.22	76.4	1C	0.9087	69.5
17:06	114	42.2	14.46	93.2	1C	0.9087	84.7
17:07	114	42.4	14.93	93.2	1C	0.9087	84.7
17:08	114	42.5	15.12	91.6	1C	0.9087	83.2
17:09	114	42.7	15.23	88.2	1C	0.9087	80.1
17:10	114	42.8	15.20	86.5	1C	0.9087	78.6
17:11	114	42.9	15.23	86.5	1C	0.9087	78.6
17:12	115	43.0	15.33	87.4	1C	0.9087	79.4
17:13	115	43.1	15.52	89.0	1C	0.9087	80.9
17:14	114	43.2	15.33	73.1	1C	0.9087	66.4
17:15	114	43.3	14.97	60.5	1C	0.9087	55.0
17:16	114	43.4	14.31	47.9	1C	0.9087	43.5
17:17	113	43.5	13.63	46.2	1C	0.9087	42.0
17:18	113	43.5	14.41	48.7	1C	0.9087	44.3
17:19	113	43.4	19.32	56.3	1C	0.9087	51.1
17:20	113	43.4	16.21	73.9	1C	0.9087	67.2
17:21	114	43.5	15.46	68.0	1C	0.9087	61.8
17:22	113	43.5	15.11	52.9	1C	0.9087	48.1
17:23	113	43.5	14.38	51.2	1C	0.9087	46.6
17:24	113	43.5	14.36	51.2	1C	0.9087	46.6
17:25	113	43.5	14.43	51.2	1C	0.9087	46.6
17:26	113	43.5	14.51	51.2	1C	0.9087	46.6
17:27	112	43.5	14.52	40.3	1C	0.9087	36.6
17:28	112	43.6	17.92	42.8	1C	0.9087	38.9
17:29	113	43.5	18.19	62.2	1C	0.9087	56.5
17:30	113	43.5	15.58	65.5	1C	0.9087	59.5
17:31	113	43.5	15.64	62.2	1C	0.9087	56.5
17:32	113	43.5	15.33	49.6	1C	0.9087	45.0
17:33	113	43.5	14.80	49.6	1C	0.9087	45.0
17:34	112	43.5	14.82	49.6	1C	0.9087	45.0
17:35	112	43.3	15.89	47.9	1C	0.9087	43.5
Average	**113**	**41.8**	**14.71**	**59.5**			**54.1**

East Devon Crematorium Abatement System Outlet

Mercury

Contract	East Devon Crematorium, DEM0508
Date	12th July 2011
Location	Flue Gas Abatement System Outlet
Engineer(s)	JB & ST
Absorbent	4% $K_2CR_2O_7$ / 20% HNO_3 in H_2O

Test Log	Test 4		Test 5		Test 6	
Barometric Pressure(kPa)	101.7		101.7		101.7	
Gas Meter Temperature(Deg C)	42.2		42.1		41.8	
Oxygen Concentration(%v/v dry)	14.22		14.43		14.71	
Flue Gas Volumetric Flow(Nm^3/h dry)	1263		1295		1278	
	Start	End	Start	End	Start	End
Time	13:42	14:51	15:04	16:04	16:14	17:20
Gas Meter Reading(Am^3 dry)	258.918	259.521	259.521	259.999	259.999	260.634
Absorber Weight(g)	3491.7	3521.3	3414.9	3450.7	3449.2	3481.2
Filter Reference	ED120711FHGA4		ED120711FHGA5		ED120711FHGA6	
Filter Fraction Analysed	1		1		1	
Filter(µg as Hg)	0.02		0.07		0.07	
Filter Blank(µg as Hg)	0.02		0.02		0.02	
Probe Rinse Reference	Washed into HgA4		Washed into HgA5		Washed into HgA6A	
Probe Rinse Volume(ml)	0		0		0	
Probe Rinse(µg/l as Hg)	0		0		0	
Probe Rinse Blank(µg/l as Hg)	0		0		0	
Absorbent Reference	ED120711HGA4		ED120711HGA5		ED120711HGA6 A&B	
Absorbent Volume(ml)	500		500		250	250
Absorbent(µg/l as Hg)	11		17		29	5
Absorbent Blank(µg/l as Hg)	5		5		5	5

Calculation: General

Barometric Pressure(kPa)	101.7	101.7	101.7
Gas Meter Temperature(Deg C)	42.2	42.1	41.8
Gas Volume Sampled(Am^3 dry)	0.603	0.478	0.635
Gas Volume Sampled(Nm^3 dry)	0.5243	0.4157	0.5529
Mass of Dry Gas(g @ 1292.8 g/Nm^3)	677.85	537.45	714.74
Change in Absorber Weight(g)	29.6	35.8	32.0
Water Vapour Volume(Nm^3 @ 803.9 g/Nm^3)	0.0368	0.0445	0.0398
Gas Volume(Nm^3 wet)	0.5612	0.4603	0.5927
Mass of Wet Gas(g)	707.45	573.25	746.74
Moisture Concentration(%v/v)	**6.6**	**9.7**	**6.7**
Moisture Concentration(%w/w)	**4.2**	**6.2**	**4.3**

Calculation: Mercury

Filter(µg as Hg)	0.00	0.05	0.05
Probe Rinse(µg as Hg)	0.00	0.00	0.00
Absorbent(µg as Hg)	3.00	6.00	6.00
Total Mercury Sampled(µg)	3.00	6.05	6.05
Mercury Emission(µg/Nm^3 dry)	5.72	14.55	10.94
Oxygen Concentration(%v/v dry)	14.22	14.43	14.71
Mercury Emission (µg/Nm^3 @ 11 %v/v Oxygen dry)	**8.46**	**22.22**	**17.44**
Flue Gas Volumetric Flowrate(Nm^3/h dry)	1263	1295	1278
Mercury Emission(g/h)	**0.007**	**0.019**	**0.014**
Required Sample Velocity(Nm/s)	7.50	7.69	7.58
Nozzle Used(mm)	4.5	4.5	4.5
Area of Nozzle(m^2)	0.00001590	0.00001590	0.00001590
Test Duration(mins)	69	60	66
Actual Sample Velocity(Nm/s)	7.96	7.26	8.78
Isokinetic Closure(%)	106	94	116
		105	

East Devon Crematorium Abatement System Outlet

Flue Gas Volumetric Flow

Contract	East Devon Crematorium, DEM0508
Date	12th July 2011
Location	Flue Gas Abatement System Outlet
Engineer(s)	JB & ST

Test Log	Test 1	Test 2	Test 3
Flue Gas Temperature(Deg C)	113	115	113
Flue Gas Pitot Head Sample Points(Pa)	57.9	65.0	59.5
Flue Gas Pitot Head Duct Mean(Pa)	52.6	59.0	54.1
Flue Gas Moisture(%v/v)	6.6	9.7	6.7
Flue Gas Moisture(%w/w)	4.2	6.2	4.3
Flue Gas Duct Dimensions(mm)	250 mm Diameter Circular Stack		
Flue Gas Duct Area(m^2)	0.0491		
Calculation			
Flue Gas Density(kg/m^3)	0.9005	0.8889	0.8988
Sample Points			
Flue Gas Velocity(Am/s)	11.34	12.09	11.51
Flue Gas Volumetric Flowrate(Am^3/h)	2004	2137	2033
Flue Gas Volumetric Flowrate(Am^3/h dry)	1873	1930	1897
Flue Gas Volumetric Flowrate(Nm^3/h dry)	1325	1359	1340
Duct Mean			
Flue Gas Velocity(Am/s)	10.81	11.53	10.97
Flue Gas Volumetric Flowrate(Am^3/h)	1910	2037	1938
Flue Gas Volumetric Flowrate(Am^3/h dry)	1785	1840	1808
Flue Gas Volumetric Flowrate(Nm^3/h dry)	**1263**	**1295**	**1278**

East Devon Crematorium Abatement System Outlet

Dioxin & Furan Test 7

Data Log 13-Jul-11

Time	Flue Gas °C	Meter °C	Flue O_2 %v/v dry	Sample Point Pa	Sample Point	Factor	Duct Mean Pa
09:31	111	18.1	12.11	126.8	1C	0.9087	115.3
09:32	112	18.3	13.83	111.7	1C	0.9087	101.5
09:33	112	18.5	12.94	99.1	1C	0.9087	90.1
09:34	112	18.9	13.02	99.1	1C	0.9087	90.1
09:35	112	19.3	13.07	89.0	1C	0.9087	80.9
09:36	113	19.8	11.35	91.6	1C	0.9087	83.2
09:37	113	20.3	11.50	92.4	1C	0.9087	84.0
09:38	113	20.8	11.98	104.2	1C	0.9087	94.6
09:39	113	21.3	12.78	92.4	1C	0.9087	84.0
09:40	113	21.7	11.56	100.8	1C	0.9087	91.6
09:41	114	22.3	12.15	106.7	1C	0.9087	96.9
09:42	114	22.8	11.80	119.3	1C	0.9087	108.4
09:43	116	23.4	11.71	147.8	1C	0.9087	134.3
09:44	116	23.9	12.23	138.6	1C	0.9087	125.9
09:45	117	24.4	11.97	156.2	1C	0.9087	142.0
09:46	118	24.8	12.23	160.4	1C	0.9087	145.8
09:47	119	25.3	11.92	170.5	1C	0.9087	154.9
09:48	119	25.8	11.98	169.7	1C	0.9087	154.2
09:49	120	26.3	11.87	168.0	1C	0.9087	152.7
09:50	121	26.7	12.19	168.0	1C	0.9087	152.7
09:51	121	27.1	12.45	167.2	1C	0.9087	151.9
09:52	122	27.6	12.65	161.3	1C	0.9087	146.6
09:53	122	28.0	12.44	152.9	1C	0.9087	138.9
09:54	122	28.4	12.39	142.8	1C	0.9087	129.8
09:55	123	28.8	12.29	152.0	1C	0.9087	138.2
09:56	123	29.3	12.40	160.4	1C	0.9087	145.8
09:57	124	29.7	12.42	158.8	1C	0.9087	144.3
09:58	124	30.1	12.46	142.8	1C	0.9087	129.8
09:59	124	30.4	12.43	134.4	1C	0.9087	122.1
10:00	124	30.8	12.16	120.1	1C	0.9087	109.1
10:01	123	31.1	12.28	115.1	1C	0.9087	104.6
10:02	123	31.4	12.34	102.5	1C	0.9087	93.1
10:03	123	31.7	12.33	98.3	1C	0.9087	89.3
10:04	122	32.0	12.25	85.7	1C	0.9087	77.9
10:05	122	32.3	12.04	81.5	1C	0.9087	74.0

10:06	121	32.7	11.38	71.4	1C	0.9087	64.9
10:07	121	32.9	12.50	76.4	1C	0.9087	69.5
10:08	121	33.1	11.59	68.0	1C	0.9087	61.8
10:09	120	33.4	11.82	69.7	1C	0.9087	63.4
10:10	120	33.7	12.97	74.8	1C	0.9087	67.9
10:11	119	33.9	13.32	63.0	1C	0.9087	57.2
10:12	119	34.2	13.29	68.9	1C	0.9087	62.6
10:13	119	34.5	11.23	55.4	1C	0.9087	50.4
10:14	118	34.8	12.23	51.2	1C	0.9087	46.6
10:15	118	35.0	12.32	61.3	1C	0.9087	55.7
10:16	119	35.4	10.27	49.6	1C	0.9087	45.0
10:17	118	35.6	13.76	27.7	1C	0.9087	25.2
10:18	119	35.9	11.94	38.6	1C	0.9087	35.1
10:19	118	36.1	12.54	30.2	1C	0.9087	27.5
10:20	118	36.4	13.18	46.2	1C	0.9087	42.0
10:21	119	36.6	10.72	54.6	1C	0.9087	49.6
10:22	118	36.8	14.65	31.1	1C	0.9087	28.2
10:23	118	37.0	14.11	53.8	1C	0.9087	48.9
10:24	119	37.2	11.19	61.3	1C	0.9087	55.7
10:25	119	37.3	12.36	44.5	1C	0.9087	40.5
10:26	118	37.5	13.45	34.4	1C	0.9087	31.3
10:27	119	37.6	13.08	59.6	1C	0.9087	54.2
10:28	118	37.8	12.51	88.2	1C	0.9087	80.1
10:29	118	38.0	13.12	82.3	1C	0.9087	74.8
10:30	118	38.2	12.98	71.4	1C	0.9087	64.9
10:31	117	38.2	12.72	60.5	1C	0.9087	55.0
10:32	117	38.3	14.39	65.5	1C	0.9087	59.5
10:33	117	38.4	12.98	86.5	1C	0.9087	78.6
10:34	117	38.5	12.19	74.8	1C	0.9087	67.9
10:35	116	38.7	12.79	70.6	1C	0.9087	64.1
10:36	116	38.8	12.84	70.6	1C	0.9087	64.1
10:37	116	39.0	12.88	73.1	1C	0.9087	66.4
10:38	116	39.1	13.57	74.8	1C	0.9087	67.9
10:39	116	39.2	13.43	67.2	1C	0.9087	61.1
10:40	115	39.3	13.46	66.4	1C	0.9087	60.3
10:41	116	39.4	13.51	77.3	1C	0.9087	70.2
10:42	116	39.5	13.50	90.7	1C	0.9087	82.4
10:43	116	39.7	14.03	87.4	1C	0.9087	79.4
10:44	116	39.8	13.84	89.0	1C	0.9087	80.9
10:45	116	39.8	14.21	101.6	1C	0.9087	92.4
10:46	117	39.9	14.79	104.2	1C	0.9087	94.6
10:47	117	40.0	14.99	124.3	1C	0.9087	113.0
10:48	118	40.1	14.30	119.3	1C	0.9087	108.4

10:49	118	40.1	14.40	118.4	1C	0.9087	107.6
10:50	118	40.1	14.98	97.4	1C	0.9087	88.5
10:51	117	40.2	15.21	91.6	1C	0.9087	83.2
10:52	117	40.2	13.92	87.4	1C	0.9087	79.4
10:53	117	40.3	13.88	87.4	1C	0.9087	79.4
10:54	117	40.4	13.86	86.5	1C	0.9087	78.6
10:55	117	40.6	13.89	88.2	1C	0.9087	80.1
10:56	117	40.6	13.98	86.5	1C	0.9087	78.6
10:57	117	40.7	14.07	86.5	1C	0.9087	78.6
10:58	117	40.7	14.13	86.5	1C	0.9087	78.6
10:59	117	40.9	14.21	85.7	1C	0.9087	77.9
11:00	117	41.0	14.24	85.7	1C	0.9087	77.9
11:01	117	41.1	14.23	85.7	1C	0.9087	77.9
11:02	117	41.1	14.31	85.7	1C	0.9087	77.9
11:03	117	41.3	14.35	84.8	1C	0.9087	77.1
11:04	117	41.4	14.42	84.0	1C	0.9087	76.3
11:05	117	41.4	14.53	84.8	1C	0.9087	77.1
11:06	117	41.4	14.59	84.8	1C	0.9087	77.1
11:07	117	41.5	14.67	84.0	1C	0.9087	76.3
11:08	117	41.5	14.77	84.0	1C	0.9087	76.3
11:09	117	41.7	14.84	84.0	1C	0.9087	76.3
11:10	117	41.6	14.87	84.8	1C	0.9087	77.1
11:11	117	41.5	14.90	84.0	1C	0.9087	76.3
11:12	117	41.6	14.95	84.0	1C	0.9087	76.3
11:13	117	41.7	14.98	83.2	1C	0.9087	75.6
11:14	117	41.7	15.01	77.3	1C	0.9087	70.2
11:15	116	41.9	17.08	44.5	1C	0.9087	40.5
11:16	115	41.9	18.09	44.5	1C	0.9087	40.5
11:17	115	42.0	18.33	36.1	1C	0.9087	32.8
11:18	115	42.0	14.37	35.3	1C	0.9087	32.1
11:19	115	42.1	9.44	41.2	1C	0.9087	37.4
11:20	117	42.1	17.10	126.8	1C	0.9087	115.3
11:21	119	42.2	12.34	123.5	1C	0.9087	112.2
11:22	118	42.3	13.67	89.0	1C	0.9087	80.9
11:23	118	42.3	14.21	67.2	1C	0.9087	61.1
11:24	117	42.5	13.80	65.5	1C	0.9087	59.5
11:25	117	42.5	14.64	64.7	1C	0.9087	58.8
11:26	117	42.6	15.06	67.2	1C	0.9087	61.1
11:27	117	42.6	14.91	76.4	1C	0.9087	69.5
11:28	117	42.7	14.59	77.3	1C	0.9087	70.2
11:29	118	42.8	11.09	105.0	1C	0.9087	95.4
11:30	119	42.9	11.64	122.6	1C	0.9087	111.4
11:31	119	43.0	12.46	107.5	1C	0.9087	97.7

11:32	120	43.0	12.20	106.7	1C	0.9087	96.9
11:33	119	43.1	12.69	90.7	1C	0.9087	82.4
11:34	119	43.1	12.63	70.6	1C	0.9087	64.1
11:35	118	43.2	12.05	63.8	1C	0.9087	58.0
11:36	118	43.3	12.39	62.2	1C	0.9087	56.5
11:37	117	43.3	12.20	52.9	1C	0.9087	48.1
11:38	117	43.3	12.29	45.4	1C	0.9087	41.2
11:39	116	43.3	11.85	42.0	1C	0.9087	38.2
11:40	116	43.3	12.22	41.2	1C	0.9087	37.4
11:41	116	43.4	12.42	41.2	1C	0.9087	37.4
11:42	115	43.4	11.74	39.5	1C	0.9087	35.9
11:43	115	43.4	12.06	37.8	1C	0.9087	34.3
11:44	115	43.4	12.24	32.8	1C	0.9087	29.8
11:45	114	43.5	12.41	34.4	1C	0.9087	31.3
11:46	114	43.5	12.51	37.0	1C	0.9087	33.6
11:47	114	43.5	12.27	37.8	1C	0.9087	34.3
11:48	114	43.5	12.77	37.8	1C	0.9087	34.3
11:49	113	43.5	13.57	37.0	1C	0.9087	33.6
11:50	113	43.5	14.06	36.1	1C	0.9087	32.8
11:51	114	43.5	14.73	49.6	1C	0.9087	45.0
11:52	114	43.5	13.69	47.0	1C	0.9087	42.7
11:53	113	43.7	13.98	37.8	1C	0.9087	34.3
11:54	113	43.9	15.66	37.8	1C	0.9087	34.3
11:55	113	43.9	15.91	50.4	1C	0.9087	45.8
11:56	113	44.0	14.62	47.0	1C	0.9087	42.7
11:57	113	44.0	14.63	46.2	1C	0.9087	42.0
11:58	113	44.0	15.11	38.6	1C	0.9087	35.1
11:59	113	44.1	17.11	47.9	1C	0.9087	43.5
12:00	113	44.2	15.62	43.7	1C	0.9087	39.7
12:01	113	44.2	15.32	43.7	1C	0.9087	39.7
12:02	113	44.1	15.40	43.7	1C	0.9087	39.7
12:03	113	44.1	15.60	51.2	1C	0.9087	46.6
12:04	113	44.1	15.10	52.1	1C	0.9087	47.3
12:05	113	44.1	14.95	64.7	1C	0.9087	58.8
12:06	114	44.1	13.82	73.1	1C	0.9087	66.4
12:07	113	44.1	14.74	49.6	1C	0.9087	45.0
12:08	113	44.1	16.33	66.4	1C	0.9087	60.3
12:09	113	44.2	16.00	70.6	1C	0.9087	64.1
12:10	114	44.2	15.51	77.3	1C	0.9087	70.2
12:11	114	44.2	14.44	73.9	1C	0.9087	67.2
12:12	114	44.1	14.90	66.4	1C	0.9087	60.3
12:13	113	44.1	14.94	64.7	1C	0.9087	58.8
12:14	113	44.0	14.99	63.8	1C	0.9087	58.0

12:15	113	44.0	15.09	70.6	1C	0.9087	64.1
12:16	114	44.0	15.09	84.8	1C	0.9087	77.1
12:17	114	44.0	14.20	74.8	1C	0.9087	67.9
12:18	114	44.0	15.37	73.9	1C	0.9087	67.2
12:19	114	44.1	15.24	76.4	1C	0.9087	69.5
12:20	114	44.1	13.78	72.2	1C	0.9087	65.6
12:21	113	44.0	14.58	56.3	1C	0.9087	51.1
12:22	113	44.0	15.14	52.1	1C	0.9087	47.3
12:23	113	44.0	15.00	58.8	1C	0.9087	53.4
12:24	113	44.0	14.83	65.5	1C	0.9087	59.5
12:25	113	44.0	13.81	58.8	1C	0.9087	53.4
12:26	113	44.0	15.16	64.7	1C	0.9087	58.8
12:27	113	44.0	14.79	64.7	1C	0.9087	58.8
12:28	113	44.0	13.90	63.8	1C	0.9087	58.0
12:29	113	44.0	13.91	61.3	1C	0.9087	55.7
12:30	112	44.1	15.11	47.9	1C	0.9087	43.5
12:31	112	44.1	15.00	32.8	1C	0.9087	29.8
12:32	111	44.0	14.02	31.9	1C	0.9087	29.0
12:33	111	44.0	17.96	34.4	1C	0.9087	31.3
12:34	111	44.1	14.66	36.1	1C	0.9087	32.8
12:35	110	44.1	13.35	22.7	1C	0.9087	20.6
12:36	110	44.0	16.20	26.0	1C	0.9087	23.7
12:37	110	44.0	16.66	26.0	1C	0.9087	23.7
12:38	110	44.0	16.44	20.2	1C	0.9087	18.3
12:39	109	43.9	11.90	21.8	1C	0.9087	19.8
12:40	109	43.9	9.31	10.9	1C	0.9087	9.9
12:41	108	43.8	13.25	11.8	1C	0.9087	10.7
12:42	109	43.7	15.33	63.8	1C	0.9087	58.0
12:43	114	43.7	14.82	143.6	1C	0.9087	130.5
12:44	115	43.6	10.91	108.4	1C	0.9087	98.5
12:45	115	43.5	14.04	82.3	1C	0.9087	74.8
12:46	115	43.6	15.05	54.6	1C	0.9087	49.6
12:47	115	43.6	13.09	52.1	1C	0.9087	47.3
12:48	115	43.6	11.99	51.2	1C	0.9087	46.6
12:49	115	43.6	11.98	53.8	1C	0.9087	48.9
12:50	115	43.6	11.74	56.3	1C	0.9087	51.1
12:51	115	43.6	12.57	37.0	1C	0.9087	33.6
12:52	115	43.6	12.80	10.9	1C	0.9087	9.9
12:53	115	43.5	13.43	16.8	1C	0.9087	15.3
12:54	115	43.6	14.00	10.9	1C	0.9087	9.9
12:55	115	43.6	14.36	10.9	1C	0.9087	9.9
12:56	115	43.6	14.59	31.9	1C	0.9087	29.0
12:57	115	43.6	13.51	23.5	1C	0.9087	21.4

12:58	115	43.6	13.42	27.7	1C	0.9087	25.2
12:59	115	43.6	13.48	17.6	1C	0.9087	16.0
13:00	114	43.6	14.07	15.1	1C	0.9087	13.7
13:01	114	43.6	14.06	16.0	1C	0.9087	14.5
13:02	113	43.6	13.55	16.8	1C	0.9087	15.3
13:03	112	43.6	12.88	18.5	1C	0.9087	16.8
13:04	113	43.5	12.69	19.3	1C	0.9087	17.6
13:05	113	43.6	11.15	20.2	1C	0.9087	18.3
13:06	112	43.6	12.68	21.8	1C	0.9087	19.8
13:07	112	43.6	13.40	17.6	1C	0.9087	16.0
13:08	112	43.6	13.59	17.6	1C	0.9087	16.0
13:09	112	43.6	14.78	0.8	1C	0.9087	0.8
13:10	113	43.6	14.78	28.6	1C	0.9087	26.0
13:11	113	43.6	11.20	27.7	1C	0.9087	25.2
13:12	112	43.6	15.98	5.0	1C	0.9087	4.6
13:13	112	43.6	16.27	9.2	1C	0.9087	8.4
13:14	112	43.6	15.30	7.6	1C	0.9087	6.9
13:15	112	43.6	15.13	10.9	1C	0.9087	9.9
13:16	112	43.7	15.28	10.1	1C	0.9087	9.2
13:17	112	43.6	16.80	6.7	1C	0.9087	6.1
13:18	112	43.6	16.77	10.1	1C	0.9087	9.2
13:19	112	43.5	15.71	5.0	1C	0.9087	4.6
13:20	111	43.6	15.79	5.0	1C	0.9087	4.6
13:21	112	43.6	16.14	16.0	1C	0.9087	14.5
13:22	112	43.5	13.57	30.2	1C	0.9087	27.5
13:23	113	43.5	13.49	26.9	1C	0.9087	24.4
13:24	113	43.5	13.70	23.5	1C	0.9087	21.4
13:25	113	43.5	13.93	55.4	1C	0.9087	50.4
13:26	113	43.6	14.16	70.6	1C	0.9087	64.1
13:27	113	43.6	14.71	74.8	1C	0.9087	67.9
13:28	113	43.5	14.89	75.6	1C	0.9087	68.7
13:29	113	43.5	14.89	71.4	1C	0.9087	64.9
13:30	113	43.5	14.68	63.0	1C	0.9087	57.2
13:31	113	43.6	14.62	67.2	1C	0.9087	61.1
13:32	113	43.5	14.85	67.2	1C	0.9087	61.1
13:33	113	43.5	14.84	67.2	1C	0.9087	61.1
13:34	113	43.5	14.80	65.5	1C	0.9087	59.5
13:35	113	43.5	14.77	66.4	1C	0.9087	60.3
13:36	113	43.6	14.78	65.5	1C	0.9087	59.5
13:37	113	43.7	14.91	65.5	1C	0.9087	59.5
13:38	113	43.7	15.01	65.5	1C	0.9087	59.5
13:39	113	43.9	15.14	65.5	1C	0.9087	59.5
13:40	113	43.8	15.26	66.4	1C	0.9087	60.3

13:41	112	43.8	15.33	66.4	1C	0.9087	60.3
13:42	112	43.8	15.41	66.4	1C	0.9087	60.3
13:43	113	43.9	15.56	68.9	1C	0.9087	62.6
13:44	112	43.9	15.73	67.2	1C	0.9087	61.1
13:45	113	43.9	15.92	85.7	1C	0.9087	77.9
13:46	113	43.9	15.09	84.0	1C	0.9087	76.3
13:47	113	43.9	15.26	71.4	1C	0.9087	64.9
13:48	113	43.8	16.10	73.9	1C	0.9087	67.2
13:49	114	44.0	15.99	88.2	1C	0.9087	80.1
13:50	113	44.0	14.75	62.2	1C	0.9087	56.5
13:51	112	43.9	14.36	46.2	1C	0.9087	42.0
13:52	112	44.1	15.03	44.5	1C	0.9087	40.5
13:53	112	44.2	15.20	58.0	1C	0.9087	52.7
13:54	112	44.3	14.49	69.7	1C	0.9087	63.4
13:55	113	44.3	15.12	89.0	1C	0.9087	80.9
13:56	113	44.4	16.87	79.8	1C	0.9087	72.5
13:57	113	44.5	15.77	51.2	1C	0.9087	46.6
13:58	112	44.5	12.52	35.3	1C	0.9087	32.1
13:59	111	44.6	12.86	25.2	1C	0.9087	22.9
14:00	111	44.7	17.41	22.7	1C	0.9087	20.6
14:01	110	44.6	16.51	15.1	1C	0.9087	13.7
14:02	110	44.6	15.36	16.0	1C	0.9087	14.5
14:03	109	44.6	16.47	16.0	1C	0.9087	14.5
14:04	110	44.7	12.97	31.9	1C	0.9087	29.0
14:05	113	44.8	14.82	130.2	1C	0.9087	118.3
14:06	115	45.0	10.89	110.9	1C	0.9087	100.8
14:07	116	45.0	13.75	90.7	1C	0.9087	82.4
14:08	115	44.9	14.49	62.2	1C	0.9087	56.5
14:09	115	45.1	13.95	45.4	1C	0.9087	41.2
14:10	115	45.1	12.70	49.6	1C	0.9087	45.0
14:11	116	45.1	11.38	75.6	1C	0.9087	68.7
14:12	115	45.1	12.91	58.8	1C	0.9087	53.4
14:13	115	45.2	13.21	56.3	1C	0.9087	51.1
14:14	115	45.2	11.91	61.3	1C	0.9087	55.7
14:15	116	45.2	12.41	76.4	1C	0.9087	69.5
14:16	116	45.3	12.62	67.2	1C	0.9087	61.1
14:17	116	45.3	12.34	67.2	1C	0.9087	61.1
14:18	116	45.4	12.31	74.8	1C	0.9087	67.9
14:19	116	45.3	12.48	69.7	1C	0.9087	63.4
14:20	116	45.3	12.53	58.8	1C	0.9087	53.4
14:21	116	45.4	13.03	53.8	1C	0.9087	48.9
14:22	115	45.5	12.74	40.3	1C	0.9087	36.6
14:23	115	45.5	12.12	39.5	1C	0.9087	35.9

14:24	114	45.6	12.02	39.5	1C	0.9087	35.9
14:25	114	45.6	12.12	39.5	1C	0.9087	35.9
14:26	114	45.7	12.90	40.3	1C	0.9087	36.6
14:27	114	45.6	12.19	37.0	1C	0.9087	33.6
14:28	114	45.7	12.33	34.4	1C	0.9087	31.3
14:29	113	45.7	12.45	31.1	1C	0.9087	28.2
14:30	113	45.7	12.67	32.8	1C	0.9087	29.8
14:31	113	45.7	13.24	37.8	1C	0.9087	34.3
14:32	113	45.8	13.36	37.8	1C	0.9087	34.3
14:33	112	45.8	13.98	26.9	1C	0.9087	24.4
14:34	112	45.8	15.10	16.0	1C	0.9087	14.5
14:35	112	45.9	15.25	19.3	1C	0.9087	17.6
14:36	112	46.0	15.95	27.7	1C	0.9087	25.2
14:37	112	46.0	15.57	36.1	1C	0.9087	32.8
14:38	112	46.0	15.29	34.4	1C	0.9087	31.3
14:39	111	46.0	15.55	34.4	1C	0.9087	31.3
14:40	111	45.9	15.78	33.6	1C	0.9087	30.5
14:41	111	45.9	16.03	33.6	1C	0.9087	30.5
14:42	111	45.9	16.31	32.8	1C	0.9087	29.8
14:43	111	45.9	16.40	33.6	1C	0.9087	30.5
14:44	111	46.0	16.49	32.8	1C	0.9087	29.8
14:45	111	46.0	16.70	33.6	1C	0.9087	30.5
14:46	111	46.0	17.01	32.8	1C	0.9087	29.8
14:47	110	46.0	17.24	32.8	1C	0.9087	29.8
14:48	110	46.0	17.53	31.9	1C	0.9087	29.0
14:49	110	46.0	17.72	39.5	1C	0.9087	35.9
14:50	111	46.0	17.85	47.9	1C	0.9087	43.5
14:51	112	46.1	14.36	71.4	1C	0.9087	64.9
14:52	113	46.0	13.72	73.1	1C	0.9087	66.4
14:53	113	46.0	13.99	79.8	1C	0.9087	72.5
14:54	114	46.0	14.34	79.8	1C	0.9087	72.5
14:55	114	46.0	14.54	79.8	1C	0.9087	72.5
14:56	114	46.0	14.67	73.9	1C	0.9087	67.2
14:57	114	46.1	14.51	66.4	1C	0.9087	60.3
14:58	114	46.0	14.44	65.5	1C	0.9087	59.5
14:59	114	46.0	14.48	65.5	1C	0.9087	59.5
15:00	114	46.0	14.63	64.7	1C	0.9087	58.8
15:01	114	46.0	14.71	65.5	1C	0.9087	59.5
15:02	114	46.0	14.78	64.7	1C	0.9087	58.8
15:03	114	46.0	14.93	70.6	1C	0.9087	64.1
15:04	114	46.0	15.38	75.6	1C	0.9087	68.7
15:05	114	45.9	15.69	79.8	1C	0.9087	72.5
15:06	114	45.9	16.09	79.8	1C	0.9087	72.5

15:07	115	45.9	16.29	78.1	1C	0.9087	71.0
15:08	115	46.0	16.38	78.1	1C	0.9087	71.0
15:09	115	46.0	16.47	78.1	1C	0.9087	71.0
15:10	115	46.1	16.54	79.0	1C	0.9087	71.7
15:11	115	46.1	16.61	78.1	1C	0.9087	71.0
15:12	115	46.1	16.67	77.3	1C	0.9087	70.2
15:13	115	46.1	16.70	78.1	1C	0.9087	71.0
15:14	115	46.2	16.75	77.3	1C	0.9087	70.2
15:15	116	46.2	17.59	74.8	1C	0.9087	67.9
15:16	116	46.2	19.50	78.1	1C	0.9087	71.0
15:17	117	46.2	15.92	93.2	1C	0.9087	84.7
15:18	117	46.2	17.16	85.7	1C	0.9087	77.9
15:19	117	46.2	17.16	86.5	1C	0.9087	78.6
15:20	117	46.1	17.18	86.5	1C	0.9087	78.6
15:21	117	46.1	17.20	86.5	1C	0.9087	78.6
15:22	117	46.1	17.23	98.3	1C	0.9087	89.3
Average	**115**	**41.3**	**14.1**	**65.0**			**59.0**

East Devon Crematorium Abatement System Outlet

Dioxins and Furans

Contract	East Devon Crematorium, DEM0508
Date	13th July 2011
Location	Flue Gas Abatement System Outlet
Engineer(s)	JB & ST
Absorbent	XAD-2

Test Log	**Dioxins Test**	
Barometric Pressure(kPa)	102.0	
Gas Meter Temperature(Deg C)	41.3	
Oxygen Concentration(%v/v dry)	14.08	
Flue Gas Volumetric Flow(Nm^3/h dry)	1348	
	Start	End
Time	09:31	15:22
Gas Meter Reading(Am^3 dry)	260.634	264.091
Sample Reference	Combined ED130711 DX1 + ED130711 DC1 + ED130711 DF1	

Calculation: General

Barometric Pressure(kPa)	101.9
Gas Meter temperature(Deg C)	41.3
Gas Volume Sampled(Am^3 dry)	3.457
Gas Volume Sampled(Nm^3 dry)	3.020

Calculation: Dioxins and Furans

	Lower Bound	Upper Bound
Total I-TEQ(ng)	0.0066	0.0120
Total I-TEQ Emission (ng/Nm^3 dry)	0.0022	0.0040
Total I-TEQ Emission (ng/Nm^3 @ 11 %v/v Oxygen dry)	**0.0032**	**0.0058**

N.B. **The above result is the average over 4 cremation cycles**
The secondary chamber temperature control set points were 800°C

Required Sample Velocity(Nm/s)	8.00
Nozzle Used(mm)	4.5
Area of Nozzle(m^2)	0.00001590
Test Duration(mins)	351
Actual Sample Velocity(Nm/s)	9.02
Isokinetic Closure(%)	113

East Devon Crematorium Abatement System Outlet

Flue Gas Volumetric Flow

Contract	East Devon Crematorium, DEM0508
Date	13th July 2011
Location	Flue Gas Abatement System Outlet
Engineer(s)	JB & ST

Test Log	Dioxins Test
Flue Gas Temperature(Deg C)	115
Flue Gas Pitot Head Sample Points(Pa)	65.0
Flue Gas Pitot Head Duct Mean(Pa)	59.0
Flue Gas Moisture(%v/v)	5.5
Flue Gas Moisture(%w/w)	3.5
Flue Gas Duct Dimensions(mm)	250mm Diameter Circular Flue
Flue Gas Duct Area(m^2)	0.0491

Calculation

Flue Gas Density(kg/m^3)	0.8979
Sample Points	
Flue Gas Velocity(Am/s)	12.03
Flue Gas Volumetric Flowrate(Am^3/h)	2126
Flue Gas Volumetric Flowrate(Am^3/h dry)	2009
Flue Gas Volumetric Flowrate(Nm^3/h dry)	1414
Duct Mean	
Flue Gas Velocity(Am/s)	11.47
Flue Gas Volumetric Flowrate(Am^3/h)	2027
Flue Gas Volumetric Flowrate(Am^3/h dry)	1915
Flue Gas Volumetric Flowrate(Nm^3/h dry)	**1348**

East Devon Crematorium Abatement System Outlet

Residence Time Calculation 12/07/11

Test 2

Moisture %v/v:	6.64	Exit Area m2:	0.0491
Moisture %w/w:	4.24	Duct Area m2:	0.0491
SCC Vol m3:	3.21		

Oxygen Balance

Time	Mean Pa	Flue %v/v	O_2 SCC %v/v	O_2 Flue °C	Temp SCC Temp °C	Out Density kg/m³	Velocity m/s	Efflux Velocity m/s	Vol Am³/h	Vol Am³/h dry	Vol Am³/h wet	Vol Nm³/h dry	Vol Nm³/h wet	SCC Fraction	SCC Nm³/h	Vol SCC m³/s @ SCC T	Residence Time
10:35	109.1	15.20	11.5	118	847	0.8887	15.67	15.67	2769.59	2578.28	191.31	1802.48	133.75	0.6070	1227.88	1.40	2.29
10:36	89.3	14.32	11.0	118	838	0.8883	14.18	14.18	2505.83	2332.74	173.09	1629.99	120.95	0.6679	1209.69	1.37	2.35
10:37	79.4	14.12	11.0	118	837	0.8883	13.37	13.37	2362.52	2199.32	163.19	1536.77	114.03	0.6874	1170.40	1.32	2.43
10:38	77.9	13.65	9.8	118	839	0.8885	13.24	13.24	2339.39	2177.80	161.59	1522.12	112.94	0.6530	1106.84	1.25	2.56
10:39	84.7	12.37	8.0	118	847	0.8878	13.82	13.82	2441.35	2272.72	168.64	1587.24	117.77	0.6634	1170.81	1.33	2.41
10:40	84.0	12.01	9.4	118	849	0.8876	13.75	13.75	2430.64	2262.75	167.90	1579.87	117.23	0.7722	1337.18	1.53	2.10
10:41	77.9	13.68	11.9	118	840	0.8880	13.24	13.24	2339.99	2178.35	161.64	1521.73	112.91	0.8003	1330.81	1.51	2.13
10:42	81.7	15.20	12.8	118	834	0.8883	13.56	13.56	2396.35	2230.82	165.53	1558.78	115.66	0.7079	1219.14	1.37	2.34
10:43	74.8	15.11	13.2	118	836	0.8883	12.98	12.98	2293.35	2134.94	158.41	1491.78	110.69	0.7492	1228.40	1.39	2.32
10:44	84.7	14.80	11.6	118	837	0.8880	13.81	13.81	2441.04	2272.43	168.62	1587.44	117.79	0.6590	1163.89	1.31	2.44
10:45	77.1	14.15	11.4	118	835	0.8885	13.17	13.17	2327.89	2167.09	160.80	1514.64	112.39	0.7089	1186.04	1.34	2.40
10:46	87.0	14.15	11.3	118	832	0.8883	14.00	14.00	2473.49	2302.63	170.86	1608.96	119.39	0.7044	1252.77	1.41	2.28
10:47	88.5	13.83	10.9	118	836	0.8878	14.12	14.12	2495.73	2323.34	172.39	1622.59	120.40	0.7115	1274.87	1.44	2.23
10:48	92.4	14.16	11.2	118	835	0.8878	14.42	14.42	2548.95	2372.88	176.07	1657.19	122.96	0.6954	1275.38	1.44	2.23
10:49	74.8	14.04	11.3	118	835	0.8885	12.98	12.98	2293.06	2134.67	158.39	1491.97	110.71	0.7181	1182.03	1.33	2.41
10:50	61.1	13.88	10.1	117	836	0.8894	11.72	11.72	2070.74	1927.70	143.04	1348.70	100.07	0.6524	979.96	1.11	2.90
10:51	44.3	12.56	8.1	117	843	0.8910	9.97	9.97	1761.59	1639.90	121.68	1149.41	85.29	0.6548	837.88	0.95	3.38
10:52	42.7	11.83	8.3	116	847	0.8917	9.79	9.79	1730.28	1610.76	119.52	1129.85	83.84	0.7184	895.50	1.02	3.14
10:53	40.5	12.09	8.3	116	850	0.8924	9.52	9.52	1682.65	1566.42	116.23	1099.59	81.59	0.6997	850.96	0.97	3.30
10:54	45.8	12.20	8.2	116	853	0.8928	10.13	10.13	1789.86	1666.23	123.63	1170.26	86.83	0.6863	890.01	1.02	3.15
10:55	45.8	11.99	7.9	116	856	0.8933	10.13	10.13	1789.40	1665.80	123.60	1170.56	86.86	0.6871	891.10	1.02	3.14
10:56	45.0	11.71	8.0	116	859	0.8933	10.04	10.04	1774.43	1651.86	122.57	1160.76	86.13	0.7127	913.38	1.05	3.05
10:57	44.3	12.13	8.7	115	860	0.8938	9.95	9.95	1758.87	1637.38	121.49	1151.18	85.42	0.7172	911.02	1.05	3.06
10:58	48.9	12.64	9.5	115	861	0.8938	10.46	10.46	1847.61	1719.98	127.62	1209.26	89.73	0.7277	969.66	1.12	2.87

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10:59	57.2	13.19	9.7	115	863	0.8938	11.32	11.32	2000.10	1861.94	138.16	1309.06	97.13	0.6877	997.37	1.15	2.79
11:00	57.2	12.97	9.5	115	865	0.8940	11.32	11.32	1999.84	1861.70	138.14	1309.23	97.15	0.6949	1006.98	1.17	2.75
11:01	56.5	13.06	9.9	115	866	0.8942	11.24	11.24	1986.20	1849.01	137.20	1300.64	96.51	0.7171	1029.18	1.19	2.69
11:02	56.5	13.18	10.1	115	867	0.8945	11.24	11.24	1985.95	1848.77	137.18	1300.81	96.52	0.7129	1023.87	1.19	2.70
11:03	55.7	13.38	10.6	115	867	0.8945	11.16	11.16	1972.48	1836.23	136.25	1291.99	95.87	0.7283	1036.79	1.20	2.67
11:04	55.0	13.66	10.9	115	867	0.8942	11.09	11.09	1959.18	1823.85	135.33	1282.94	95.20	0.7277	1028.86	1.19	2.69
11:05	55.0	13.97	11.5	115	866	0.8942	11.09	11.09	1959.18	1823.85	135.33	1282.94	95.20	0.7392	1043.56	1.21	2.65
11:06	55.0	14.37	12.0	115	865	0.8947	11.08	11.08	1958.68	1823.38	135.30	1283.28	95.22	0.7340	1037.13	1.20	2.67
11:07	55.0	14.59	12.2	115	864	0.8949	11.08	11.08	1958.42	1823.14	135.28	1283.44	95.23	0.7254	1026.28	1.19	2.70
11:08	66.4	14.96	11.9	115	863	0.8945	12.19	12.19	2153.34	2004.59	148.74	1410.45	104.66	0.6645	1041.91	1.20	2.66
11:09	65.6	13.47	10.9	115	868	0.8938	12.12	12.12	2141.75	1993.81	147.94	1401.78	104.01	0.7445	1147.57	1.33	2.41
11:10	55.0	14.73	13.1	115	864	0.8945	11.09	11.09	1958.93	1823.61	135.31	1283.11	95.21	0.7921	1111.61	1.29	2.50
11:11	67.2	15.62	12.5	115	862	0.8935	12.26	12.26	2166.79	2017.12	149.67	1417.80	105.20	0.6313	1000.19	1.15	2.78
11:12	76.3	13.44	11.1	116	869	0.8917	13.08	13.08	2312.19	2152.47	159.71	1509.83	112.03	0.7620	1262.58	1.47	2.19
11:13	55.0	15.08	13.6	116	864	0.8931	11.09	11.09	1960.44	1825.02	135.42	1282.12	95.13	0.8033	1125.01	1.30	2.47
11:14	70.2	16.00	12.4	116	862	0.8926	12.54	12.54	2216.63	2063.52	153.11	1448.92	107.51	0.5822	951.08	1.10	2.92
11:15	94.6	13.41	9.7	117	872	0.8910	14.58	14.58	2575.73	2397.81	177.92	1680.62	124.70	0.6707	1251.87	1.46	2.20
11:16	91.6	12.92	10.2	117	876	0.8906	14.34	14.34	2534.50	2359.43	175.07	1652.87	122.64	0.7460	1355.62	1.58	2.03
11:17	84.0	13.85	11.1	116	863	0.8912	13.73	13.73	2425.66	2258.11	167.55	1583.11	117.47	0.7219	1260.35	1.46	2.20
11:18	85.5	14.23	11.4	117	856	0.8910	13.85	13.85	2447.93	2278.84	169.09	1597.24	118.52	0.7072	1248.04	1.43	2.24
11:19	84.0	14.39	11.6	117	852	0.8910	13.73	13.73	2425.98	2258.40	167.57	1582.91	117.45	0.7014	1227.73	1.41	2.28
11:20	83.2	14.43	11.7	117	850	0.8910	13.67	13.67	2414.92	2248.11	166.81	1575.70	116.92	0.7031	1224.86	1.40	2.29
11:21	92.4	14.58	12.3	117	848	0.8906	14.40	14.40	2545.04	2369.24	175.80	1659.74	123.15	0.7407	1352.50	1.54	2.08
11:22	90.8	15.02	12.6	117	845	0.8906	14.28	14.28	2523.92	2349.58	174.34	1645.97	122.13	0.7122	1294.37	1.47	2.18
11:23	92.4	15.12	12.8	117	843	0.8903	14.40	14.40	2545.36	2369.54	175.82	1659.53	123.14	0.7178	1314.28	1.49	2.15
11:24	106.9	15.36	12.6	117	844	0.8890	15.51	15.51	2740.03	2550.76	189.27	1783.70	132.35	0.6721	1331.25	1.51	2.12
11:25	93.9	14.42	11.5	117	859	0.8892	14.53	14.53	2567.96	2390.58	177.38	1672.12	124.07	0.6908	1279.21	1.47	2.18
11:26	77.9	14.61	12.8	117	852	0.8901	13.23	13.23	2337.29	2175.84	161.45	1523.48	113.04	0.7768	1296.54	1.48	2.16
11:27	95.4	15.27	12.7	117	845	0.8894	14.65	14.65	2588.42	2409.63	178.80	1685.87	125.09	0.6854	1280.53	1.46	2.20
11:28	93.1	14.49	11.4	117	858	0.8892	14.47	14.47	2557.50	2380.84	176.66	1665.31	123.57	0.6770	1250.90	1.44	2.23
11:29	87.8	14.09	12.0	117	864	0.8892	14.05	14.05	2483.04	2311.53	171.52	1616.83	119.97	0.7669	1359.94	1.57	2.04
11:30	78.6	15.01	13.0	117	851	0.8903	13.29	13.29	2348.42	2186.20	162.22	1531.13	113.61	0.7464	1256.45	1.44	2.23
11:31	93.9	15.31	12.2	117	851	0.8894	14.53	14.53	2567.63	2390.27	177.36	1672.33	124.09	0.6477	1207.20	1.38	2.33

11:32	87.0	14.18	11.4	117	863	0.8896	13.99	13.99	2471.59	2300.87	170.73	1610.19	119.48	0.7102	1263.01	1.46	2.20
11:33	94.6	14.14	11.8	117	868	0.8892	14.59	14.59	2578.38	2400.28	178.10	1678.90	124.58	0.7416	1369.63	1.59	2.02
11:34	82.4	14.83	12.5	117	860	0.8896	13.61	13.61	2405.67	2239.50	166.17	1567.25	116.29	0.7206	1245.72	1.44	2.24
11:35	87.8	15.73	13.9	117	846	0.8899	14.05	14.05	2482.09	2310.64	171.45	1617.45	120.02	0.7451	1325.23	1.51	2.13
11:36	97.7	15.64	12.7	117	851	0.8892	14.82	14.82	2619.63	2438.68	180.95	1705.77	126.57	0.6400	1218.20	1.39	2.30
11:37	94.6	14.67	12.3	117	862	0.8890	14.59	14.59	2578.71	2400.58	178.12	1678.69	124.56	0.7302	1350.37	1.56	2.06
11:38	96.2	14.67	12.4	117	866	0.8890	14.71	14.71	2599.42	2419.86	179.56	1692.17	125.56	0.7319	1364.04	1.58	2.03
11:39	87.0	14.77	12.3	117	863	0.8892	13.99	13.99	2472.23	2301.46	170.77	1609.78	119.45	0.7178	1274.90	1.47	2.18
11:40	82.4	15.82	13.2	117	848	0.8899	13.61	13.61	2405.36	2239.21	166.15	1567.45	116.31	0.6582	1147.93	1.31	2.45
11:41	98.5	15.90	13.2	117	848	0.8890	14.88	14.88	2630.18	2448.50	181.68	1712.20	127.05	0.6503	1240.48	1.41	2.27
11:42	91.6	14.78	12.4	117	860	0.8890	14.36	14.36	2536.77	2361.55	175.23	1651.39	122.53	0.7257	1320.94	1.52	2.11
11:43	63.4	14.34	11.6	117	864	0.8906	11.93	11.93	2107.85	1962.25	145.60	1374.64	102.00	0.7106	1078.75	1.25	2.57
11:44	51.9	14.42	12.4	116	851	0.8922	10.79	10.79	1906.19	1774.52	131.67	1245.36	92.41	0.7636	1043.41	1.19	2.69
11:45	68.7	14.87	12.3	116	846	0.8919	12.41	12.41	2193.25	2041.75	151.50	1432.53	106.29	0.6998	1108.74	1.26	2.54
11:46	64.9	13.98	10.8	116	860	0.8924	12.06	12.06	2130.91	1983.72	147.19	1392.53	103.33	0.6861	1058.68	1.22	2.63
11:47	59.5	13.39	10.7	116	867	0.8931	11.55	11.55	2040.49	1899.55	140.95	1334.47	99.02	0.7360	1081.19	1.25	2.56
11:48	47.3	13.89	12.3	115	856	0.8942	10.29	10.29	1818.04	1692.46	125.58	1190.52	88.34	0.8116	1054.62	1.21	2.65
11:49	46.6	14.63	12.4	115	846	0.8949	10.20	10.20	1802.62	1678.11	124.52	1181.34	87.66	0.7382	959.76	1.09	2.94
11:50	46.6	14.65	12.5	115	841	0.8956	10.20	10.20	1801.93	1677.46	124.47	1181.80	87.69	0.7444	967.43	1.10	2.93
11:51	61.8	14.77	12.5	115	840	0.8954	11.75	11.75	2076.69	1933.24	143.45	1361.65	101.03	0.7311	1096.50	1.24	2.58
Average	**73.7**	**14.13**	**11.3**	**116**	**853**	**0.8911**	**12.76**	**12.76**	**2255.09**	**2099.32**	**155.77**	**1471.12**	**109.16**	**0.7102**	**1152.04**	**1.32**	**2.47**
Minimum			**7.9**		**832**												**2.02**

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East Devon Crematorium Abatement System Outlet

Residence Time Calculation 12/07/11

Test 3

Moisture %v/v:	7.02	Exit Area m2:	0.0491
Moisture %w/w:	4.49	Duct Area m2:	0.0491
SCC Vol m3:	3.21		

Oxygen Balance

Time	Mean Pa	Flue %v/v	O_2 SCC %v/v	O_2 Flue °C	Temp SCC Temp °C	Out Density kg/m^3	Velocity m/s	Efflux Velocity m/s	Vol Am^3/h	Vol Am^3/h dry	Vol Am^3/h wet	Vol Nm^3/h dry	Vol Nm^3/h wet	SCC Fraction	SCC Nm^3/h	Vol m^3/s SCC T	Vol @ Residence Time
12:12	89.3	14.84	9.7	115	882	0.8935	14.14	14.14	2498.44	2325.86	172.58	1634.81	121.30	0.5425	1008.15	1.18	2.71
12:13	59.5	13.46	9.9	115	866	0.8954	11.53	11.53	2037.87	1897.10	140.77	1336.19	99.15	0.6750	1001.07	1.16	2.77
12:14	56.5	13.26	10.4	114	855	0.8961	11.23	11.23	1984.16	1847.10	137.06	1301.98	96.61	0.7290	1045.79	1.20	2.67
12:15	74.0	14.22	11.1	115	846	0.8954	12.86	12.86	2272.55	2115.58	156.98	1490.07	110.56	0.6815	1126.05	1.28	2.50
12:16	77.9	13.09	8.3	115	861	0.8951	13.19	13.19	2330.69	2169.70	160.99	1527.80	113.36	0.6212	1062.50	1.23	2.62
12:17	71.0	11.57	7.7	115	870	0.8951	12.59	12.59	2225.49	2071.76	153.73	1458.84	108.25	0.7075	1140.33	1.33	2.42
12:18	71.0	11.75	7.4	115	868	0.8954	12.59	12.59	2225.20	2071.50	153.71	1459.03	108.26	0.6782	1097.83	1.27	2.52
12:19	63.4	11.74	7.5	114	869	0.8958	11.89	11.89	2101.62	1956.45	145.17	1378.71	102.30	0.6834	1044.50	1.21	2.65
12:20	70.2	11.56	7.5	115	871	0.8956	12.52	12.52	2212.92	2060.06	152.86	1451.35	107.69	0.6956	1117.28	1.30	2.47
12:21	64.9	12.36	8.2	115	870	0.8956	12.04	12.04	2127.07	1980.14	146.93	1395.04	103.51	0.6732	1042.67	1.21	2.65
12:22	61.8	12.27	8.2	114	868	0.8961	11.75	11.75	2075.88	1932.49	143.39	1362.17	101.07	0.6831	1031.64	1.20	2.68
12:23	64.1	12.53	8.7	114	867	0.8961	11.96	11.96	2113.97	1967.95	146.02	1387.17	102.93	0.6882	1057.62	1.23	2.62
12:24	68.7	12.56	8.4	114	867	0.8958	12.38	12.38	2188.45	2037.29	151.17	1435.67	106.53	0.6711	1070.02	1.24	2.59
12:25	67.9	12.51	8.6	114	867	0.8961	12.31	12.31	2175.98	2025.67	150.31	1427.86	105.95	0.6845	1083.30	1.26	2.56
12:26	64.9	12.67	8.5	114	866	0.8963	12.03	12.03	2126.25	1979.38	146.87	1395.58	103.55	0.6669	1034.25	1.20	2.68
12:27	56.5	12.18	7.9	114	867	0.8972	11.22	11.22	1982.88	1845.91	136.97	1302.83	96.67	0.6708	970.63	1.13	2.85
12:28	56.5	12.02	7.9	114	868	0.8972	11.22	11.22	1982.88	1845.91	136.97	1302.83	96.67	0.6819	985.10	1.14	2.81
12:29	55.7	11.99	7.7	114	868	0.8975	11.14	11.14	1969.18	1833.16	136.02	1294.16	96.03	0.6752	969.90	1.13	2.85
12:30	56.5	11.94	7.6	114	869	0.8975	11.22	11.22	1982.62	1845.67	136.95	1302.99	96.68	0.6762	977.80	1.14	2.83
12:31	60.3	11.80	7.1	114	870	0.8977	11.59	11.59	2048.24	1906.76	141.48	1346.47	99.91	0.6627	992.27	1.15	2.78
12:32	88.5	11.44	7.5	114	875	0.8963	14.06	14.06	2483.89	2312.32	171.58	1630.33	120.97	0.7097	1277.99	1.49	2.15
12:33	87.0	12.48	8.2	115	876	0.8956	13.94	13.94	2463.34	2293.19	170.16	1615.59	119.88	0.6627	1190.50	1.39	2.31
12:34	80.9	12.02	7.7	114	879	0.8958	13.44	13.44	2375.03	2210.97	164.06	1558.07	115.61	0.6741	1165.88	1.37	2.35
12:35	84.7	11.99	7.8	115	881	0.8951	13.76	13.76	2431.34	2263.39	167.95	1593.78	118.26	0.6803	1202.45	1.41	2.27
12:36	90.8	11.93	7.6	115	884	0.8945	14.25	14.25	2518.41	2344.45	173.96	1649.57	122.40	0.6742	1234.57	1.45	2.21

2222

12:37	99.2	11.68	7.0	116	890	0.8933	14.90	14.90	2633.93	2451.99	181.94	1723.02	127.85	0.6661	1275.57	1.51	2.13
12:38	98.5	11.62	7.3	116	895	0.8926	14.85	14.85	2624.79	2443.48	181.31	1715.72	127.31	0.6812	1296.07	1.54	2.08
12:39	97.7	11.78	7.4	116	896	0.8919	14.80	14.80	2615.60	2434.93	180.67	1708.39	126.76	0.6766	1282.62	1.53	2.10
12:40	97.7	11.79	7.6	116	897	0.8915	14.81	14.81	2616.28	2435.56	180.72	1707.95	126.73	0.6875	1300.93	1.55	2.07
12:41	97.7	12.04	7.8	117	898	0.8910	14.81	14.81	2616.95	2436.18	180.77	1707.52	126.70	0.6765	1281.78	1.53	2.10
12:42	98.5	12.00	7.7	117	900	0.8906	14.87	14.87	2627.82	2446.31	181.52	1713.73	127.16	0.6734	1281.15	1.53	2.10
12:43	97.7	11.89	7.8	117	902	0.8903	14.81	14.81	2617.96	2437.12	180.84	1706.86	126.65	0.6879	1300.72	1.55	2.06
12:44	96.2	12.15	8.2	117	901	0.8896	14.70	14.70	2598.42	2418.94	179.49	1692.82	125.61	0.6914	1296.06	1.55	2.07
12:45	80.1	12.38	8.4	117	900	0.8903	13.42	13.42	2371.11	2207.33	163.78	1545.92	114.71	0.6826	1169.92	1.40	2.30
12:46	61.1	12.41	8.2	116	898	0.8915	11.70	11.70	2068.35	1925.48	142.87	1350.26	100.19	0.6687	1003.14	1.20	2.69
12:47	53.4	12.28	8.5	116	897	0.8926	10.94	10.94	1933.52	1799.96	133.56	1263.86	93.78	0.6941	971.03	1.16	2.78
12:48	44.3	12.36	8.2	115	895	0.8938	9.95	9.95	1758.87	1637.38	121.49	1151.18	85.42	0.6738	861.06	1.02	3.14
12:49	42.0	12.24	8.8	115	893	0.8947	9.69	9.69	1711.90	1593.65	118.25	1121.59	83.22	0.7144	884.52	1.05	3.06
12:50	42.0	12.81	9.6	115	891	0.8954	9.68	9.68	1711.23	1593.03	118.20	1122.03	83.25	0.7154	885.96	1.05	3.06
12:51	41.2	13.32	10.2	114	889	0.8961	9.59	9.59	1694.95	1577.87	117.08	1112.21	82.53	0.7108	873.14	1.03	3.11
12:52	40.5	13.57	10.8	114	887	0.8965	9.50	9.50	1678.75	1562.79	115.96	1102.15	81.78	0.7257	881.59	1.04	3.08
12:53	39.7	13.92	11.4	114	885	0.8970	9.41	9.41	1662.41	1547.58	114.83	1091.98	81.03	0.7328	881.26	1.04	3.09
12:54	42.7	14.23	11.8	114	883	0.8970	9.76	9.76	1725.16	1606.00	119.17	1133.20	84.08	0.7326	914.25	1.08	2.98
12:55	46.6	14.47	12.0	114	883	0.8968	10.19	10.19	1800.76	1676.38	124.39	1182.56	87.75	0.7204	939.72	1.10	2.91
12:56	47.3	14.58	12.4	114	881	0.8970	10.27	10.27	1815.23	1689.84	125.39	1192.37	88.47	0.7475	979.77	1.15	2.79
12:57	45.8	14.95	12.9	114	879	0.8975	10.10	10.10	1785.25	1661.93	123.32	1173.28	87.06	0.7485	965.26	1.13	2.84
12:58	46.6	15.28	13.5	114	878	0.8977	10.18	10.18	1799.83	1675.51	124.32	1183.17	87.79	0.7611	988.25	1.16	2.77
12:59	50.4	15.77	14.4	114	875	0.8979	10.59	10.59	1871.90	1742.60	129.30	1230.87	91.33	0.7968	1072.07	1.25	2.56
13:00	51.1	16.13	14.7	113	873	0.8982	10.67	10.67	1885.79	1755.52	130.26	1240.32	92.03	0.7699	1046.92	1.22	2.63
13:01	48.9	16.25	14.9	114	871	0.8979	10.43	10.43	1843.32	1715.99	127.33	1212.07	89.94	0.7793	1034.48	1.20	2.67
13:02	40.5	16.41	15.2	113	869	0.8986	9.49	9.49	1676.80	1560.97	115.82	1103.43	81.88	0.7922	956.06	1.11	2.89
13:03	38.9	16.51	15.1	113	866	0.8993	9.30	9.30	1644.22	1530.64	113.57	1082.83	80.35	0.7591	902.37	1.05	3.07
13:04	38.9	16.42	15.2	113	865	0.9000	9.30	9.30	1643.58	1530.05	113.53	1083.25	80.38	0.7930	939.41	1.09	2.95
13:05	38.9	16.57	15.7	112	862	0.9005	9.30	9.30	1643.15	1529.65	113.50	1083.53	80.40	0.8267	976.20	1.13	2.85
13:06	38.9	16.89	16.1	112	859	0.9010	9.30	9.30	1642.72	1529.25	113.47	1083.82	80.42	0.8442	995.43	1.15	2.80
13:07	38.2	17.19	16.6	112	856	0.9014	9.20	9.20	1626.12	1513.79	112.32	1073.42	79.65	0.8637	1006.73	1.16	2.78
13:08	40.5	17.52	16.6	112	852	0.9017	9.47	9.47	1673.97	1558.34	115.63	1105.29	82.01	0.7816	945.93	1.08	2.97
13:09	38.2	16.46	13.7	112	855	0.9012	9.20	9.20	1626.33	1513.99	112.34	1073.28	79.64	0.6160	740.80	0.85	3.78
13:10	33.6	15.72	14.7	112	852	0.9019	8.63	8.63	1525.04	1419.69	105.34	1007.22	74.74	0.8354	916.12	1.05	3.06
Average	**62.6**	**13.42**	**10.1**	**114**	**876**	**0.8960**	**11.67**	**11.67**	**2062.82**	**1920.33**	**142.49**	**1352.88**	**100.38**	**0.7081**	**1050.45**	**1.23**	**2.66**
Minimum			**7.0**		**846**												**2.06**

APPENDIX 2

Analysis Reports

Scientific Analysis Laboratories is a limited company registered in England and Wales (No 2514780) whose address is at Hadfield House, Hadfield Street, Manchester M16 9FE.

Scientific Analysis Laboratories

Certificate of Analysis

Hadfield House
Hadfield Street
Cornbrook
Manchester
M16 9FE
Tel: 0161 874 2400
Fax: 0161 874 2404

Report Number: 244742-1

Date of Report: 01-Aug-2011

Customer: Davies & Co (Engineering)
Moor Road
Leeds
LS10 2DD

Customer Contact: Mr Steve Atherton

Customer Job Reference: DEM0508
Customer Purchase Order: 50000515
Date Job Received at SAL: 22-Jul-2011
Date Analysis Started: 26-Jul-2011
Date Analysis Completed: 01-Aug-2011

The results reported relate to samples received in the laboratory
Opinions and interpretations expressed herein are outside the scope of UKAS accreditation
This report should not be reproduced except in full without the written approval of the laboratory
Tests covered by this certificate were conducted in accordance with SAL SOPs

UKAS TESTING 1549

Report checked and authorised by :
Mary Drury
Project Manager

Issued by : Signature valid
Digitally signed by Mary Drury
Date: 2011.08.01 10:41:55 BST
Reason: Issued
Location: SAL

Davies & Co (Engineering) Ltd

SAL Reference: 244742
Customer Reference: DEM0508

Impinger(DI water) Analysed as Impinger(DI water)
Miscellaneous

					SAL Reference	244742 001	244742 002	244742 003	244742 004	244742 005
					Customer Sample Reference	ED120711 HA1	ED120711 HA2	ED120711 HA3A	ED120711 HA3B	ED120711 HOB
					Test Sample	AR	AR	AR	AR	AR
Determinand	Method	LOD	Units	Symbol						
Hydrogen Chloride	IC	0.05	mg/l	U		11	8.6	35	0.76	0.83
Volume	Vol	1	ml	U		60	65	65	65	60

SAL Reference: 244742
Customer Reference: DEM0508

Filter Analysed as Filter
Miscellaneous

					SAL Reference	244742 006	244742 007	244742 008	244742 009
					Customer Sample Reference	ED120711 FHGA4	ED120711 FHGA5	ED120711 FHGA6	ED120711 FHGABLANK
					Test Sample	AR	AR	AR	AR
Determinand	Method	LOD	Units	Symbol					
Mercury	CVAFS (HF Digest BS EN 13211)	0.01	µg	U		(13) 0.02	(13) 0.07	(13) 0.07	(13) 0.02

SAL Reference: 244742
Customer Reference: DEM0508

Impinger (4%K2Cr2O7/20%HNO3) Analysed as Impinger (4%K2Cr2O7/20%HNO3)
Miscellaneous

					SAL Reference	244742 010	244742 011	244742 012	244742 013	244742 014
					Customer Sample Reference	ED120711 HGA4	ED120711 HGA5	ED120711 HGA6A	ED120711 HGA6B	ED120711 HGOB
					Test Sample	AR	AR	AR	AR	AR
Determinand	Method	LOD	Units	Symbol						
Mercury	CVAFS (BS EN 13211)	5	ug/l	U		11	17	29	<5	<5
Volume	CVAFS (BS EN 13211)	1	ml	U		65	60	60	65	65

Index to symbols used in 244742-1

Value	Description
AR	As Received
13	Results have been blank corrected
U	Analysis is UKAS accredited

Scientific Analysis Laboratories is a limited company registered in England and Wales (No 2514788) whose address is at Hadfield House, Hadfield Street, Manchester M16 9FE.

Scientific Analysis Laboratories

Certificate of Analysis

Hadfield House
Hadfield Street
Cornbrook
Manchester
M16 9FE
Tel 0161 874 2400
Fax 0161 874 2404

Report Number: 244749-1

Date of Report: 03-Aug-2011

Customer: Davies & Co (Engineering)
Moor Road
Leeds
LS10 2DD

Customer Contact: Mr Steve Atherton

Customer Job Reference: DEM0508
Customer Purchase Order: 50000515
Date Job Received at SAL: 22-Jul-2011
Date Analysis Started: 27-Jul-2011
Date Analysis Completed: 01-Aug-2011

The results reported relate to samples received in the laboratory
Opinions and interpretations expressed herein are outside the scope of UKAS accreditation
This report should not be reproduced except in full without the written approval of the laboratory
Tests covered by this certificate were conducted in accordance with SAL SOPs

UKAS TESTING 1549

Report checked
and authorised by :
Ms Jennifer Hughes
Customer Service Manager
(Air Division)

Issued by : Signature valid
Digitally signed by Jenny Hughes
Date: 2011.08.03 09:23:39 BST
Reason: Issued
Location: SAL

Summary Of Results

Composite (Filt, Trap, Wash)

SAL Reference	Customer Sample Reference	Analysis	Symbol	ITEQ Toxic Equivalents ng	
				Lower Bound	Upper Bound
244749 004	Combined ED130711 DX1 + ED130711 DC1 + ED130711 DF1	Dioxins and Furans (BS EN 1948:96)	U	0.0069	0.012
244749 008	Combined METHOD BLANK TRAP + METHOD BLANK FILTER + METHOD BLANK WASH	Dioxins and Furans (BS EN 1948:96)	U	0.00042	0.0096

Sampling Recoveries

SAL Reference	Customer Sample Reference	Determinand	Sampling Recovery %
244749 004	Combined ED130711 DX1 + ED130711 DC1 + ED130711 DF1	1,2,3,7,8-PeCDF	86
		1,2,3,7,8,9-HxCDF	82
		1,2,3,4,7,8,9-HpCDF	97

Composite (Filt, Trap, Wash)

Customer Sample Reference : Combined ED130711 DX1 + ED130711 DC1 + ED130711 DF1

SAL Sample Reference : 244749 004

Dioxins and Furans (BS EN 1948:96)

Technique : GC/MS (HR)

Determinand	Symbol	LOD ng	Result ng	Internal Recovery %	ITEQ Toxic Equivalents ng	
					Lower Bound	Upper Bound
2,3,7,8-TCDD	U	0.0029	<0.0029	69	0.0	0.0029
1,2,3,7,8-PeCDD	U	0.0030	<0.003	67	0.0	0.0015
1,2,3,4,7,8-HxCDD	U	0.0019	<0.0019	104	0.0	0.00019
1,2,3,6,7,8-HxCDD	U	0.0026	<0.0026	75	0.0	0.00026
1,2,3,7,8,9-HxCDD	U	0.0026	**0.0045**		0.00045	0.00045
1,2,3,4,6,7,8-HpCDD	U	0.0051	**0.024**	63	0.00024	0.00024
OCDD	U	0.0086	**0.063**	46	0.00006	0.00006
				Dioxins Totals :	0.00075	0.0056
2,3,7,8-TCDF	U	0.0036	**0.0055**	56	0.00055	0.00055
1,2,3,7,8-PeCDF	U	0.0031	<0.0031		0.0	0.00016
2,3,4,7,8-PeCDF	U	0.0031	**0.0051**	65	0.0026	0.0026
1,2,3,4,7,8-HxCDF	U	0.0021	**0.0058**	96	0.00058	0.00058
1,2,3,6,7,8-HxCDF	U	0.0011	**0.0062**	177	0.00062	0.00062
2,3,4,6,7,8-HxCDF	U	0.0019	**0.011**	103	0.0011	0.0011
1,2,3,7,8,9-HxCDF	U	0.0031	<0.0031		0.0	0.00031
1,2,3,4,6,7,8-HpCDF	U	0.0027	**0.031**	75	0.00031	0.00031
1,2,3,4,7,8,9-HpCDF	U	0.0050	**0.0091**		0.00009	0.00009
OCDF	U	0.0071	**0.055**	57	0.00005	0.00005
				Furans Totals :	0.0059	0.0063
				Totals :	**0.0066**	**0.012**

Composite (Filt, Trap, Wash)

Customer Sample Reference : Combined METHOD BLANK TRAP + METHOD BLANK FILTER + METHOD BLANK WASH

SAL Sample Reference : 244749 008

Dioxins and Furans (BS EN 1948:96)

Technique : GC/MS (HR)

Determinand	Symbol	LOD ng	Result ng	Internal Recovery %	ITEQ Toxic Equivalents ng	
					Lower Bound	Upper Bound
2,3,7,8-TCDD	U	0.0030	<0.003	67	0.0	0.0030
1,2,3,7,8-PeCDD	U	0.0041	<0.0041	48	0.0	0.0021
1,2,3,4,7,8-HxCDD	U	0.0021	<0.0021	96	0.0	0.00021
1,2,3,6,7,8-HxCDD	U	0.0027	<0.0027	74	0.0	0.00027
1,2,3,7,8,9-HxCDD	U	0.0027	<0.0027		0.0	0.00027
1,2,3,4,6,7,8-HpCDD	U	0.0045	<0.0045	71	0.0	0.00004
OCDD	U	0.0077	<0.0077	52	0.0	0.00001
				Dioxins Totals :	0.0	0.0059
2,3,7,8-TCDF	U	0.0031	**0.0042**	64	0.00042	0.00042
1,2,3,7,8-PeCDF	U	0.0041	<0.0041		0.0	0.00021
2,3,4,7,8-PeCDF	U	0.0041	<0.0041	48	0.0	0.0021
1,2,3,4,7,8-HxCDF	U	0.0025	<0.0025	80	0.0	0.00025
1,2,3,6,7,8-HxCDF	U	0.0016	<0.0016	123	0.0	0.00016
2,3,4,6,7,8-HxCDF	U	0.0023	<0.0023	85	0.0	0.00023
1,2,3,7,8,9-HxCDF	U	0.0038	<0.0038		0.0	0.00038
1,2,3,4,6,7,8-HpCDF	U	0.0026	<0.0026	77	0.0	0.00003
1,2,3,4,7,8,9-HpCDF	U	0.0052	<0.0052		0.0	0.00005
OCDF	U	0.0077	<0.0077	52	0.0	0.00001
				Furans Totals :	0.00042	0.0038
				Totals :	**0.00042**	**0.0096**

Index to symbols used in 244749-1

Value	Description
AR	As Received
U	Analysis is UKAS accredited

Particulate Weight Determination

Filter / Rinse Reference		Clean Dry Weight g	Dirty Dry Weight g
ED120711F1	M11	0.54954	0.54986
ED120711F2	M12	0.54839	0.54861
ED120711F3	M13	0.54712	0.54748
ED120711R1	1	79.50227	79.50238
ED120711R2	2	79.50238	79.50246
ED120711R3	3	79.50246	79.50259

TRANSURVEYS

TRAFFIC SURVEY REPORT

KELLAS ROAD, DUNDEE

TRANSURVEYS LIMITED

BLUE SQUARE OFFICES, 272 BATH STRET, GLASGOW, G2 4JR

TRAFFIC SURVEY REPORT

QUALITY MANAGEMENT

CLIENT	Cameron + Ross
PROJECT	Kellas Road, Dundee
REFERENCE	TS-19-058
REVISION	001

Revision	Date	Prepared by	Signed	Checked by	Signed
001	22/10/2018	Neil Dempsey	[redacted]	Neil Dempsey	[redacted]

SURVEYED NETWORK

Junction Turning Counts & Queue Surveys:-

1. B961 (Drumgeith Road) / Kellas Road Priority Junction

Automatic Traffic Counts:-

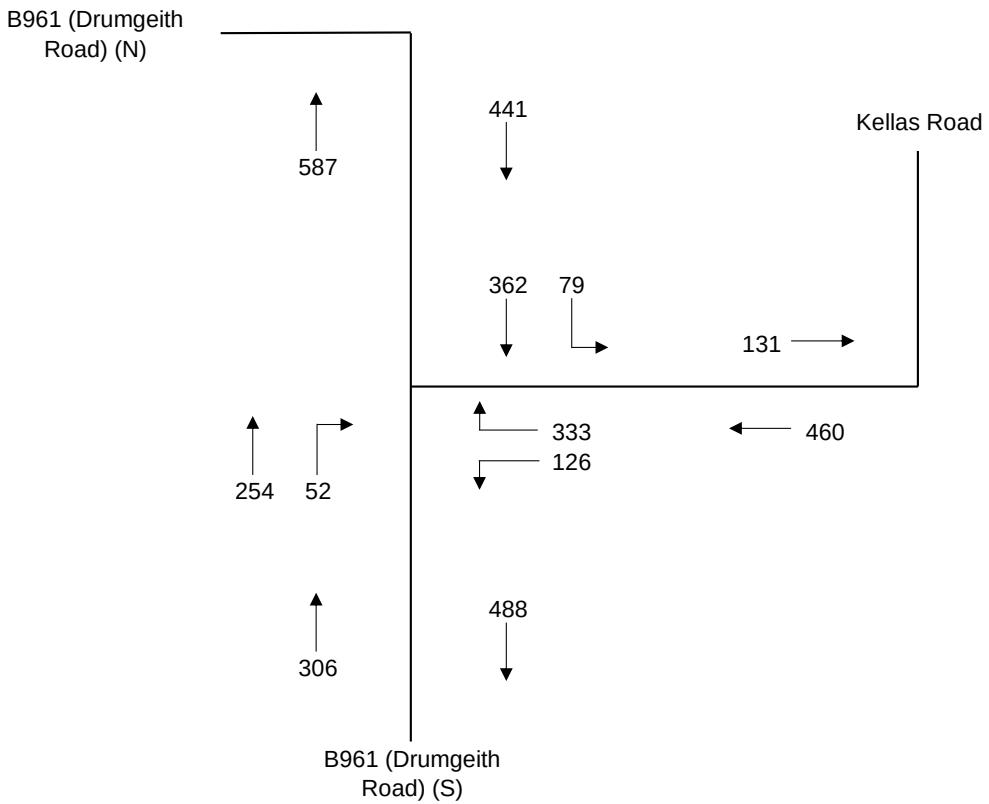
2. Unnamed Road, east of Duntrune House; and
3. Kellas Road - approximately 30m south of Unnamed Road.

CLASSIFIED VEHICLE JUNCTION TURNING COUNTS

TRAFFIC SURVEY REPORT

2236

SURVEY NETWORK TRAFFIC FLOW DIAGRAMS

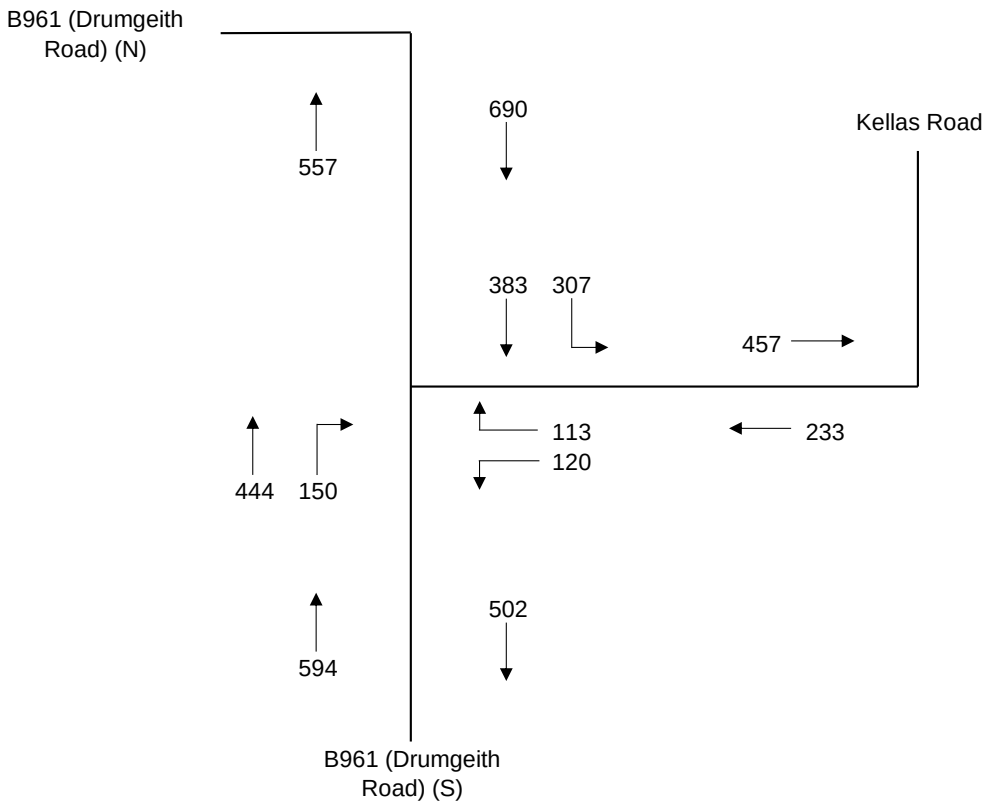


	Peak Hour
Weekday AM Hour	07:30-08:30
Veh.Classification	TOTAL PCUs

Date: 8th October 2019

For illustrative purposes only, please refer to data sheets for individual traffic movements

SURVEY NETWORK TRAFFIC FLOW DIAGRAMS



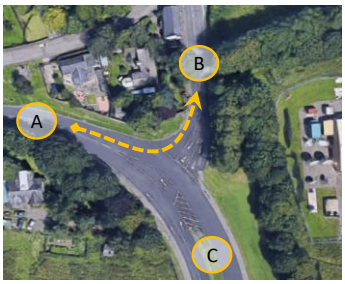
For illustrative purposes only, please refer to data sheets for individual traffic movements

	Peak Hour
Weekday PM Hour	16:15-17:15
Veh.Classification	TOTAL PCUs

Date: 8th October 2019

CLASSIFIED VEHICLE JUNCTION TURNING COUNT

Project: Kellas Road, Dundee
Client: Cameron + Ross
Project Ref: TS-19-058
Date: Tuesday 8th October 2019
Weather: AM: Dry / Sunny; PM: Wet / Overcast
Junction 1: B961 (Drumgeith Road) / Kellas Road Priority Junction
Movement 1.1: B961 (Drumgeith Road) (North) to Kellas Road Left Turn (A-B)



TIME		VEHICLE CLASSIFICATION							TOTAL		
		B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
07:00	07:15	0	0	7	0	0	0	0	7	0	7.00
07:15	07:30	0	0	9	2	1	0	0	12	1	12.50
07:30	07:45	0	0	10	3	0	0	1	14	1	15.00
07:45	08:00	0	0	12	6	2	0	0	20	2	21.00
08:00	08:15	0	0	13	3	2	0	0	18	2	19.00
08:15	08:30	0	0	18	6	0	0	0	24	0	24.00
08:30	08:45	0	0	11	3	1	1	0	16	2	17.80
08:45	09:00	0	1	18	3	0	0	0	22	0	21.40
09:00	09:15	0	0	16	7	1	2	0	26	3	29.10
09:15	09:30	0	0	12	3	2	0	0	17	2	18.00
09:30	09:45	0	0	7	6	0	0	0	13	0	13.00
09:45	10:00	0	0	21	7	2	0	0	30	2	31.00
TOTAL		0	1	154	49	11	3	1	219	15	228.80

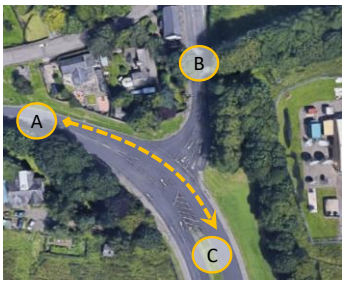
PEAK	VEHICLE CLASSIFICATION							TOTAL		
JUNCTION	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
07:30 - 08:30	0	0	53	18	4	0	1	76	5	79.00
NETWORK	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
07:30 - 08:30	0	0	53	18	4	0	1	76	5	79.00

TIME		VEHICLE CLASSIFICATION							TOTAL		
		B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
15:30	15:45	0	0	39	6	1	1	0	47	2	48.80
15:45	16:00	0	0	55	6	4	1	0	66	5	69.30
16:00	16:15	0	1	53	5	1	0	0	60	1	59.90
16:15	16:30	1	0	53	15	4	0	0	73	4	74.20
16:30	16:45	0	0	55	10	1	0	1	67	2	68.50
16:45	17:00	1	0	61	7	1	0	0	70	1	69.70
17:00	17:15	0	0	84	9	1	0	0	94	1	94.50
17:15	17:30	0	1	68	4	1	0	0	74	1	73.90
17:30	17:45	0	0	49	6	1	0	0	56	1	56.50
17:45	18:00	0	0	56	9	0	1	0	66	1	67.30
18:00	18:15	0	0	56	3	0	1	0	60	1	61.30
18:15	18:30	0	0	43	2	0	0	0	45	0	45.00
TOTAL		2	2	672	82	15	4	1	778	20	788.90

PEAK	VEHICLE CLASSIFICATION							TOTAL		
JUNCTION	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
16:15 - 17:15	2	0	253	41	7	0	1	304	8	306.90
NETWORK	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
16:15 - 17:15	2	0	253	41	7	0	1	304	8	306.90

CLASSIFIED VEHICLE JUNCTION TURNING COUNT

Project: Kellas Road, Dundee
Client: Cameron + Ross
Project Ref: TS-19-058
Date: Tuesday 8th October 2019
Weather: AM: Dry / Sunny; PM: Wet / Overcast
Junction 1: B961 (Drumgeith Road) / Kellas Road Priority Junction
Movement 1.2: B961 (Drumgeith Road) (North) to B961 (Drumgeith Road) (South) Ahead (A-C)



TIME	VEHICLE CLASSIFICATION							TOTAL		
	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
07:00 07:15	0	0	37	2	1	1	0	41	2	42.80
07:15 07:30	1	0	61	12	4	1	0	79	5	81.50
07:30 07:45	0	1	60	13	4	0	0	78	4	79.40
07:45 08:00	1	0	82	20	5	4	0	112	9	118.90
08:00 08:15	0	0	44	15	6	3	0	68	9	74.90
08:15 08:30	2	1	62	13	4	3	0	85	7	88.70
08:30 08:45	0	0	51	11	3	2	0	67	5	71.10
08:45 09:00	0	0	58	11	0	0	0	69	0	69.00
09:00 09:15	0	0	39	10	4	0	0	53	4	55.00
09:15 09:30	0	0	32	7	2	3	0	44	5	48.90
09:30 09:45	0	0	44	8	8	3	0	63	11	70.90
09:45 10:00	0	0	48	10	3	0	0	61	3	62.50
TOTAL	4	2	618	132	44	20	0	820	64	863.60

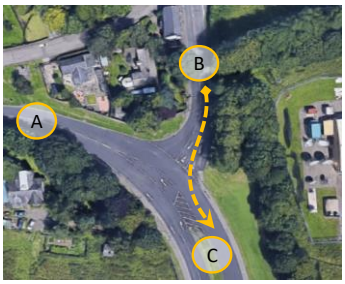
PEAK	VEHICLE CLASSIFICATION							TOTAL		
JUNCTION	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
07:30 - 08:30	3	2	248	61	19	10	0	343	29	361.90
NETWORK	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
07:30 - 08:30	3	2	248	61	19	10	0	343	29	361.90

TIME	VEHICLE CLASSIFICATION							TOTAL		
	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
15:30 15:45	0	1	55	8	4	1	0	69	5	71.70
15:45 16:00	0	0	60	8	3	5	0	76	8	84.00
16:00 16:15	0	0	70	6	2	0	0	78	2	79.00
16:15 16:30	0	0	69	12	5	2	0	88	7	93.10
16:30 16:45	0	0	81	16	2	2	0	101	4	104.60
16:45 17:00	0	0	69	11	1	2	0	83	3	86.10
17:00 17:15	0	0	76	11	2	3	1	93	6	98.90
17:15 17:30	0	0	83	10	3	1	0	97	4	99.80
17:30 17:45	0	0	62	7	2	1	0	72	3	74.30
17:45 18:00	0	1	68	7	1	2	0	79	3	81.50
18:00 18:15	0	0	48	8	0	0	0	56	0	56.00
18:15 18:30	0	0	68	5	0	2	0	75	2	77.60
TOTAL	0	2	809	109	25	21	1	967	47	1006.60

PEAK	VEHICLE CLASSIFICATION							TOTAL		
JUNCTION	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
16:15 - 17:15	0	0	295	50	10	9	1	365	20	382.70
NETWORK	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
16:15 - 17:15	0	0	295	50	10	9	1	365	20	382.70

CLASSIFIED VEHICLE JUNCTION TURNING COUNT

Project: Kellas Road, Dundee
Client: Cameron + Ross
Project Ref: TS-19-058
Date: Tuesday 8th October 2019
Weather: AM: Dry / Sunny; PM: Wet / Overcast
Junction 1: B961 (Drumgeith Road) / Kellas Road Priority Junction
Movement 1.3: Kellas Road to B961 (Drumgeith Road) (South) Left Turn (B-C)



TIME	VEHICLE CLASSIFICATION							TOTAL		
	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
07:00 07:15	0	0	13	1	0	1	0	15	1	16.30
07:15 07:30	1	1	18	4	0	0	0	24	0	22.60
07:30 07:45	0	1	15	3	2	0	0	21	2	21.40
07:45 08:00	0	0	27	9	0	2	0	38	2	40.60
08:00 08:15	0	0	20	2	2	0	1	25	3	27.00
08:15 08:30	1	0	25	12	0	0	0	38	0	37.20
08:30 08:45	0	0	26	2	0	1	0	29	1	30.30
08:45 09:00	0	0	31	5	1	1	0	38	2	39.80
09:00 09:15	1	0	18	5	0	0	0	24	0	23.20
09:15 09:30	1	0	21	6	0	0	0	28	0	27.20
09:30 09:45	0	0	21	4	2	1	0	28	3	30.30
09:45 10:00	0	0	21	5	0	0	0	26	0	26.00
TOTAL	4	2	256	58	7	6	1	334	14	341.90

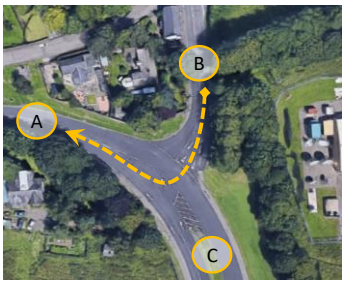
PEAK	VEHICLE CLASSIFICATION							TOTAL		
JUNCTION	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
07:30 - 08:30	1	1	87	26	4	2	1	122	7	126.20
NETWORK	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
07:30 - 08:30	1	1	87	26	4	2	1	122	7	126.20

TIME	VEHICLE CLASSIFICATION							TOTAL		
	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
15:30 15:45	1	0	17	2	0	0	0	20	0	19.20
15:45 16:00	0	0	28	2	2	0	0	32	2	33.00
16:00 16:15	0	0	21	6	0	0	0	27	0	27.00
16:15 16:30	0	0	33	7	0	0	0	40	0	40.00
16:30 16:45	0	0	18	2	0	1	0	21	1	22.30
16:45 17:00	1	0	28	2	0	0	0	31	0	30.20
17:00 17:15	0	0	23	1	2	0	0	26	2	27.00
17:15 17:30	0	0	17	5	0	0	0	22	0	22.00
17:30 17:45	0	0	32	4	1	0	0	37	1	37.50
17:45 18:00	0	0	25	1	1	1	0	28	2	29.80
18:00 18:15	0	0	31	2	1	0	0	34	1	34.50
18:15 18:30	0	0	18	2	1	0	0	21	1	21.50
TOTAL	2	0	291	36	8	2	0	339	10	344.00

PEAK	VEHICLE CLASSIFICATION							TOTAL		
JUNCTION	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
16:15 - 17:15	1	0	102	12	2	1	0	118	3	119.50
NETWORK	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
16:15 - 17:15	1	0	102	12	2	1	0	118	3	119.50

CLASSIFIED VEHICLE JUNCTION TURNING COUNT

Project: Kellas Road, Dundee
Client: Cameron + Ross
Project Ref: TS-19-058
Date: Tuesday 8th October 2019
Weather: AM: Dry / Sunny; PM: Wet / Overcast
Junction 1: B961 (Drumgeith Road) / Kellas Road Priority Junction
Movement 1.3: Kellas Road to B961 (Drumgeith Road) (North) Right Turn (B-A)



TIME	VEHICLE CLASSIFICATION							TOTAL		
	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
07:00 07:15	0	0	32	8	0	0	0	40	0	40.00
07:15 07:30	0	0	40	7	0	2	0	49	2	51.60
07:30 07:45	1	0	63	13	4	0	0	81	4	82.20
07:45 08:00	1	0	63	6	1	3	0	74	4	77.60
08:00 08:15	0	0	70	9	0	0	0	79	0	79.00
08:15 08:30	0	0	87	6	1	0	0	94	1	94.50
08:30 08:45	0	0	62	13	4	0	0	79	4	81.00
08:45 09:00	0	1	36	8	0	2	1	48	3	51.00
09:00 09:15	0	0	33	4	3	1	0	41	4	43.80
09:15 09:30	0	0	36	4	4	1	0	45	5	48.30
09:30 09:45	0	0	23	2	2	1	0	28	3	30.30
09:45 10:00	0	0	47	2	0	0	0	49	0	49.00
TOTAL	2	1	592	82	19	10	1	707	30	728.30

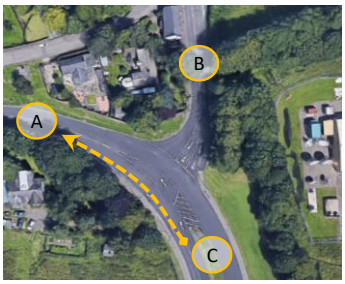
PEAK	VEHICLE CLASSIFICATION							TOTAL		
JUNCTION	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
07:30 - 08:30	2	0	283	34	6	3	0	328	9	333.30
NETWORK	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
07:30 - 08:30	2	0	283	34	6	3	0	328	9	333.30

TIME	VEHICLE CLASSIFICATION							TOTAL		
	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
15:30 15:45	0	0	27	6	1	1	0	35	2	36.80
15:45 16:00	0	0	21	7	1	0	0	29	1	29.50
16:00 16:15	1	0	17	5	0	0	0	23	0	22.20
16:15 16:30	0	1	15	8	0	0	0	24	0	23.40
16:30 16:45	0	0	27	5	0	0	1	33	1	34.00
16:45 17:00	0	0	21	4	1	1	0	27	2	28.80
17:00 17:15	0	0	23	4	0	0	0	27	0	27.00
17:15 17:30	0	0	32	2	0	0	0	34	0	34.00
17:30 17:45	0	0	24	1	0	0	0	25	0	25.00
17:45 18:00	0	0	21	3	0	0	0	24	0	24.00
18:00 18:15	0	0	27	4	0	0	0	31	0	31.00
18:15 18:30	0	0	24	3	0	0	0	27	0	27.00
TOTAL	1	1	279	52	3	2	1	339	6	342.70

PEAK	VEHICLE CLASSIFICATION							TOTAL		
JUNCTION	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
16:15 - 17:15	0	1	86	21	1	1	1	111	3	113.20
NETWORK	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
16:15 - 17:15	0	1	86	21	1	1	1	111	3	113.20

CLASSIFIED VEHICLE JUNCTION TURNING COUNT

Project: Kellas Road, Dundee
Client: Cameron + Ross
Project Ref: TS-19-058
Date: Tuesday 8th October 2019
Weather: AM: Dry / Sunny; PM: Wet / Overcast
Junction 1: B961 (Drumgeith Road) / Kellas Road Priority Junction
Movement 1.4: B961 (Drumgeith Road) (South) to B961 (Drumgeith Road) (North) Ahead (C-A)



TIME	VEHICLE CLASSIFICATION							TOTAL		
	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
07:00 07:15	0	0	39	9	1	0	0	49	1	49.50
07:15 07:30	0	0	31	7	1	0	0	39	1	39.50
07:30 07:45	0	0	49	6	1	6	1	63	8	72.30
07:45 08:00	0	0	41	13	1	3	0	58	4	62.40
08:00 08:15	0	0	48	8	2	0	0	58	2	59.00
08:15 08:30	0	0	40	8	8	0	0	56	8	60.00
08:30 08:45	0	0	31	13	4	1	0	49	5	52.30
08:45 09:00	0	0	37	9	2	1	0	49	3	51.30
09:00 09:15	0	0	40	12	4	5	0	61	9	69.50
09:15 09:30	0	0	31	16	3	0	0	50	3	51.50
09:30 09:45	0	0	37	13	4	0	0	54	4	56.00
09:45 10:00	0	0	49	12	3	0	0	64	3	65.50
TOTAL	0	0	473	126	34	16	1	650	51	688.80

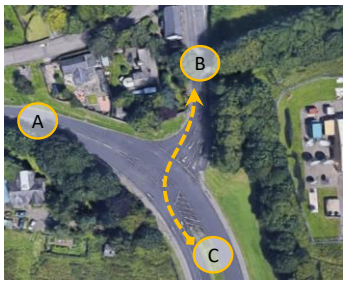
PEAK	VEHICLE CLASSIFICATION							TOTAL		
JUNCTION	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
07:30 - 08:30	0	0	178	35	12	9	1	235	22	253.70
NETWORK	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
07:30 - 08:30	0	0	178	35	12	9	1	235	22	253.70

TIME	VEHICLE CLASSIFICATION							TOTAL		
	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
15:30 15:45	1	0	123	6	0	4	0	134	4	138.40
15:45 16:00	0	0	56	10	0	2	0	68	2	70.60
16:00 16:15	1	0	63	11	4	1	0	80	5	82.50
16:15 16:30	0	0	78	19	6	2	0	105	8	110.60
16:30 16:45	0	0	97	16	2	3	0	118	5	122.90
16:45 17:00	0	0	74	9	2	2	0	87	4	90.60
17:00 17:15	1	0	105	8	3	1	0	118	4	120.00
17:15 17:30	0	0	83	10	0	0	1	94	1	95.00
17:30 17:45	0	0	77	7	0	1	0	85	1	86.30
17:45 18:00	0	0	41	3	0	0	0	44	0	44.00
18:00 18:15	0	0	47	6	0	0	0	53	0	53.00
18:15 18:30	0	0	53	6	0	0	0	59	0	59.00
TOTAL	3	0	897	111	17	16	1	1045	34	1072.90

PEAK	VEHICLE CLASSIFICATION							TOTAL		
JUNCTION	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
16:15 - 17:15	1	0	354	52	13	8	0	428	21	444.10
NETWORK	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
16:15 - 17:15	1	0	354	52	13	8	0	428	21	444.10

CLASSIFIED VEHICLE JUNCTION TURNING COUNT

Project: Kellas Road, Dundee
Client: Cameron + Ross
Project Ref: TS-19-058
Date: Tuesday 8th October 2019
Weather: AM: Dry / Sunny; PM: Wet / Overcast
Junction 1: B961 (Drumgeith Road) / Kellas Road Priority Junction
Movement 1.5: B961 (Drumgeith Road) (South) to Kellas Road Right Turn (C-B)



TIME		VEHICLE CLASSIFICATION							TOTAL		
		B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
07:00	07:15	0	0	7	1	0	1	0	9	1	10.30
07:15	07:30	0	0	7	2	1	0	0	10	1	10.50
07:30	07:45	0	0	7	2	1	0	0	10	1	10.50
07:45	08:00	0	0	7	1	0	0	0	8	0	8.00
08:00	08:15	0	0	10	2	0	1	0	13	1	14.30
08:15	08:30	0	0	14	4	1	0	0	19	1	19.50
08:30	08:45	0	0	12	2	0	0	0	14	0	14.00
08:45	09:00	0	0	10	2	1	0	0	13	1	13.50
09:00	09:15	0	0	15	6	0	0	0	21	0	21.00
09:15	09:30	0	0	13	3	0	0	1	17	1	18.00
09:30	09:45	0	0	13	5	0	0	0	18	0	18.00
09:45	10:00	0	0	18	4	3	0	0	25	3	26.50
TOTAL		0	0	133	34	7	2	1	177	10	184.10

PEAK	VEHICLE CLASSIFICATION							TOTAL		
JUNCTION	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
07:30 - 08:30	0	0	38	9	2	1	0	50	3	52.30
NETWORK	**B/CYCLE**	**M/CYCLE**	**CAR/TAXI**	**LGV**	**OGV1**	**OGV2**	**BUS/COACH**	**VEHICLES**	**HGVs**	**PCUs**
07:30 - 08:30	0	0	38	9	2	1	0	50	3	52.30

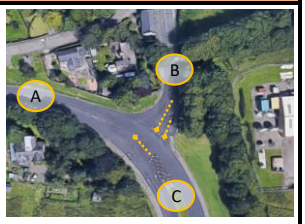
TIME		VEHICLE CLASSIFICATION							TOTAL		
		B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
15:30	15:45	0	1	33	5	0	1	0	40	1	40.70
15:45	16:00	1	0	32	4	1	0	0	38	1	37.70
16:00	16:15	0	0	35	2	0	1	0	38	1	39.30
16:15	16:30	0	0	36	2	0	1	1	40	2	42.30
16:30	16:45	0	0	35	4	0	0	0	39	0	39.00
16:45	17:00	0	0	23	4	0	0	0	27	0	27.00
17:00	17:15	0	0	34	5	0	1	0	40	1	41.30
17:15	17:30	1	0	31	2	0	0	0	34	0	33.20
17:30	17:45	0	0	31	1	0	2	0	34	2	36.60
17:45	18:00	0	0	24	1	0	0	0	25	0	25.00
18:00	18:15	0	0	35	2	1	0	1	39	2	40.50
18:15	18:30	0	0	19	1	1	0	0	21	1	21.50
TOTAL		2	1	368	33	3	6	2	415	11	424.10

PEAK	VEHICLE CLASSIFICATION							TOTAL		
JUNCTION	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
16:15 - 17:15	0	0	128	15	0	2	1	146	3	149.60
NETWORK	**B/CYCLE**	**M/CYCLE**	**CAR/TAXI**	**LGV**	**OGV1**	**OGV2**	**BUS/COACH**	**VEHICLES**	**HGVs**	**PCUs**
16:15 - 17:15	0	0	128	15	0	2	1	146	3	149.60

VEHICLE QUEUE SURVEYS

STUDY NETWORK MAXIMUM QUEUE COUNT

Project: Kellas Road, Dundee
Client: Cameron + Ross
Project Ref: TS-19-058
Date: Tuesday 8th October 2019
Weather: AM: Dry / Sunny; PM: Wet / Overcast
Junction 1: B961 (Drumgeith Road) / Kellas Road Priority Junction



TIME		VEHICLE MOVEMENT(S) / QUEUE - PCUs / LANE			
		B961 (Drumgeith Road) (North) (A-BC)	Kellas Road		B961 (Drumgeith Road) (South) (C-B)
			Near. (B-C)	Off. (B-A)	
07:15	07:20	-	0	1	0
07:20	07:25	-	0	4	0
07:25	07:30	-	0	4	1
07:30	07:35	-	0	3	0
07:35	07:40	-	0	11	0
07:40	07:45	-	0	3	1
07:45	07:50	-	1	7	1
07:50	07:55	-	1	16	0
07:55	08:00	-	1	9	1
08:00	08:05	-	1	2	0
08:05	08:10	-	1	4	0
08:10	08:15	-	1	2	1
08:15	08:20	-	1	5	2
08:20	08:25	-	1	4	1
08:25	08:30	-	2	11	2
08:30	08:35	-	2	2	0
08:35	08:40	-	1	4	1
08:40	08:45	-	2	10	1

QUEUE	NETWORK PEAK (07:30-08:30)			
MINIMUM	-	0	2	0
MAXIMUM	-	2	16	2
AVERAGE	-	1	6	1
85th%ILE	-	1	11	1

TIME		VEHICLE MOVEMENT(S) / QUEUE - PCUs / LANE			
		B961 (Drumgeith Road) (North) (A-BC)	Kellas Road		B961 (Drumgeith Road) (South) (C-B)
			Near. (B-C)	Off. (B-A)	
16:00	16:05	-	1	2	2
16:05	16:10	-	2	2	3
16:10	16:15	-	1	2	1
16:15	16:20	-	2	6	1
16:20	16:25	-	3	2	3
16:25	16:30	-	1	1	2
16:30	16:35	-	1	4	2
16:35	16:40	-	0	4	3
16:40	16:45	-	2	2	1
16:45	16:50	-	1	3	1
16:50	16:55	-	1	3	2
16:55	17:00	-	1	2	1
17:00	17:05	-	1	2	2
17:05	17:10	-	2	2	1
17:10	17:15	-	1	5	5
17:15	17:20	-	2	5	2
17:20	17:25	-	1	4	4
17:25	17:30	-	2	2	2

QUEUE	NETWORK PEAK (16:15-17:15)			
MINIMUM	-	0	1	1
MAXIMUM	-	3	6	5
AVERAGE	-	1	3	2
85th%ILE	-	2	4	3

CLASSIFIED AUTOMATIC TRAFFIC COUNTS
(LINK FLOW & SPEED SURVEYS)

TRAFFIC SURVEY REPORT

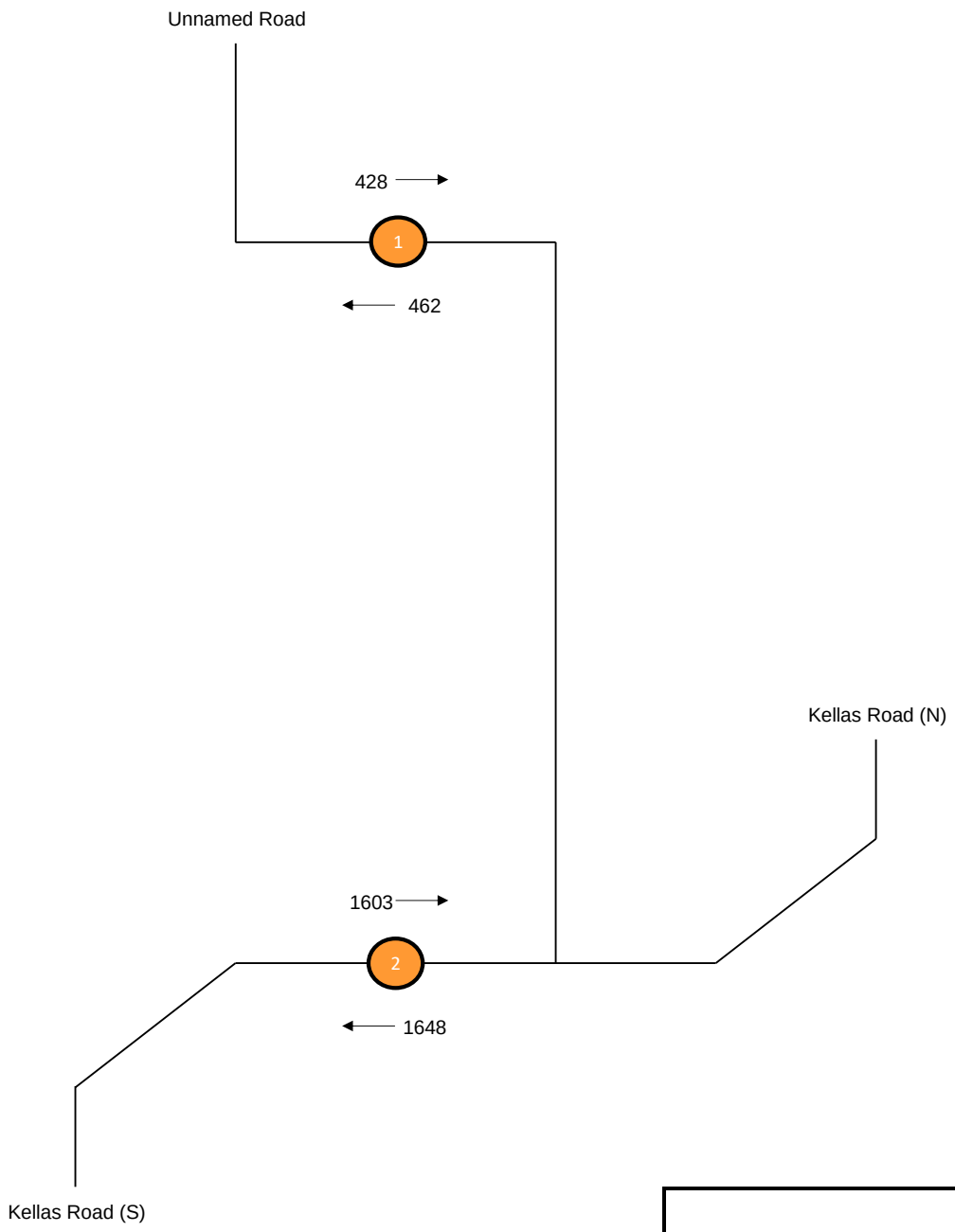
2247

SITE LOCATION

Project: Kellas Road, Dundee
Client: Cameron + Ross
Project.Ref. TS-19-058

Location 1: Unamed Road, east of Duntrune House
Location 2: Kellas Road - Approx. 30m south of Unnamed Road

SURVEY NETWORK TRAFFIC FLOW DIAGRAM



Time	**24hr (00:00-00:00)**
Date	**7 day (Weekly) Average**

CLASS	AXLES	AXLE GROUPS	DESCRIPTION	DOMINATE VEHICLE	AGGREGATE
1	2	1 or 2	Very Short - Bicycle or Motorcycle		**LIGHT**
2	2	1 or 2	Short - Car, 4WD or Light Van		
3	3 / 4 / 5	3	Short Towing - Trailer, Caravan etc.		
4	2	2	2-Axle Truck or Bus		**MEDIUM**
5	3	2	3-Axle Truck or Bus		
6	>3	2	4-Axle Truck		
7	3	3	3-Axle Articulated Vehicle or Rigid Vehicle & Trailer		**HEAVY**
8	4	>2	4-Axle Articulated Vehicle or Rigid Vehicle & Trailer		
9	5	>2	5-Axle Articulated Vehicle or Rigid Vehicle & Trailer		
10	>=6	>2	6 (or more) Axle Articulated Vehicle or Rigid Vehicle & Trailer		
11	>6	4	B-Double or Heavy Truck & Trailer		
12	>6	>=5	Double or Triple Heavy Truck & 2 (or more) Trailers		

ATC CLASSIFIED LINK & SPEED SURVEY

Project: Kellas Road, Dundee
Client: Cameron + Ross
Project.Ref. TS-19-058

Location 1: Unnamed Road, east of Duntrune House
Movement: Eastbound

TIME		TOTAL	ARX VEHICLE CLASSIFICATIONS												SPEED BIN TOTALS																				SPEED STATISTICS			
			LIGHT			MEDIUM			HEAVY																													
			1	2	3	4	5	6	7	8	9	10	11	12	0-5 mph	5-10mph	10-15mph	15-20mph	20-25mph	25-30mph	30-35mph	35-40mph	40-45mph	45-50mph	50-55mph	55-60mph	60-65mph	65-70mph	70-75mph	75-80mph	80-85mph	85-90mph	90-95mph	95-100mph	AVERAGE	MINIMUM	MAXIMUM	85th%ile
Date: 10 October 2019																																						
00:00	01:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	36.8	36.8	36.8	-
01:00	02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
02:00	03:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26.4	26.4	26.4	-
03:00	04:00	5	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	1	0	0	0	0	0	0	0	0	0	0	0	36.6	31.3	42.1	-
04:00	05:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	37.0	37.0	37.0	-
05:00	06:00	4	0	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	0	0	0	0	0	0	0	0	0	0	0	36.7	30.9	40.8	-
06:00	07:00	14	0	13	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	8	4	0	0	0	0	0	0	0	0	0	0	0	37.9	31.4	44.4	42.1
07:00	08:00	60	0	56	0	3	0	1	0	0	0	0	0	0	0	0	0	0	0	2	14	26	16	2	0	0	0	0	0	0	0	0	0	0	37.5	26.2	47.7	42.2
08:00	09:00	71	0	63	0	6	0	1	0	0	1	0	0	0	0	0	0	1	2	3	22	34	8	1	0	0	0	0	0	0	0	0	0	0	35.6	18.7	49.6	39.9
09:00	10:00	30	0	27	0	3	0	0	0	0	0	0	0	0	0	0	0	0	1	6	8	13	2	0	0	0	0	0	0	0	0	0	0	0	33.8	21.5	41.8	38.8
10:00	11:00	25	1	15	0	8	1	0	0	0	0	0	0	0	0	0	1	0	0	1	13	7	3	0	0	0	0	0	0	0	0	0	0	0	33.5	10.1	43.3	38.7
11:00	12:00	32	0	29	0	3	0	0	0	0	0	0	0	0	0	0	2	0	0	4	11	9	5	1	0	0	0	0	0	0	0	0	0	0	34.0	12.0	47.5	40.5
12:00	13:00	32	0	28	0	4	0	0	0	0	0	0	0	0	0	0	0	0	1	5	13	12	1	0	0	0	0	0	0	0	0	0	0	0	33.6	23.3	41.4	37.9
13:00	14:00	19	0	18	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	11	6	0	1	0	0	0	0	0	0	0	0	0	0	34.2	29.2	45.8	39.4
14:00	15:00	17	0	14	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	7	3	1	0	0	0	0	0	0	0	0	0	0	36.7	28.3	46.2	41.5
15:00	16:00	29	1	21	0	6	0	0	0	1	0	0	0	0	0	1	0	1	1	9	6	9	2	0	0	0	0	0	0	0	0	0	0	0	31.5	8.2	41.5	39.1
16:00	17:00	30	0	29	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	5	12	9	3	0	0	0	0	0	1	0	0	0	0	0	35.3	26.3	74.0	39.6
17:00	18:00	30	0	26	1	2	0	0	0	0	1	0	0	0	0	0	0	0	0	1	14	12	2	1	0	0	0	0	0	0	0	0	0	0	35.5	25.1	45.4	39.3
18:00	19:00	22	0	19	0	2	0	0	0	1	0	0	0	0	0	0	0	0	1	2	11	7	1	0	0	0	0	0	0	0	0	0	0	0	33.3	23.8	40.7	36.7
19:00	20:00	12	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	6	2	2	0	1	0	0	0	0	0	0	0	0	0	0	31.5	22.6	45.8	39.5
20:00	21:00	13	0	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	8	2	0	0	0	0	0	0	0	0	0	0	0	0	32.5	27.0	39.4	37.2
21:00	22:00	7	0	7	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	3	1	0	0	0	0	0	0	0	0	0	0	0	31.6	9.4	40.2	-
22:00	23:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	33.8	30.9	35.3	-
23:00	00:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	32.7	28.8	38.9	-
07:00-19:00		**397**	**2**	**345**	**1**	**42**	**1**	**2**	**0**	**2**	**2**	**0**	**0**	**0**	**0**	**1**	**3**	**2**	**6**	**40**	**140**	**151**	**46**	**7**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**34.8**	**8.2**	**74.0**	**39.9**
06:00-22:00		**443**	**2**	**390**	**1**	**43**	**1**	**2**	**0**	**2**	**2**	**0**	**0**	**0**	**0**	**2**	**3**	**2**	**7**	**49**	**154**	**166**	**51**	**8**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**34.7**	**8.2**	**74.0**	**39.8**
06:00-00:00		**451**	**2**	**398**	**1**	**43**	**1**	**2**	**0**	**2**	**2**	**0**	**0**	**0**	**0**	**2**	**3**	**2**	**7**	**51**	**157**	**169**	**51**	**8**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**34.7**	**8.2**	**74.0**	**39.7**
00:00-00:00		**463**	**2**	**404**	**1**	**49**	**1**	**2**	**0**	**2**	**2**	**0**	**0**	**0**	**0**	**2**	**3**	**2**	**7**	**52**	**159**	**176**	**53**	**8**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**34.7**	**8.2**	**74.0**	**39.7**
Date: 11 October 2019																																						
00:00	01:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	31.5	31.5	31.5	-
01:00	02:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29.0	29.0	29.0	-
02:00	03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
03:00	04:00	6	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	1	0	0	0	0	0	0	0	0	0	0	0	35.4	26.6	42.7	-
04:00	05:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	35.3	32.1	38.6	-
05:00	06:00	7	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	3	0	0	0	0	0	0	0	0	0	0	0	38.5	31.1	44.4	-
06:00	07:00	10	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	5	1	0	0	0	0	0	0	0	0	0	0	0	34.9	26.4	42.9	-
07:00	08:00	35	0	32	0	2	1	0	0	0	0	0	0	0	0	0	0	0	1	1	6	15	11	1	0	0	0	0	0	0	0	0	0	0	37.8	23.5	46.4	42.9
08:00	09:00	66	0	58	2	5	0	0	0	0	0	1	0	0	0	0	0	2	3	11	21	18	8	3	0	0	0	0	0	0	0	0	0	0	34.2	18.7	47.0	41.1
09:00	10:00	28	0	25	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	6	10	7	4	1	0	0	0	0	0	0	0	0	0	0	34.4	25.3	48.4	40.5
10:00	11:00	28	0	27	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	14	8	3	0	0	0	0	0	0	0	0	0	0	0	34.3	26.8	42.9	39.3
11:00	12:00	29	1	25	1	2	0	0	0	0	0	0	0	0	0	0	0	0	1	4	14	7	3	0	0	0	0	0	0	0	0	0	0	0	33.6	20.2	44.0	38.9
12:00	13:00	23	0	19	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	2	8	10	3	0	0	0	0	0	0	0	0	0	0	0	35.5	26.0	44.3	39.8
13:00	14:00	25	0	21	1	3	0	0	0	0	0	0	0	0	0	0	0	0	2	5	9	3	6	0	0	0	0	0	0	0	0	0	0	0	34.0	22.8	43.1	41.2
14:00	15:00	20	0	14	1	4	0	1	0	0	0	0	0	0	0	0	0	0	0	4	11	2	2	1	0	0	0	0	0	0	0	0	0	0	33.6	25.5	48.4	40.2
15:00	16:00	37	1	33	2	1	0	0	0	0	0	0	0	0	0	0	0	0	1	5	11	13	5	2	0	0	0	0	0	0	0	0	0	0	35.4	20.1	47.8	41.0
16:00	17:00	33	0	28	2	3	0	0	0	0	0	0	0	0	0	0	0	0	1	10	10	10	2	0	0	0	0	0	0	0	0	0	0	0	32.9	25.0	41.8	38.6
17:00	18:00	31	1	28	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	6	10	9	6	0	0	0	0	0	0	0	0	0	0	0	35.1	26.5	44.7	41.7
18:00	19:00	21	0	20	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	6	11	2	0	0	0	0	0	0	0	0	0	0	0	35.4	28.2	42.9	38.7
19:00	20:00	17	0	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	6	5	3	0	0	0	0	0	0	0	0	0	0	0	35.2	27.5	43.3	41.4
20:00	21:00	8	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	3	0	0	0	0	0	0	0	0	0	0	0	36.1	28.3	42.1	-
21:00	22:00	12	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	5	2	1	1	0	0	0	0	0	0	0	0	0	38.6	26.9	52.5	45.6
22:00	23:00	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	32.5	28.8	34.7	-
23:00	00:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	32.4	28.2	36.6	-
07:00-19:00		**376**	**3**	**330**	**11**	**29**	**1**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**2**	**9**	**59**	**130**	**113**	**55**	**8**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**34.7**	**18.7**	**48.4**	**40.7**
06:00-22:00		**423**	**3**	**377**	**11**	**29**	**1**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**2**	**9**	**67**	**141**	**130**	**64**	**9**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**34.8**	**18.7**	**52.5**	**40.8**
06:00-00:00		**428**	**3**	**382**	**11**	**29**	**1**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**2**	**9**	**69**	**143**	**131**	**64**	**9**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**34.8**	**18.7**	**52.5**	**40.8**
00:00-00:00		**445**	**3**	**393**	**11**	**35**	**1**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**2**	**9**	**71**	**149**	**136**	**68**	**9**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**34.9**	**18.7**	**52.5**	**40.8**
Date: 12 October 2019																																						
00:00	01:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	32.4	29.9	34.8	-
01:00	02:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	38.8	37.8	39.8	-
02:00	03:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	39.3	39.3	39.3	-
03:00	04:00	6	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	1	0	0	0	0	0	0	0	0	0	0	0	34.8	26.5	40.0	-
04:00	05:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	34.4	34.4	34.4	-
05:00	06:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
06:00	07:00	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	3	0	0	0	0	0	0	0	0	0	0	0	0	34.2	26.4	39.7	-
07:00	08:00	12	0	10	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	4	2	1	0	0	0	0	0	0	0	0	0	0	37.0	30.7	46.6	42.9
08:00	09:00	24	0	19	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	6	9	7	0	2	0	0	0	0	0	0	0	0	0	0	33.8	25.3	48.2	38.7
09:00	10:00	22	0	20	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	3	11	6	1	1	0	0	0	0	0	0	0	0	0	0	34.4	28.6	45.2	38.9
10:00	11:00	32	1	30	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	4	14	11	2	0	0	0	0	0	0	0	0	0	0	0	33.2	12.2	43.6	37.7
11:00	12:00	31	0	28	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	8	12	8	3	0	0	0	0	0	0	0	0	0	0	0	33.9	26.1	44.0	39.5
12:00	13:00	36	1	32	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	6	15	9	3	1	0	2	0	0	0	0	0	0	0	0	35.8	25.1	59.2	42.5
13:00	14:00	22	0	21	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	11	7	3	0	0	0	0	0	0	0	0	0	0	0	35.3	29.8	44.5	39.7
14:00	15:00	31	1	29	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	8	11	5	3	2	0	0	0	0	0	0	0	0	0	0	33.3	11.8	49.0	42.2
15:00	16:00	27	0	26	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	12	6	3	1	0	0	0	0	0	0	0	0	0	0	34.0	26.5	47.2	40.7
16:00	17:00	25	0	23	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	20	3	1	0	0	0	0	0	0	0	0	0	0	0	33.7	29.9	43.4	35.3
17:00	18:00	19	0	18	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	10	2	2	0	0	0	0	0	0	0	0	0	0	0	32.8	26.5	43.1	37.0
18:00	19:00	14	0	13	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	7	3	0	1	0	0	0	0	0	0	0	0	0	0	33.9	23.1	48.3	39.2
19:00	20:00	13	0	12	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	3	1	1	0	0	0	0	0	0	0	0	0	0	0	30.4	25.8	42.5	37.3
20:00	21:00	12	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	4	3	0	0	0	0	0	0	0	0	0	0	0	0	31.6	25.3	37.1	36.1
21:00	22:00	8	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	3	1	0	0	0	0	0	0	0	0	0	0	0	34.5	27.6	40.2	-
22:00	23:00	7	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	3	0	0	0	0	0	0	0	0	0	0	0	0	33.8	27.4	37.0	-
23:00	00:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	1	0	0	0	0	0	0	0	0	0	0	35.4	27.3	47.7	-
07:00-19:00		**295**	**3**	**269**	**10**	**13**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**2**	**49**	**137**	**71**	**23**	**9**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**34.2**	**11.8**	**59.2**	**38.9**
06:00-22:00		**333**	**3**	**306**	**11**	**13**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**2**	**65**	**147**	**81**	**25**	**9**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**33.9**	**11.8**	**59.2**	**38.7**
06:00-00:00		**344**	**3**	**317**	**11**	**13**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**2**	**67**	**152**	**84**	**25**	**10**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**34.0**	**11.8**	**59.2**	**38.7**
00:00-00:00		**356**	**3**	**323**	**11**	**19**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**2**	**69**	**156**	**89**	**26**	**10**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**34.0**	**11.8**	**59.2**	**38.9**
Date: 13 October 2019																																						
00:00	01:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	32.9	31.1	36.0	-
01:00	02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
02:00	03:00	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	36.0	36.0	36.0	-
03:00	04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
04:00	05:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
05:00	06:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	39.1	39.1	39.1	-
06:00	07:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29.8	29.8	29.8	-
07:00	08:00	7	0	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	1	0	1	0	0	0	0	0	0	0	0	0	0	32.9	21.8	47.2	-
08:00	09:00	12	0	10	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	5	2	3	2	0	0	0	0	0	0	0	0	0	0	0	33.3	25.4	42.0	41.8
09:00	10:00	23	1	20	0	0	0	0	0	0	2	0	0	0	0	1	0	1	2	3	10	5	1	0	0	0	0	0	0	0	0	0	0	0	30.7	9.7	41.3	38.5
10:00	11:00	11	0	10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	3	2	0	0	0	0	0	0	0	0	0	0	0	34.7	25.7	44.0	41.5
11:00	12:00	24	0	21	3	0	0	0	0	0	0	0	0	0	0	0	0	0	1	6	11	5	0	0	1	0	0	0	0	0	0	0	0	0	33.1	21.4	52.1	38.3
12:00	13:00	30	0	24	2	4	0	0	0	0	0	0	0	0	0	0	0	0	0	11	13	4	2	0	0	0	0	0	0	0	0	0	0	0	32.7	26.6	43.7	37.1
13:00	14:00	33	0	33	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	5	13	9	2	2	0	0	0	0	0	0	0	0	0	0	34.1	16.7	50.0	39.6
14:00	15:00	20	0	18	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	3	7	5	4	0	0	0	0	0	0	0	0	0	0	0	35.0	24.2	43.3	41.1
15:00	16:00	24	1	22	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2	7	7	5	0	1	0	0	0	0	0	0	0	0	0	35.2	11.2	50.9	42.3

TIME		TOTAL	ARX VEHICLE CLASSIFICATIONS												SPEED BIN TOTALS																				SPEED STATISTICS			
			LIGHT			MEDIUM			HEAVY						0-5 mph	5-10mph	10-15mph	15-20mph	20-25mph	25-30mph	30-35mph	35-40mph	40-45mph	45-50mph	50-55mph	55-60mph	60-65mph	65-70mph	70-75mph	75-80mph	80-85mph	85-90mph	90-95mph	95-100mph	AVERAGE	MINIMUM	MAXIMUM	85th%ile
			1	2	3	4	5	6	7	8	9	10	11	12																								
16:00	17:00	22	0	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	10	10	1	0	0	0	0	0	0	0	0	0	0	0	35.2	29.5	40.4	38.9
17:00	18:00	25	0	24	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	5	8	7	1	0	0	0	0	0	0	0	0	0	0	36.0	25.2	46.1	41.4
18:00	19:00	17	0	16	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	8	5	3	0	0	0	0	0	0	0	0	0	0	0	35.2	29.1	44.5	40.9
19:00	20:00	9	0	8	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	2	0	1	0	0	0	0	0	0	0	0	0	0	35.1	30.1	49.1	-
20:00	21:00	13	0	13	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	7	2	1	0	0	0	0	0	0	0	0	0	0	0	31.3	13.4	43.1	37.0
21:00	22:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	33.0	30.8	34.7	-
22:00	23:00	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0	33.6	30.7	38.3	-
23:00	00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
07:00-19:00		**248**	**2**	**226**	**11**	**7**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**1**	**1**	**2**	**7**	**44**	**93**	**65**	**29**	**4**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**34.0**	**9.7**	**52.1**	**39.9**
06:00-22:00		**275**	**2**	**252**	**12**	**7**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**1**	**2**	**2**	**7**	**47**	**110**	**69**	**30**	**5**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**33.9**	**9.7**	**52.1**	**39.6**
06:00-00:00		**280**	**2**	**257**	**12**	**7**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**1**	**2**	**2**	**7**	**47**	**114**	**70**	**30**	**5**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**33.9**	**9.7**	**52.1**	**39.6**
00:00-00:00		**286**	**2**	**262**	**12**	**8**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**1**	**2**	**2**	**7**	**47**	**117**	**73**	**30**	**5**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**33.9**	**9.7**	**52.1**	**39.4**
Date: 14 October 2019																																						
00:00	01:00	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27.3	27.3	27.3	-
01:00	02:00	2	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25.7	24.0	27.3	-
02:00	03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
03:00	04:00	6	0	1	0	5	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	2	0	0	0	0	0	0	0	0	0	0	0	0	30.3	20.6	36.4	-
04:00	05:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
05:00	06:00	7	0	6	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	1	0	0	0	0	0	0	0	0	0	0	0	38.0	34.4	43.3	-
06:00	07:00	14	0	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	6	6	1	0	0	0	0	0	0	0	0	0	0	0	34.7	28.8	42.7	38.2
07:00	08:00	50	0	47	0	3	0	0	0	0	0	0	0	0	0	0	0	0	4	0	22	14	8	2	0	0	0	0	0	0	0	0	0	0	35.5	20.2	48.2	41.1
08:00	09:00	53	0	49	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	4	17	23	7	1	1	0	0	0	0	0	0	0	0	0	36.4	26.7	50.0	40.2
09:00	10:00	32	0	31	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	5	16	9	1	0	0	0	0	0	0	0	0	0	0	0	33.3	17.3	41.6	37.2
10:00	11:00	26	0	24	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	3	14	6	1	1	0	0	0	0	0	0	0	0	0	0	33.9	23.5	46.5	39.2
11:00	12:00	27	0	16	1	9	0	1	0	0	0	0	0	0	0	0	0	0	0	4	14	9	0	0	0	0	0	0	0	0	0	0	0	0	33.5	26.7	38.9	37.7
12:00	13:00	27	0	21	1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	2	10	11	2	2	0	0	0	0	0	0	0	0	0	0	35.9	27.0	47.1	41.2
13:00	14:00	27	0	24	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	4	15	5	3	0	0	0	0	0	0	0	0	0	0	0	33.8	26.9	42.2	39.8
14:00	15:00	27	0	23	0	3	0	1	0	0	0	0	0	0	0	0	0	0	0	2	14	10	1	0	0	0	0	0	0	0	0	0	0	0	34.4	25.9	42.2	37.1
15:00	16:00	16	0	12	0	2	1	0	0	1	0	0	0	0	0	0	0	0	0	2	9	5	0	0	0	0	0	0	0	0	0	0	0	0	34.0	25.1	39.9	37.7
16:00	17:00	45	0	39	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	4	19	19	3	0	0	0	0	0	0	0	0	0	0	0	34.8	26.1	44.3	38.8
17:00	18:00	41	0	38	0	3	0	0	0	0	0	0	0	0	0	0	0	3	1	2	14	15	5	1	0	0	0	0	0	0	0	0	0	0	34.2	17.5	45.5	40.6
18:00	19:00	20	1	18	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	6	9	4	0	0	0	0	0	0	0	0	0	0	0	36.8	27.4	44.9	43.8
19:00	20:00	13	0	10	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	4	2	1	0	0	0	0	0	0	0	0	0	0	36.9	30.7	49.1	42.3
20:00	21:00	6	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	1	0	0	1	0	0	0	0	0	0	0	0	0	34.9	25.9	53.5	-
21:00	22:00	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	33.5	26.4	38.2	-
22:00	23:00	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	36.1	29.7	40.3	-
23:00	00:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	34.0	31.0	37.0	-
07:00-19:00		**391**	**1**	**342**	**4**	**40**	**1**	**2**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**6**	**33**	**170**	**135**	**35**	**7**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**34.8**	**17.3**	**50.0**	**39.4**
06:00-22:00		**427**	**1**	**375**	**4**	**43**	**1**	**2**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**6**	**37**	**184**	**148**	**38**	**8**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**34.9**	**17.3**	**53.5**	**39.4**
06:00-00:00		**432**	**1**	**380**	**4**	**43**	**1**	**2**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**6**	**38**	**185**	**150**	**39**	**8**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**34.9**	**17.3**	**53.5**	**39.4**
00:00-00:00		**448**	**1**	**388**	**4**	**51**	**1**	**2**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**8**	**42**	**188**	**156**	**40**	**8**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**34.8**	**17.3**	**53.5**	**39.4**
Date: 15 October 2019																																						
00:00	01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
01:00	02:00	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25.4	25.4	25.4	-
02:00	03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
03:00	04:00	6	0	1	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	2	0	0	0	0	0	0	0	0	0	0	0	35.0	25.2	42.0	-
04:00	05:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	38.8	38.8	38.8	-
05:00	06:00	6	0	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	39.6	35.3	43.7	-
06:00	07:00	12	0	11	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	9	2	0	0	0	0	0	0	0	0	0	0	0	36.5	18.8	43.7	42.2
07:00	08:00	59	1	51	2	5	0	0	0	0	0	0	0	0	0	0	1	0	4	5	16	19	12	1	1	0	0	0	0	0	0	0	0	0	35.4	10.2	50.2	42.1
08:00	09:00	66	0	58	1	6	0	0	0	1	0	0	0	0	0	0	0	0	2	9	17	30	8	0	0	0	0	0	0	0	0	0	0	0	35.0	22.5	44.3	39.7
09:00	10:00	34	1	31	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	14	11	6	0	0	0	0	0	0	0	0	0	0	0	35.3	26.0	42.2	40.2
10:00	11:00	21	0	16	1	3	0	0	1	0	0	0	0	0	0	0	0	1	1	3	6	5	3	1	1	0	0	0	0	0	0	0	0	0	34.8	19.6	50.9	41.5
11:00	12:00	29	0	24	0	4	0	0	0	0	1	0	0	0	0	0	0	0	1	4	9	10	5	0	0	0	0	0	0	0	0	0	0	0	35.0	22.9	44.3	41.5
12:00	13:00	42	0	32	0	8	0	2	0	0	0	0	0	0	0	0	0	0	0	3	13	15	8	2	0	0	0	1	0	0	0	0	0	0	37.2	26.8	66.3	41.6
13:00	14:00	30	1	24	1	3	0	1	0	0	0	0	0	0	0	0	0	1	1	3	9	9	5	1	1	0	0	0	0	0	0	0	0	0	35.5	18.8	52.6	42.9
14:00	15:00	30	0	25	1	3	0	0	0	1	0	0	0	0	0	0	0	0	1	6	10	11	2	0	0	0	0	0	0	0	0	0	0	0	33.9	24.9	41.5	39.7
15:00	16:00	24	0	22	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	10	7	5	0	0	0	0	0	0	0	0	0	0	0	35.3	25.8	42.5	40.6
16:00	17:00	51	1	42	1	6	0	0	1	0	0	0	0	0	0	0	1	0	1	6	21	18	3	1	0	0	0	0	0	0	0	0	0	0	34.1	13.0	45.2	38.6
17:00	18:00	34	0	30	0	3	0	1	0	0	0	0	0	0	0	0	0	0	0	1	11	14	7	0	0	1	0	0	0	0	0	0	0	0	36.9	27.3	55.0	41.7
18:00	19:00	25	0	24	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3	9	10	2	0	0	0	0	0	0	0	0	1	0	0	36.9	27.9	85.7	39.5
19:00	20:00	18	0	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	6	5	6	0	0	0	0	0	0	0	0	0	0	0	36.5	26.9	43.5	41.6
20:00	21:00	9	0	8	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	1	1	1	0	0	0	0	0	0	0	0	0	38.7	31.8	54.5	-
21:00	22:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	31.5	25.3	37.2	-
22:00	23:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0	0	0	0	0	0	43.7	41.3	45.5	-
23:00	00:00	2	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	40.4	36.1	44.8	-
07:00-19:00		**445**	**4**	**379**	**8**	**44**	**0**	**5**	**2**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**2**	**2**	**11**	**48**	**145**	**159**	**66**	**6**	**3**	**1**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**35.4**	**10.2**	**85.7**	**40.4**
06:00-22:00		**488**	**4**	**420**	**8**	**45**	**0**	**6**	**2**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**2**	**3**	**11**	**50**	**156**	**177**	**75**	**7**	**4**	**1**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**35.5**	**10.2**	**85.7**	**40.7**
06:00-00:00		**494**	**4**	**425**	**8**	**46**	**0**	**6**	**2**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**2**	**3**	**11**	**50**	**156**	**178**	**79**	**8**	**4**	**1**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**35.6**	**10.2**	**85.7**	**40.8**
00:00-00:00		**508**	**4**	**432**	**8**	**53**	**0**	**6**	**2**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**2**	**3**	**11**	**52**	**158**	**183**	**84**	**8**	**4**	**1**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**35.6**	**10.2**	**85.7**	**41.0**
Date: 16 October 2019																																						
00:00	01:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	45.8	45.8	45.8	-
01:00	02:00	2	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	30.0	24.5	35.4	-
02:00	03:00	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	33.6	33.6	33.6	-
03:00	04:00	3	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	31.7	27.3	38.7	-
04:00	05:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	42.6	42.6	42.6	-
05:00	06:00	7	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	6	0	0	0	0	0	0	0	0	0	0	0	41.2	31.5	43.9	-
06:00	07:00	17	0	14	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	8	5	1	0	0	0	0	0	0	0	0	0	0	39.0	32.0	47.7	43.0
07:00	08:00	57	0	51	0	5	0	1	0	0	0	0	0	0	0	0	0	0	0	4	13	21	12	5	1	1	0	0	0	0	0	0	0	0	38.4	25.3	57.4	44.8
08:00	09:00	75	0	71	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	1	19	29	22	3	1	0	0	0	0	0	0	0	0	0	38.3	27.6	50.0	43.1
09:00	10:00	29	1	25	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	4	5	16	3	1	0	0	0	0	0	0	0	0	0	0	36.0	28.0	45.5	39.8
10:00	11:00	28	0	22	0	5	0	1	0	0	0	0	0	0	0	0	0	0	1	3	12	8	3	1	0	0	0	0	0	0	0	0	0	0	34.6	24.7	46.4	41.4
11:00	12:00	28	0	26	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	4	10	10	3	1	0	0	0	0	0	0	0	0	0	0	35.2	27.0	46.3	39.8
12:00	13:00	27	0	22	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	5	6	11	4	1	0	0	0	0	0	0	0	0	0	0	35.7	26.0	45.0	41.6
13:00	14:00	22	0	21	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	8	9	2	0	0	0	0	0	0	0	0	0	0	0	35.1	26.2	42.9	39.7
14:00	15:00	17	0	15	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	10	1	0	0	0	0	0	0	0	0	0	0	0	36.2	31.6	41.5	38.9
15:00	16:00	27	0	24	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	11	12	4	0	0	0	0	0	0	0	0	0	0	0	36.6	33.0	44.5	41.8
16:00	17:00	37	0	33	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	8	13	13	2	1	0	0	0	0	0	0	0	0	0	0	34.3	25.8	46.0	38.7
17:00	18:00	39	0	33	0	5	0	0	0	0	1	0	0	0	0	0	0	0	0	4	23	8	4	0	0	0	0	0	0	0	0	0	0	0	34.4	29.0	42.1	39.3
18:00	19:00	32	0	31	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	12	9	7	1	1	0	0	0	0	0	0	0	0	0	36.5	27.2	50.7	41.1
19:00	20:00	11	2	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	3	6	0	0	0	0	0	0	0	0	0	0	0	0	33.7	23.3	39.2	37.6
20:00	21:00	15	0	13	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	4	4	1	0	0	0	0	0	0	0	0	0	0	37.6	27.1	48.7	43.8
21:00	22:00	7	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	2	2	0	0	1	0	0	0	0	0	0	0	0	39.0	19.4	59.4	-
22:00	23:00	6	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	1	0	0	0	0	0	0	0	0	0	0	42.1	38.2	47.8	-
23:00	00:00	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	37.9	32.0	41.9	-
07:00-19:00		**418**	**1**	**374**	**1**	**38**	**0**	**2**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**38**	**138**	**156**	**67**	**14**	**3**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.3**	**24.7**	**57.4**	**41.0**
06:00-22:00		**468**	**3**	**417**	**1**	**43**	**0**	**2**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**40**	**150**	**176**	**78**	**16**	**3**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.4**	**19.4**	**59.4**	**41.5**
06:00-00:00		**477**	**3**	**426**	**1**	**43**	**0**	**2**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**40**	**151**	**180**	**81**	**17**	**3**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.5**	**19.4**	**59.4**	**41.8**
00:00-00:00		**492**	**3**	**437**	**1**	**47**	**0**	**2**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**3**	**42**	**153**	**182**	**88**	**18**	**3**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.5**	**19.4**	**59.4**	**41.9**
5 day (Weekday) Average																																						
07:00-19:00		**405**	**2**	**354**	**5**	**39**	**1**	**2**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**7**	**44**	**145**	**143**	**54**	**8**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**35.2**	**15.8**	**63.1**	**40.3**
06:00-22:00		**450**	**3**	**396**	**5**	**41**	**1**	**3**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**7**	**49**	**157**	**159**	**61**	**10**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**35.3**	**14.8**	**65.0**	**40.4**
06:00-00:00		**456**	**3**	**402**	**5**	**41**	**1**	**3**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**7**	**50**	**158**	**162**	**63**	**10**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**35.3**	**14.8**	**65.0**	**40.5**
00:00-00:00		**471**	**3**	**411**	**5**	**47**	**1**	**3**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**8**	**52**	**161**	**167**	**67**	**10**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**35.3**	**14.8**	**65.0**	**40.6**
7 day (Weekly) Average																																						
07:00-19:00		**367**	**2**	**324**	**7**	**30**	**0**	**2**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**6**	**44**	**136**	**121**	**46**	**8**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**34.9**	**14.4**	**61.0**	**40.0**
06:00-22:00		**408**	**3**	**362**	**7**	**32**	**0**	**2**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**6**	**51**	**149**	**135**	**52**	**9**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**34.9**	**13.6**	**62.3**	**40.1**
06:00-00:00		**415**	**3**	**369**	**7**	**32**	**0**	**2**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**6**	**52**	**151**	**137**	**53**	**9**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**34.9**	**13.6**	**62.3**	**40.1**
00:00-00:00		**428**	**3**	**377**	**7**	**37**	**0**	**2**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**7**	**54**	**154**	**142**	**56**	**9**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**34.9**	**13.6**	**62.3**	**40.2**

ATC CLASSIFIED LINK & SPEED SURVEY

Project: Kellas Road, Dundee
Client: Cameron + Ross
Project.Ref. TS-19-058

Location 1: Unnamed Road, east of Duntrune House
Movement: Westbound

TIME		TOTAL	ARX VEHICLE CLASSIFICATIONS												SPEED BIN TOTALS																				SPEED STATISTICS			
			LIGHT			MEDIUM			HEAVY																													
			1	2	3	4	5	6	7	8	9	10	11	12	0-5 mph	5-10mph	10-15mph	15-20mph	20-25mph	25-30mph	30-35mph	35-40mph	40-45mph	45-50mph	50-55mph	55-60mph	60-65mph	65-70mph	70-75mph	75-80mph	80-85mph	85-90mph	90-95mph	95-100mph	AVERAGE	MINIMUM	MAXIMUM	85th%ile
Date:	**10 October 2019**																																					
00:00	01:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	47.9	47.9	47.9	-
01:00	02:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	41.0	41.0	41.0	-
02:00	03:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24.9	24.9	24.9	-
03:00	04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
04:00	05:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
05:00	06:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
06:00	07:00	7	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	2	1	0	0	0	0	0	0	0	0	0	42.5	36.2	50.4	-
07:00	08:00	27	1	22	0	3	0	1	0	0	0	0	0	0	0	0	0	1	0	2	12	10	2	0	0	0	0	0	0	0	0	0	0	0	34.7	19.3	43.9	38.5
08:00	09:00	22	0	19	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	4	8	5	5	0	0	0	0	0	0	0	0	0	0	0	35.7	28.2	44.8	43.7
09:00	10:00	34	0	22	0	10	1	1	0	0	0	0	0	0	0	0	0	0	0	3	16	11	2	2	0	0	0	0	0	0	0	0	0	0	35.5	25.0	47.6	39.5
10:00	11:00	22	0	14	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	2	6	9	2	3	0	0	0	0	0	0	0	0	0	0	36.9	27.5	46.1	44.5
11:00	12:00	19	0	14	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	3	6	6	4	0	0	0	0	0	0	0	0	0	0	0	35.0	27.1	44.8	41.4
12:00	13:00	29	1	25	0	3	0	0	0	0	0	0	0	0	0	0	0	1	0	6	10	6	5	1	0	0	0	0	0	0	0	0	0	0	34.3	16.9	45.1	40.8
13:00	14:00	36	0	34	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	16	13	3	3	0	0	0	0	0	0	0	0	0	0	35.7	24.5	47.9	41.5
14:00	15:00	50	0	44	0	6	0	0	0	0	0	0	0	0	0	0	0	1	0	3	16	15	9	5	1	0	0	0	0	0	0	0	0	0	37.0	17.1	50.2	44.0
15:00	16:00	35	0	30	0	5	0	0	0	0	0	0	0	0	0	0	0	0	1	2	10	16	4	2	0	0	0	0	0	0	0	0	0	0	35.9	24.3	46.4	40.9
16:00	17:00	73	0	68	0	5	0	0	0	0	0	0	0	0	0	0	0	0	1	4	14	33	20	0	0	0	0	0	1	0	0	0	0	0	37.9	25.0	74.0	41.4
17:00	18:00	78	0	73	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	3	25	30	14	6	0	0	0	0	0	0	0	0	0	0	37.1	28.1	49.9	41.8
18:00	19:00	42	0	40	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	5	9	14	13	0	0	0	0	0	0	0	0	0	0	0	36.4	22.3	44.6	42.1
19:00	20:00	16	0	14	0	2	0	0	0	0	0	0	0	0	0	0	0	1	1	3	3	6	2	0	0	0	0	0	0	0	0	0	0	0	33.0	19.6	43.4	39.9
20:00	21:00	11	0	11	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	3	4	2	0	1	0	0	0	0	0	0	0	0	0	0	31.6	11.3	48.1	40.6
21:00	22:00	11	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	3	1	1	0	0	0	0	0	0	0	0	0	0	35.6	26.5	49.1	42.4
22:00	23:00	3	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	33.3	28.0	37.9	-
23:00	00:00	6	0	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	32.2	27.2	36.1	-
07:00-19:00		**467**	**2**	**405**	**0**	**55**	**1**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**4**	**37**	**148**	**168**	**83**	**22**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**36.4**	**16.9**	**74.0**	**41.5**
06:00-22:00		**512**	**2**	**448**	**0**	**57**	**1**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**4**	**5**	**44**	**160**	**182**	**87**	**26**	**2**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**36.2**	**11.3**	**74.0**	**41.5**
06:00-00:00		**521**	**2**	**455**	**1**	**58**	**1**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**4**	**5**	**47**	**163**	**185**	**87**	**26**	**2**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**36.2**	**11.3**	**74.0**	**41.5**
00:00-00:00		**524**	**2**	**458**	**1**	**58**	**1**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**4**	**6**	**47**	**163**	**185**	**88**	**27**	**2**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**36.2**	**11.3**	**74.0**	**41.5**
Date:	**11 October 2019**																																					
00:00	01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
01:00	02:00	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	31.9	28.2	35.3	-
02:00	03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
03:00	04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
04:00	05:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
05:00	06:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
06:00	07:00	10	0	9	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	2	5	1	0	0	0	0	0	0	0	0	0	0	40.6	31.5	49.1	-
07:00	08:00	19	0	15	0	3	1	0	0	0	0	0	0	0	0	0	0	1	0	4	4	7	2	1	0	0	0	0	0	0	0	0	0	0	34.2	17.6	47.7	40.0
08:00	09:00	21	0	18	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	1	6	10	2	2	0	0	0	0	0	0	0	0	0	0	36.8	29.8	46.7	44.3
09:00	10:00	33	0	29	1	2	1	0	0	0	0	0	0	0	0	0	0	0	4	4	12	8	4	1	0	0	0	0	0	0	0	0	0	0	33.6	22.2	46.1	40.3
10:00	11:00	19	0	13	0	5	0	0	0	0	1	0	0	0	0	0	0	0	0	1	6	10	0	2	0	0	0	0	0	0	0	0	0	0	36.2	29.6	48.8	38.7
11:00	12:00	22	0	19	2	1	0	0	0	0	0	0	0	0	0	0	0	0	1	4	7	6	3	0	1	0	0	0	0	0	0	0	0	0	34.4	21.0	51.1	41.6
12:00	13:00	28	0	26	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	9	11	4	2	0	0	0	0	0	0	0	0	0	0	36.3	24.3	47.7	41.0
13:00	14:00	40	1	35	1	1	0	2	0	0	0	0	0	0	0	0	0	1	1	3	8	19	8	0	0	0	0	0	0	0	0	0	0	0	36.0	19.4	44.8	41.6
14:00	15:00	32	0	26	1	4	0	0	0	0	1	0	0	0	0	0	0	0	0	1	18	11	0	2	0	0	0	0	0	0	0	0	0	0	35.0	29.7	49.4	38.7
15:00	16:00	62	0	53	1	8	0	0	0	0	0	0	0	0	0	0	0	0	1	3	18	21	17	2	0	0	0	0	0	0	0	0	0	0	36.9	24.6	47.0	42.6
16:00	17:00	68	0	63	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	4	18	22	17	7	0	0	0	0	0	0	0	0	0	0	37.8	26.8	49.2	44.0
17:00	18:00	70	0	65	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	4	13	36	14	2	1	0	0	0	0	0	0	0	0	0	37.7	25.3	54.9	43.5
18:00	19:00	43	0	39	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	2	6	18	9	7	0	1	0	0	0	0	0	0	0	0	39.4	27.9	59.0	46.2
19:00	20:00	26	0	20	1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	2	5	7	6	5	0	0	0	1	0	0	0	0	0	0	39.9	28.4	66.6	47.2
20:00	21:00	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	31.3	24.6	38.1	-
21:00	22:00	9	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	3	3	1	1	0	0	0	0	0	0	0	0	0	0	34.8	17.5	45.6	-
22:00	23:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	37.3	19.8	52.9	-
23:00	00:00	6	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	4	0	1	0	0	0	0	0	0	0	0	0	41.6	33.7	50.4	-
07:00-19:00		**457**	**1**	**401**	**10**	**39**	**2**	**2**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**8**	**32**	**125**	**179**	**80**	**28**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.6**	**17.6**	**59.0**	**42.1**
06:00-22:00		**507**	**1**	**444**	**11**	**44**	**2**	**2**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**9**	**36**	**135**	**193**	**92**	**35**	**2**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**36.8**	**17.5**	**66.6**	**42.5**
06:00-00:00		**517**	**1**	**454**	**11**	**44**	**2**	**2**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**9**	**36**	**137**	**193**	**97**	**35**	**4**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**36.8**	**17.5**	**66.6**	**42.5**
00:00-00:00		**520**	**1**	**457**	**11**	**44**	**2**	**2**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**9**	**37**	**138**	**194**	**97**	**35**	**4**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**36.8**	**17.5**	**66.6**	**42.5**
Date:	**12 October 2019**																																					
00:00	01:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	32.9	25.4	40.3	-
01:00	02:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	39.4	37.7	41.2	-
02:00	03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
03:00	04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
04:00	05:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
05:00	06:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
06:00	07:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0	0	38.2	32.4	41.7	-
07:00	08:00	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	34.8	30.2	37.9	-
08:00	09:00	15	0	14	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	7	3	3	1	0	0	0	0	0	0	0	0	0	0	36.4	26.9	46.9	43.3
09:00	10:00	19	0	15	0	3	0	0	0	0	0	1	0	0	0	0	0	0	1	4	5	7	2	0	0	0	0	0	0	0	0	0	0	0	33.8	24.1	45.0	38.4
10:00	11:00	32	0	28	0	2	0	0	0	0	0	2	0	0	0	0	0	0	1	4	14	8	5	0	0	0	0	0	0	0	0	0	0	0	34.2	24.5	43.1	40.6
11:00	12:00	30	1	27	0	2	0	0	0	0	0	0	0	0	0	0	3	1	0	0	13	9	4	0	0	0	0	0	0	0	0	0	0	0	32.8	13.0	44.3	39.9
12:00	13:00	44	1	39	2	2	0	0	0	0	0	0	0	0	0	0	0	0	2	3	10	15	10	3	0	1	0	0	0	0	0	0	0	0	37.2	23.0	58.6	43.7
13:00	14:00	27	0	25	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	7	12	3	3	0	0	0	0	0	0	0	0	0	0	37.6	29.1	47.8	44.3
14:00	15:00	38	3	33	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	0	12	15	5	1	0	2	0	0	0	0	0	0	0	0	36.0	11.8	57.2	41.6
15:00	16:00	34	0	30	2	1	0	0	0	0	0	0	0	1	0	0	0	1	0	3	9	11	4	3	3	0	0	0	0	0	0	0	0	0	37.6	19.9	52.7	48.4
16:00	17:00	35	0	34	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	5	15	8	4	0	0	0	0	0	0	0	0	0	0	38.3	27.0	48.1	42.8
17:00	18:00	18	0	15	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	8	4	2	0	0	0	0	0	0	0	0	0	0	38.5	29.5	48.4	44.4
18:00	19:00	30	0	29	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	6	11	6	5	2	0	0	0	0	0	0	0	0	0	0	35.2	25.2	49.1	43.7
19:00	20:00	13	0	12	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	3	6	0	0	0	0	0	0	0	0	0	0	0	0	32.9	24.8	39.4	37.5
20:00	21:00	10	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	3	2	0	0	0	0	0	0	0	0	0	0	0	0	29.6	22.3	39.2	-
21:00	22:00	7	0	6	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	0	1	0	0	0	0	0	0	0	0	0	0	0	33.6	28.7	43.3	-
22:00	23:00	7	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	29.1	22.8	36.9	-
23:00	00:00	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	0	0	0	0	0	0	0	0	0	0	0	0	35.8	31.5	39.3	-
07:00-19:00		**327**	**5**	**294**	**10**	**14**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**1**	**0**	**0**	**4**	**3**	**5**	**27**	**99**	**111**	**53**	**19**	**3**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.2**	**11.8**	**58.6**	**42.4**
06:00-22:00		**361**	**5**	**326**	**11**	**15**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**1**	**0**	**0**	**4**	**3**	**8**	**34**	**111**	**120**	**56**	**19**	**3**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**35.8**	**11.8**	**58.6**	**42.0**
06:00-00:00		**373**	**5**	**338**	**11**	**15**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**1**	**0**	**0**	**4**	**3**	**9**	**37**	**115**	**124**	**56**	**19**	**3**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**35.7**	**11.8**	**58.6**	**41.7**
00:00-00:00		**377**	**5**	**342**	**11**	**15**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**1**	**0**	**0**	**4**	**3**	**9**	**38**	**115**	**125**	**58**	**19**	**3**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**35.7**	**11.8**	**58.6**	**41.7**
Date:	**13 October 2019**																																					
00:00	01:00	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	35.7	35.4	36.2	-
01:00	02:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	34.0	34.0	34.0	-
02:00	03:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	40.0	40.0	40.0	-
03:00	04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
04:00	05:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
05:00	06:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
06:00	07:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	32.7	31.7	33.7	-
07:00	08:00	7	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	2	0	0	0	0	0	0	0	0	0	0	0	36.9	32.4	43.3	-
08:00	09:00	7	0	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	2	0	0	0	0	0	0	0	0	0	0	0	37.5	31.5	41.0	-
09:00	10:00	13	0	11	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2	4	5	1	1	0	0	0	0	0	0	0	0	0	0	35.7	25.3	47.7	40.3
10:00	11:00	15	0	12	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	5	4	0	0	0	0	0	0	0	0	0	0	0	36.8	29.8	43.4	43.0
11:00	12:00	33	1	31	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	6	8	12	5	0	0	0	0	0	0	0	0	0	0	0	34.7	22.2	43.2	40.1
12:00	13:00	22	0	21	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	7	7	5	0	0	0	0	0	0	0	0	0	0	0	35.0	24.6	43.9	40.6
13:00	14:00	25	0	23	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	7	2	13	3	0	0	0	0	0	0	0	0	0	0	0	34.8	26.1	43.3	39.7
14:00	15:00	35	2	32	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	5	10	10	5	2	0	0	0	0	0	0	0	0	0	0	34.8	20.4	46.9	42.3
15:00	16:00	31	0	30	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	9	16	4	0	0	0	0	0	0	0	0	0	0	0	36.0	27.0	44.4	40.1

TIME		TOTAL	ARX VEHICLE CLASSIFICATIONS												SPEED BIN TOTALS																				SPEED STATISTICS			
			LIGHT			MEDIUM			HEAVY						0-5 mph	5-10mph	10-15mph	15-20mph	20-25mph	25-30mph	30-35mph	35-40mph	40-45mph	45-50mph	50-55mph	55-60mph	60-65mph	65-70mph	70-75mph	75-80mph	80-85mph	85-90mph	90-95mph	95-100mph	AVERAGE	MINIMUM	MAXIMUM	85th%ile
			1	2	3	4	5	6	7	8	9	10	11	12																								
Date: 13 October 2019																																						
16:00	17:00	20	0	19	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	6	7	4	1	0	0	0	0	0	0	0	0	0	0	36.2	28.9	48.4	42.2
17:00	18:00	35	0	32	1	2	0	0	0	0	0	0	0	0	0	0	0	0	1	3	10	13	7	0	0	0	0	1	0	0	0	0	0	0	36.8	23.5	67.9	41.6
18:00	19:00	15	0	14	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	3	2	1	1	0	0	0	0	0	0	0	0	0	35.8	26.4	52.5	44.3
19:00	20:00	13	0	12	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	5	3	1	1	0	0	0	0	0	0	0	0	0	39.3	32.6	51.1	45.4
20:00	21:00	11	0	10	0	1	0	0	0	0	0	0	0	0	0	0	0	1	2	3	2	2	1	0	0	0	0	0	0	0	0	0	0	0	29.5	19.7	40.1	36.6
21:00	22:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	35.1	35.1	35.1	-
22:00	23:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	28.5	21.1	35.7	-
23:00	00:00	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	30.2	22.8	34.5	-
07:00-19:00		**258**	**3**	**238**	**8**	**7**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**34**	**69**	**97**	**44**	**5**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**35.7**	**20.4**	**67.9**	**40.9**
06:00-22:00		**285**	**3**	**263**	**8**	**9**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**1**	**9**	**37**	**76**	**105**	**48**	**6**	**2**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**35.6**	**19.7**	**67.9**	**40.9**
06:00-00:00		**292**	**3**	**270**	**8**	**9**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**1**	**11**	**38**	**79**	**106**	**48**	**6**	**2**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**35.4**	**19.7**	**67.9**	**40.8**
00:00-00:00		**297**	**3**	**275**	**8**	**9**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**1**	**11**	**38**	**80**	**110**	**48**	**6**	**2**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**35.4**	**19.7**	**67.9**	**40.8**
Date: 14 October 2019																																						
00:00	01:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	31.4	31.4	31.4	-
01:00	02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
02:00	03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
03:00	04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
04:00	05:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	39.2	39.2	39.2	-
05:00	06:00	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	33.2	33.2	33.2	-
06:00	07:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	30.9	15.4	38.9	-
07:00	08:00	21	0	16	0	5	0	0	0	0	0	0	0	0	0	0	0	0	1	1	11	4	2	2	0	0	0	0	0	0	0	0	0	0	34.7	23.4	45.7	42.6
08:00	09:00	21	0	18	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	11	3	1	0	0	0	0	0	0	0	0	0	0	37.4	31.9	45.4	41.3
09:00	10:00	23	0	17	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	4	9	9	1	0	0	0	0	0	0	0	0	0	0	0	34.6	27.5	41.9	39.0
10:00	11:00	19	0	17	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	4	8	6	1	0	0	0	0	0	0	0	0	0	0	0	33.4	26.1	40.3	38.3
11:00	12:00	25	0	20	0	4	0	1	0	0	0	0	0	0	0	0	0	0	0	1	12	5	5	2	0	0	0	0	0	0	0	0	0	0	36.4	26.1	49.7	42.1
12:00	13:00	27	0	24	1	2	0	0	0	0	0	0	0	0	0	0	0	0	1	5	4	8	8	1	0	0	0	0	0	0	0	0	0	0	35.8	22.3	45.3	41.9
13:00	14:00	28	0	26	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	9	13	4	0	1	0	0	0	0	0	0	0	0	0	36.8	28.9	50.3	41.4
14:00	15:00	27	0	24	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	3	6	10	7	1	0	0	0	0	0	0	0	0	0	0	36.9	25.5	49.2	42.3
15:00	16:00	34	0	27	1	6	0	0	0	0	0	0	0	0	0	0	0	0	1	2	12	8	10	1	0	0	0	0	0	0	0	0	0	0	36.4	20.3	47.6	43.0
16:00	17:00	74	0	70	1	3	0	0	0	0	0	0	0	0	0	0	0	1	0	2	20	31	17	3	0	0	0	0	0	0	0	0	0	0	37.3	16.4	48.5	42.5
17:00	18:00	94	2	79	0	12	0	0	0	0	1	0	0	0	0	0	0	2	2	11	19	30	21	8	1	0	0	0	0	0	0	0	0	0	36.7	19.6	54.1	43.0
18:00	19:00	32	0	31	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	1	8	9	7	5	0	0	0	0	0	0	0	0	0	0	37.6	22.9	48.1	45.8
19:00	20:00	19	0	18	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	5	2	8	2	2	0	0	0	0	0	0	0	0	0	0	36.3	29.0	47.8	43.3
20:00	21:00	12	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	5	3	0	0	0	0	0	0	0	0	0	0	0	36.9	27.4	43.7	41.7
21:00	22:00	9	0	8	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	1	3	3	0	0	0	0	0	0	0	0	0	0	0	0	31.5	20.3	37.2	-
22:00	23:00	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	37.0	28.9	43.7	-
23:00	00:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	35.4	32.6	39.2	-
07:00-19:00		**425**	**2**	**369**	**4**	**47**	**0**	**1**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**7**	**35**	**124**	**144**	**86**	**24**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.5**	**16.4**	**54.1**	**42.2**
06:00-22:00		**469**	**2**	**411**	**4**	**49**	**0**	**1**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**9**	**42**	**133**	**162**	**91**	**26**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.3**	**15.4**	**54.1**	**42.1**
06:00-00:00		**476**	**2**	**418**	**4**	**49**	**0**	**1**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**9**	**43**	**135**	**165**	**92**	**26**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.3**	**15.4**	**54.1**	**42.1**
00:00-00:00		**479**	**2**	**420**	**4**	**50**	**0**	**1**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**9**	**43**	**137**	**166**	**92**	**26**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.3**	**15.4**	**54.1**	**42.1**
Date: 15 October 2019																																						
00:00	01:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	39.7	38.0	41.3	-
01:00	02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
02:00	03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
03:00	04:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	34.1	34.1	34.1	-
04:00	05:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
05:00	06:00	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27.0	27.0	27.0	-
06:00	07:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0	0	38.3	34.7	40.6	-
07:00	08:00	19	0	15	1	3	0	0	0	0	0	0	0	0	0	0	0	1	0	0	8	7	2	1	0	0	0	0	0	0	0	0	0	0	35.9	19.5	46.0	40.8
08:00	09:00	22	0	18	1	3	0	0	0	0	0	0	0	0	0	0	0	0	2	0	7	11	1	1	0	0	0	0	0	0	0	0	0	0	35.2	22.4	45.7	39.7
09:00	10:00	30	0	20	0	9	0	0	0	0	1	0	0	0	0	0	0	1	0	3	11	8	6	1	0	0	0	0	0	0	0	0	0	0	35.2	18.4	45.1	42.5
10:00	11:00	27	0	20	2	5	0	0	0	0	0	0	0	0	0	0	0	0	2	2	7	11	4	1	0	0	0	0	0	0	0	0	0	0	35.6	21.2	49.3	41.9
11:00	12:00	28	0	23	1	4	0	0	0	0	0	0	0	0	0	0	0	0	2	2	11	6	5	1	1	0	0	0	0	0	0	0	0	0	35.6	20.5	50.7	43.0
12:00	13:00	29	0	25	1	3	0	0	0	0	0	0	0	0	0	0	0	0	3	2	8	10	4	2	0	0	0	0	0	0	0	0	0	0	35.5	20.8	45.7	43.3
13:00	14:00	31	0	23	1	5	0	1	0	0	1	0	0	0	0	0	0	0	1	3	9	14	3	1	0	0	0	0	0	0	0	0	0	0	35.1	23.7	45.0	39.1
14:00	15:00	34	0	28	1	4	1	0	0	0	0	0	0	0	0	0	0	0	1	3	10	15	4	1	0	0	0	0	0	0	0	0	0	0	35.8	20.8	48.5	39.9
15:00	16:00	37	0	29	1	6	0	0	0	1	0	0	0	0	0	0	0	1	0	2	6	12	11	5	0	0	0	0	0	0	0	0	0	0	38.2	18.1	49.9	44.5
16:00	17:00	86	0	80	1	5	0	0	0	0	0	0	0	0	0	0	4	0	4	7	19	29	21	2	0	0	0	0	0	0	0	0	0	0	35.0	10.5	45.5	42.6
17:00	18:00	95	1	89	0	5	0	0	0	0	0	0	0	0	0	0	0	1	0	1	13	49	22	8	1	0	0	0	0	0	0	0	0	0	38.9	18.2	52.5	43.8
18:00	19:00	42	0	39	0	2	0	0	0	1	0	0	0	0	0	0	0	0	1	2	5	18	13	2	0	1	0	0	0	0	0	0	0	0	38.2	24.6	57.9	42.9
19:00	20:00	12	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	4	4	0	0	0	0	0	0	0	0	0	0	0	37.7	27.9	44.0	43.6
20:00	21:00	8	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	1	1	2	0	0	0	0	0	0	0	0	0	0	35.6	21.0	48.5	-
21:00	22:00	12	0	9	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	4	1	0	0	0	0	0	0	0	0	0	0	39.4	35.4	45.6	44.8
22:00	23:00	4	0	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	1	0	0	0	0	0	0	0	0	0	0	0	36.3	27.9	42.8	-
23:00	00:00	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	1	0	0	0	0	0	0	0	0	0	0	41.8	37.6	48.8	-
07:00-19:00		**480**	**1**	**409**	**10**	**54**	**1**	**1**	**0**	**2**	**2**	**0**	**0**	**0**	**0**	**0**	**4**	**4**	**16**	**27**	**114**	**190**	**96**	**26**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.5**	**10.5**	**57.9**	**42.6**
06:00-22:00		**516**	**1**	**442**	**10**	**57**	**1**	**1**	**0**	**2**	**2**	**0**	**0**	**0**	**0**	**0**	**4**	**4**	**17**	**29**	**120**	**203**	**107**	**29**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.6**	**10.5**	**57.9**	**42.6**
06:00-00:00		**525**	**1**	**450**	**10**	**58**	**1**	**1**	**0**	**2**	**2**	**0**	**0**	**0**	**0**	**0**	**4**	**4**	**17**	**30**	**120**	**207**	**110**	**30**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.7**	**10.5**	**57.9**	**42.7**
00:00-00:00		**529**	**1**	**453**	**10**	**59**	**1**	**1**	**0**	**2**	**2**	**0**	**0**	**0**	**0**	**0**	**4**	**4**	**17**	**31**	**121**	**208**	**111**	**30**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.6**	**10.5**	**57.9**	**42.7**
Date: 16 October 2019																																						
00:00	01:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	33.4	33.4	33.4	-
01:00	02:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	42.5	37.4	47.7	-
02:00	03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
03:00	04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
04:00	05:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
05:00	06:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	43.1	43.1	43.1	-
06:00	07:00	5	0	3	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	3	0	0	0	0	0	0	0	0	0	0	0	38.7	33.6	41.8	-
07:00	08:00	26	0	23	1	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	5	11	8	1	0	0	0	0	0	0	0	0	0	0	37.4	16.4	47.2	42.8
08:00	09:00	27	0	24	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	1	8	13	4	1	0	0	0	0	0	0	0	0	0	0	36.6	26.9	46.5	40.8
09:00	10:00	39	0	35	1	3	0	0	0	0	0	0	0	0	0	0	0	0	2	6	11	15	4	1	0	0	0	0	0	0	0	0	0	0	34.7	24.7	45.1	39.8
10:00	11:00	24	0	18	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	2	10	8	2	2	0	0	0	0	0	0	0	0	0	0	35.7	28.7	46.0	41.6
11:00	12:00	29	0	23	0	6	0	0	0	0	0	0	0	0	0	0	0	0	1	3	9	10	4	2	0	0	0	0	0	0	0	0	0	0	36.1	23.2	48.0	40.7
12:00	13:00	15	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	5	5	1	0	0	0	0	0	0	0	0	0	0	37.9	28.7	45.1	43.2
13:00	14:00	28	0	24	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	2	6	11	7	2	0	0	0	0	0	0	0	0	0	0	37.6	28.5	46.9	43.5
14:00	15:00	26	0	22	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	2	13	7	4	0	0	0	0	0	0	0	0	0	0	0	34.9	27.6	42.7	40.0
15:00	16:00	35	1	29	0	5	0	0	0	0	0	0	0	0	0	0	1	0	0	1	12	13	3	5	0	0	0	0	0	0	0	0	0	0	36.6	14.4	45.5	44.3
16:00	17:00	70	0	65	0	5	0	0	0	0	0	0	0	0	0	0	0	0	1	5	7	29	21	7	0	0	0	0	0	0	0	0	0	0	38.8	22.7	49.2	43.6
17:00	18:00	92	1	86	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	3	16	43	22	7	1	0	0	0	0	0	0	0	0	0	38.6	28.1	52.7	43.3
18:00	19:00	42	1	37	0	4	0	0	0	0	0	0	0	0	0	0	0	1	0	1	8	16	13	3	0	0	0	0	0	0	0	0	0	0	37.9	19.8	47.9	43.1
19:00	20:00	19	2	16	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	8	6	3	0	0	0	0	0	0	0	0	0	0	0	34.9	25.7	44.5	41.5
20:00	21:00	9	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	1	4	0	0	0	0	0	0	0	0	0	0	0	36.4	28.5	42.0	-
21:00	22:00	9	0	8	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	3	1	1	1	0	0	0	0	0	0	0	0	0	39.0	29.0	51.7	-
22:00	23:00	10	0	8	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	2	3	0	1	0	0	0	0	0	0	0	0	0	37.1	20.2	52.5	-
23:00	00:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	36.5	34.9	38.0	-
07:00-19:00		**453**	**3**	**401**	**3**	**44**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**4**	**28**	**107**	**181**	**97**	**32**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**37.3**	**14.4**	**52.7**	**42.1**
06:00-22:00		**495**	**5**	**437**	**3**	**48**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**4**	**32**	**121**	**192**	**108**	**33**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**37.2**	**14.4**	**52.7**	**42.1**
06:00-00:00		**507**	**5**	**447**	**3**	**50**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**5**	**33**	**124**	**195**	**111**	**33**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**37.2**	**14.4**	**52.7**	**42.1**
00:00-00:00		**511**	**5**	**451**	**3**	**50**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**5**	**33**	**125**	**196**	**112**	**34**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**37.2**	**14.4**	**52.7**	**42.1**
5 day (Weekday) Average																																						
07:00-19:00		**456**	**2**	**397**	**5**	**48**	**1**	**2**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**3**	**8**	**32**	**124**	**172**	**88**	**26**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.7**	**15.2**	**59.5**	**42.1**
06:00-22:00		**500**	**2**	**436**	**6**	**51**	**1**	**2**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**3**	**9**	**37**	**134**	**186**	**97**	**30**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.6**	**13.8**	**61.1**	**42.2**
06:00-00:00		**509**	**2**	**445**	**6**	**52**	**1**	**2**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**4**	**9**	**38**	**136**	**189**	**99**	**30**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.6**	**13.8**	**61.1**	**42.2**
00:00-00:00		**513**	**2**	**448**	**6**	**52**	**1**	**2**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**4**	**9**	**38**	**137**	**190**	**100**	**30**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.6**	**13.8**	**61.1**	**42.2**
7 day (Weekly) Average																																						
07:00-19:00		**410**	**2**	**360**	**6**	**37**	**1**	**1**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**1**	**2**	**7**	**31**	**112**	**153**	**77**	**22**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.5**	**15.4**	**60.6**	**42.0**
06:00-22:00		**449**	**3**	**396**	**7**	**40**	**1**	**1**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**1**	**3**	**9**	**36**	**122**	**165**	**84**	**25**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.4**	**14.4**	**61.7**	**42.0**
06:00-00:00		**459**	**3**	**405**	**7**	**40**	**1**	**1**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**1**	**3**	**9**	**38**	**125**	**168**	**86**	**25**	**3**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.3**	**14.4**	**61.7**	**41.9**
00:00-00:00		**462**	**3**	**408**	**7**	**41**	**1**	**1**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**1**	**3**	**9**	**38**	**126**	**169**	**87**	**25**	**3**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.3**	**14.4**	**61.7**	**41.9**

ATC CLASSIFIED LINK & SPEED SURVEY

Project: Kellas Road, Dundee
Client: Cameron + Ross
Project.Ref. TS-19-058

Location 2: Kellas Road - Approx. 30m south of Unnamed Road
Movement: Northbound

TIME		TOTAL	ARX VEHICLE CLASSIFICATIONS												SPEED BIN TOTALS																				SPEED STATISTICS			
			LIGHT			MEDIUM			HEAVY																													
			1	2	3	4	5	6	7	8	9	10	11	12	0-5 mph	5-10mph	10-15mph	15-20mph	20-25mph	25-30mph	30-35mph	35-40mph	40-45mph	45-50mph	50-55mph	55-60mph	60-65mph	65-70mph	70-75mph	75-80mph	80-85mph	85-90mph	90-95mph	95-100mph	AVERAGE	MINIMUM	MAXIMUM	85th%ile
Date: 10 October 2019																																						
00:00	01:00	12	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	4	1	3	0	2	0	0	0	0	0	0	0	47.1	26.7	62.5	60.8
01:00	02:00	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	0	1	0	0	0	0	0	0	0	0	44.4	38.9	55.1	-
02:00	03:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	37.2	33.4	41.1	-
03:00	04:00	6	0	2	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	28.6	25.9	37.7	-
04:00	05:00	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	32.4	24.3	41.1	-
05:00	06:00	8	0	7	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	3	0	1	1	1	1	0	0	0	0	0	0	0	0	0	35.3	21.7	51.9	-
06:00	07:00	30	0	24	0	5	1	0	0	0	0	0	0	0	0	0	0	0	1	6	4	6	3	5	3	0	1	1	0	0	0	0	0	0	40.0	25.0	67.2	50.5
07:00	08:00	51	0	42	0	8	0	1	0	0	0	0	0	0	0	0	0	1	1	9	8	5	10	9	4	4	0	0	0	0	0	0	0	0	39.9	18.6	57.8	51.6
08:00	09:00	75	0	69	0	4	2	0	0	0	0	0	0	0	0	0	0	1	5	20	8	14	16	6	3	1	1	0	0	0	0	0	0	0	36.1	18.5	64.2	45.1
09:00	10:00	75	0	66	1	7	0	0	0	1	0	0	0	0	0	0	0	0	13	8	8	14	21	8	3	0	0	0	0	0	0	0	0	0	36.5	20.4	52.2	45.0
10:00	11:00	59	0	51	0	8	0	0	0	0	0	0	0	0	0	0	0	0	3	8	5	19	13	8	1	2	0	0	0	0	0	0	0	0	38.7	23.1	58.1	46.0
11:00	12:00	111	0	106	0	4	0	0	0	1	0	0	0	0	0	0	0	1	6	16	7	29	29	18	5	0	0	0	0	0	0	0	0	0	38.4	19.4	54.4	46.3
12:00	13:00	110	0	95	3	8	1	0	0	1	1	1	0	0	0	0	0	1	8	14	18	19	31	13	4	1	0	0	1	0	0	0	0	0	37.7	15.8	73.7	46.6
13:00	14:00	101	0	87	0	13	1	0	0	0	0	0	0	0	0	0	0	0	6	6	10	22	33	18	6	0	0	0	0	0	0	0	0	0	39.7	21.7	54.4	46.9
14:00	15:00	108	2	97	0	8	0	0	0	1	0	0	0	0	0	0	0	0	3	6	14	31	28	15	8	2	1	0	0	0	0	0	0	0	40.2	22.1	60.3	47.4
15:00	16:00	135	2	116	1	12	2	1	0	1	0	0	0	0	0	0	1	2	12	9	12	29	34	21	11	3	1	0	0	0	0	0	0	0	39.2	11.3	63.4	47.9
16:00	17:00	190	1	179	1	9	0	0	0	0	0	0	0	0	0	0	0	1	12	12	29	60	51	20	5	0	0	0	0	0	0	0	0	0	37.8	19.2	51.2	44.6
17:00	18:00	181	0	169	2	9	0	1	0	0	0	0	0	0	0	0	0	2	5	14	11	64	53	23	8	1	0	0	0	0	0	0	0	0	39.1	17.2	58.7	45.6
18:00	19:00	133	0	124	0	8	0	0	0	1	0	0	0	0	0	0	0	1	3	13	14	47	30	17	7	1	0	0	0	0	0	0	0	0	38.9	19.7	56.0	46.1
19:00	20:00	88	0	84	0	4	0	0	0	0	0	0	0	0	0	0	0	3	3	6	5	25	26	18	1	1	0	0	0	0	0	0	0	0	39.2	15.9	60.0	46.0
20:00	21:00	52	0	51	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	5	5	23	11	4	2	0	0	1	0	0	0	0	0	0	38.7	23.4	67.6	43.8
21:00	22:00	50	0	49	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	4	3	16	16	7	2	0	0	0	0	0	0	0	0	0	39.4	19.7	52.7	45.9
22:00	23:00	29	0	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	5	7	6	6	0	0	1	0	0	0	0	0	0	43.3	23.6	65.0	51.1
23:00	00:00	13	0	12	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	3	4	1	0	0	0	0	0	0	0	0	0	41.6	29.7	51.4	48.6
07:00-19:00		**1329**	**5**	**1201**	**8**	**98**	**6**	**3**	**0**	**6**	**1**	**1**	**0**	**0**	**0**	**0**	**1**	**10**	**77**	**135**	**144**	**353**	**349**	**176**	**65**	**15**	**3**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**38.6**	**11.3**	**73.7**	**46.3**
06:00-22:00		**1549**	**5**	**1409**	**8**	**108**	**7**	**4**	**0**	**6**	**1**	**1**	**0**	**0**	**0**	**0**	**1**	**14**	**83**	**156**	**161**	**423**	**405**	**210**	**73**	**16**	**4**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**38.7**	**11.3**	**73.7**	**46.3**
06:00-00:00		**1591**	**5**	**1450**	**8**	**109**	**7**	**4**	**0**	**6**	**1**	**1**	**0**	**0**	**0**	**0**	**1**	**14**	**84**	**158**	**165**	**430**	**415**	**220**	**80**	**16**	**4**	**3**	**1**	**0**	**0**	**0**	**0**	**0**	**38.8**	**11.3**	**73.7**	**46.5**
00:00-00:00		**1627**	**5**	**1481**	**8**	**114**	**7**	**4**	**0**	**6**	**1**	**1**	**0**	**0**	**0**	**0**	**1**	**14**	**86**	**167**	**167**	**435**	**423**	**223**	**84**	**17**	**6**	**3**	**1**	**0**	**0**	**0**	**0**	**0**	**38.8**	**11.3**	**73.7**	**46.5**
Date: 11 October 2019																																						
00:00	01:00	9	0	8	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	3	1	1	0	0	0	0	0	0	0	0	45.2	34.7	58.0	-
01:00	02:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	35.4	22.4	48.3	-
02:00	03:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0	1	0	0	0	0	0	0	0	44.4	32.6	60.8	-
03:00	04:00	9	0	5	0	4	0	0	0	0	0	0	0	0	0	0	0	0	4	3	1	0	1	0	0	0	0	0	0	0	0	0	0	0	28.3	23.8	40.6	-
04:00	05:00	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	28.7	24.7	35.4	-
05:00	06:00	7	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	3	0	1	0	0	0	0	0	0	0	0	0	0	0	31.9	24.6	42.3	-
06:00	07:00	20	0	18	0	1	0	1	0	0	0	0	0	0	0	0	0	0	3	5	1	2	1	4	2	2	0	0	0	0	0	0	0	0	38.1	23.2	59.6	52.2
07:00	08:00	59	0	47	1	6	2	1	0	1	0	1	0	0	0	0	0	0	1	8	4	13	21	10	0	2	0	0	0	0	0	0	0	0	39.7	23.7	58.1	46.2
08:00	09:00	86	0	77	0	5	2	0	1	0	1	0	0	0	0	0	0	2	12	10	6	11	20	16	6	3	0	0	0	0	0	0	0	0	38.4	18.3	58.6	48.7
09:00	10:00	61	0	49	3	9	0	0	0	0	0	0	0	0	0	0	0	0	5	9	6	10	12	14	2	3	0	0	0	0	0	0	0	0	39.1	21.1	57.4	48.7
10:00	11:00	94	1	81	2	9	0	0	0	1	0	0	0	0	0	0	1	0	2	11	6	14	35	13	10	2	0	0	0	0	0	0	0	0	40.6	11.8	57.9	48.1
11:00	12:00	84	0	80	0	3	0	0	0	0	0	1	0	0	0	0	0	0	5	6	3	21	30	15	1	2	1	0	0	0	0	0	0	0	40.3	22.8	62.0	46.8
12:00	13:00	112	1	98	0	12	0	0	0	1	0	0	0	0	0	0	0	0	3	13	10	25	38	18	4	1	0	0	0	0	0	0	0	0	39.7	23.4	58.5	46.2
13:00	14:00	131	0	113	2	13	0	1	0	1	0	1	0	0	0	0	0	0	7	9	11	36	39	21	6	2	0	0	0	0	0	0	0	0	39.8	20.5	56.8	47.0
14:00	15:00	130	4	118	1	6	1	0	0	0	0	0	0	0	0	0	0	0	3	8	8	37	42	22	8	2	0	0	0	0	0	0	0	0	40.7	21.8	56.2	47.1
15:00	16:00	171	1	159	1	8	1	1	0	0	0	0	0	0	0	0	0	0	3	19	23	39	42	35	9	1	0	0	0	0	0	0	0	0	39.7	20.0	55.3	46.9
16:00	17:00	153	1	142	0	8	1	0	0	0	0	1	0	0	0	0	0	0	9	13	5	38	41	37	9	1	0	0	0	0	0	0	0	0	40.4	20.2	58.7	47.1
17:00	18:00	186	0	182	0	3	0	1	0	0	0	0	0	0	0	0	0	0	11	16	12	34	54	40	18	0	0	1	0	0	0	0	0	0	40.7	21.8	65.2	48.7
18:00	19:00	115	0	110	0	5	0	0	0	0	0	0	0	0	0	0	0	0	5	3	10	26	29	33	3	4	2	0	0	0	0	0	0	0	42.1	21.8	63.3	48.5
19:00	20:00	87	1	79	0	6	0	0	1	0	0	0	0	0	0	0	0	1	4	7	16	21	15	15	5	2	0	1	0	0	0	0	0	0	39.1	18.0	65.9	47.8
20:00	21:00	50	0	49	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	2	3	10	20	6	4	3	0	0	0	0	0	0	0	0	41.7	21.0	58.7	50.2
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22:00	23:00	29	1	27	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	6	10	6	2	1	0	0	0	0	0	0	0	0	42.1	22.3	59.1	48.0
23:00	00:00	16	0	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	2	5	3	3	0	1	0	0	0	0	0	0	0	43.1	21.0	61.7	52.8
07:00-19:00		**1382**	**8**	**1256**	**10**	**87**	**7**	**4**	**1**	**4**	**1**	**4**	**0**	**0**	**0**	**0**	**1**	**2**	**66**	**125**	**104**	**304**	**403**	**274**	**76**	**23**	**3**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**40.2**	**11.8**	**65.2**	**47.5**
06:00-22:00		**1601**	**10**	**1462**	**10**	**96**	**7**	**5**	**2**	**4**	**1**	**4**	**0**	**0**	**0**	**0**	**1**	**3**	**79**	**142**	**124**	**357**	**456**	**310**	**94**	**30**	**3**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**40.2**	**11.8**	**65.9**	**47.6**
06:00-00:00		**1646**	**11**	**1505**	**10**	**97**	**7**	**5**	**2**	**4**	**1**	**4**	**0**	**0**	**0**	**0**	**1**	**3**	**81**	**144**	**126**	**365**	**471**	**319**	**99**	**31**	**4**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**40.3**	**11.8**	**65.9**	**47.6**
00:00-00:00		**1680**	**11**	**1534**	**10**	**102**	**7**	**5**	**2**	**4**	**1**	**4**	**0**	**0**	**0**	**0**	**1**	**3**	**88**	**150**	**133**	**368**	**474**	**324**	**100**	**32**	**5**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**40.2**	**11.8**	**65.9**	**47.8**
Date: 12 October 2019																																						
00:00	01:00	12	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3	3	3	1	0	1	0	0	0	0	0	0	0	44.0	25.3	63.5	53.6
01:00	02:00	12	0	11	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	4	3	0	1	0	0	0	0	0	0	0	0	42.4	28.9	55.6	50.1
02:00	03:00	13	0	12	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	3	1	2	2	3	0	0	0	0	0	0	0	0	0	40.3	24.7	54.0	51.7
03:00	04:00	8	0	3	0	5	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	0	1	2	0	0	0	0	0	0	0	0	0	0	33.0	23.9	48.6	-
04:00	05:00	5	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1	1	1	0	0	0	0	0	0	0	0	0	38.6	27.3	52.0	-
05:00	06:00	7	0	6	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	0	3	1	0	1	0	0	0	0	0	0	0	0	0	37.8	25.5	52.8	-
06:00	07:00	10	0	9	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	2	4	1	0	0	0	0	0	0	0	0	0	43.4	33.1	51.9	-
07:00	08:00	30	0	25	0	5	0	0	0	0	0	0	0	0	0	0	0	1	2	2	2	5	9	6	3	0	0	0	0	0	0	0	0	0	39.8	18.9	52.5	47.2
08:00	09:00	54	2	45	1	5	0	0	0	0	1	0	0	0	0	1	1	0	3	9	0	13	15	7	5	0	0	0	0	0	0	0	0	0	37.7	8.5	52.9	47.5
09:00	10:00	79	5	65	0	8	0	1	0	0	0	0	0	0	0	0	0	2	8	6	8	15	28	6	3	2	1	0	0	0	0	0	0	0	38.2	17.6	60.7	45.9
10:00	11:00	97	1	86	2	7	0	0	1	0	0	0	0	0	0	0	1	1	6	11	7	20	24	18	8	1	0	0	0	0	0	0	0	0	39.1	12.3	57.6	47.6
11:00	12:00	112	1	107	1	3	0	0	0	0	0	0	0	0	0	0	0	0	2	14	11	23	29	21	11	1	0	0	0	0	0	0	0	0	40.5	22.4	55.1	48.3
12:00	13:00	134	4	120	0	10	0	0	0	0	0	0	0	0	0	0	0	2	1	11	10	25	48	21	12	2	1	1	0	0	0	0	0	0	41.3	17.7	68.9	49.3
13:00	14:00	142	2	130	0	9	1	0	0	0	0	0	0	0	0	0	0	1	9	8	11	28	36	32	10	5	2	0	0	0	0	0	0	0	40.8	18.5	62.9	48.3
14:00	15:00	131	3	123	3	2	0	0	0	0	0	0	0	0	0	0	0	0	4	15	8	23	43	25	8	1	3	1	0	0	0	0	0	0	41.0	20.9	66.6	48.9
15:00	16:00	119	1	116	0	2	0	0	0	0	0	0	0	0	0	0	0	0	4	7	8	17	35	32	7	4	4	0	0	1	0	0	0	0	43.0	21.5	78.9	49.7
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17:00	18:00	104	0	103	0	1	0	0	0	0	0	0	0	0	0	0	0	1	6	6	1	20	38	25	4	2	1	0	0	0	0	0	0	0	41.3	18.9	60.5	47.5
18:00	19:00	98	0	94	0	3	0	1	0	0	0	0	0	0	0	0	0	0	2	8	3	22	32	22	7	2	0	0	0	0	0	0	0	0	41.4	23.9	57.3	48.6
19:00	20:00	78	0	75	0	2	0	0	0	1	0	0	0	0	0	0	0	0	5	4	9	18	20	13	5	4	0	0	0	0	0	0	0	0	40.1	21.4	58.5	48.7
20:00	21:00	46	0	46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	2	15	12	7	2	1	1	0	0	0	0	0	0	0	40.3	21.4	62.8	47.5
21:00	22:00	46	0	43	1	2	0	0	0	0	0	0	0	0	0	0	0	0	4	0	2	9	14	10	6	0	1	0	0	0	0	0	0	0	42.1	23.4	61.2	50.1
22:00	23:00	32	0	32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	3	1	9	7	6	1	1	0	0	0	0	0	0	0	0	38.3	21.8	57.1	46.3
23:00	00:00	29	1	25	1	2	0	0	0	0	0	0	0	0	0	0	0	0	1	1	3	6	8	7	3	0	0	0	0	0	0	0	0	0	41.7	22.4	53.6	49.0
07:00-19:00		**1240**	**21**	**1147**	**7**	**60**	**1**	**2**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**1**	**2**	**8**	**50**	**109**	**85**	**237**	**387**	**237**	**85**	**22**	**14**	**2**	**0**	**1**	**0**	**0**	**0**	**0**	**40.7**	**8.5**	**78.9**	**48.2**
06:00-22:00		**1420**	**21**	**1320**	**8**	**65**	**1**	**2**	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**1**	**2**	**8**	**62**	**116**	**100**	**280**	**435**	**271**	**99**	**27**	**16**	**2**	**0**	**1**	**0**	**0**	**0**	**0**	**40.7**	**8.5**	**78.9**	**48.3**
06:00-00:00		**1481**	**22**	**1377**	**9**	**67**	**1**	**2**	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**1**	**2**	**8**	**67**	**120**	**104**	**295**	**450**	**284**	**103**	**28**	**16**	**2**	**0**	**1**	**0**	**0**	**0**	**0**	**40.7**	**8.5**	**78.9**	**48.3**
00:00-00:00		**1538**	**22**	**1425**	**10**	**74**	**1**	**3**	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**1**	**2**	**8**	**71**	**129**	**108**	**304**	**462**	**295**	**109**	**29**	**17**	**2**	**0**	**1**	**0**	**0**	**0**	**0**	**40.6**	**8.5**	**78.9**	**48.4**
Date: 13 October 2019																																						
00:00	01:00	30	0	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	5	15	7	1	0	0	0	0	0	0	0	0	0	41.7	25.0	52.1	48.1
01:00	02:00	17	0	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	3	4	3	1	0	0	0	0	0	0	0	0	43.4	30.7	56.4	51.2
02:00	03:00	9	0	8	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3	1	3	1	0	0	0	0	0	0	0	0	0	41.9	29.3	50.6	-
03:00	04:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	0	0	0	0	0	0	0	0	0	0	42.0	38.4	46.6	-
04:00	05:00	5	0	4	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	1	1	0	0	0	0	0	0	52.0	41.5	65.2	-
05:00	06:00	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0	1	0	0	0	0	0	0	0	0	0	41.5	32.7	50.5	-
06:00	07:00	10	0	9	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	6	1	0	0	0	0	0	0	0	0	0	0	41.5	33.7	47.3	-
07:00	08:00	19	1	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	4	2	4	3	1	2	0	0	0	0	0	0	0	0	40.3	27.5	57.0	52.1
08:00	09:00	32	0	29	0	3	0	0	0	0	0	0	0	0	0	0	0	0	4	2	3	7	8	5	1	0	2	0	0	0	0	0	0	0	39.7	21.3	64.4	49.0
09:00	10:00	39	1	37	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	4	2	5	12	11	2	0	1	0	0	0	0	0	0	0	41.0	16.0	64.3	48.0
10:00	11:00	53	0	49	0	4	0	0	0	0	0	0	0	0	0	0	0	0	3	6	0	6	20	14	4	0	0	0	0	0	0	0	0	0	40.7	20.0	52.1	47.2
11:00	12:00	82	0	80	0	2	0	0	0	0	0	0	0	0	0	0	0	0	4	8	3	10	26	20	6	3	1	1	0	0	0	0	0	0	42.3	20.7	68.5	48.6
12:00	13:00	96	3	88	0	4	0	0	1	0	0	0	0	0	0	0	0	1	5	13	10	21	19	20	3	3	1	0	0	0	0	0	0	0	39.2	18.9	60.7	48.9
13:00	14:00	110	0	107	0	3	0	0	0	0	0	0	0	0	0	0	0	0	2	10	8	18	35	28	6	3	0	0	0	0	0	0	0	0	41.4	22.6	59.8	48.3
14:00	15:00	129	0	125	0	4	0	0	0	0	0	0	0	0	0	0	0	1	2	6	10	18	52	28	7	3	0	1	0	1	0	0	0	0	42.2	15.3	75.6	47.6
15:00	16:00	112	1	108	1	2	0	0	0	0	0	0	0	0	0	0	0	0	7	5	6	16	38	18	16	4	2	0	0	0	0	0	0	0	42.5	21.3	64.3	51.4

TIME		TOTAL	ARX VEHICLE CLASSIFICATIONS												SPEED BIN TOTALS																				SPEED STATISTICS			
			LIGHT			MEDIUM			HEAVY						0-5 mph	5-10mph	10-15mph	15-20mph	20-25mph	25-30mph	30-35mph	35-40mph	40-45mph	45-50mph	50-55mph	55-60mph	60-65mph	65-70mph	70-75mph	75-80mph	80-85mph	85-90mph	90-95mph	95-100mph	AVERAGE	MINIMUM	MAXIMUM	85th%ile
			1	2	3	4	5	6	7	8	9	10	11	12																								
Date: [illegible]																																						
16:00	17:00	123	0	119	2	2	0	0	0	0	0	0	0	0	0	0	0	0	2	12	12	14	33	32	13	4	1	0	0	0	0	0	0	0	42.3	24.8	61.0	50.4
17:00	18:00	100	0	95	1	4	0	0	0	0	0	0	0	0	0	0	0	0	4	9	3	14	37	13	15	5	0	0	0	0	0	0	0	0	42.3	21.0	59.3	50.9
18:00	19:00	78	0	73	0	5	0	0	0	0	0	0	0	0	0	0	0	1	5	11	9	11	20	15	4	2	0	0	0	0	0	0	0	0	39.1	19.8	57.9	48.0
19:00	20:00	56	0	54	0	1	0	1	0	0	0	0	0	0	0	0	0	0	3	4	3	14	23	5	3	1	0	0	0	0	0	0	0	0	40.2	21.9	57.7	48.1
20:00	21:00	51	0	49	0	2	0	0	0	0	0	0	0	0	0	0	0	0	4	7	8	17	9	5	1	0	0	0	0	0	0	0	0	0	36.3	20.4	50.6	42.9
21:00	22:00	40	0	38	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	4	4	13	7	6	4	0	0	0	0	0	0	0	0	0	39.0	20.0	53.7	48.4
22:00	23:00	17	0	15	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	2	5	3	0	4	1	1	0	0	0	0	0	0	0	0	37.9	24.8	56.3	48.9
23:00	00:00	9	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	2	1	0	2	0	0	0	0	0	0	0	0	43.7	33.9	58.0	-
07:00-19:00		**973**	**6**	**928**	**4**	**34**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**39**	**89**	**70**	**142**	**304**	**207**	**78**	**29**	**8**	**2**	**0**	**1**	**0**	**0**	**0**	**0**	**41.4**	**15.3**	**75.6**	**49.0**
06:00-22:00		**1130**	**6**	**1078**	**5**	**39**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**47**	**104**	**86**	**188**	**349**	**224**	**86**	**30**	**8**	**2**	**0**	**1**	**0**	**0**	**0**	**0**	**41.0**	**15.3**	**75.6**	**48.7**
06:00-00:00		**1156**	**6**	**1102**	**6**	**40**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**48**	**106**	**92**	**194**	**351**	**229**	**87**	**33**	**8**	**2**	**0**	**1**	**0**	**0**	**0**	**0**	**41.0**	**15.3**	**75.6**	**48.7**
00:00-00:00		**1226**	**6**	**1170**	**6**	**41**	**0**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**49**	**108**	**94**	**210**	**374**	**246**	**93**	**34**	**9**	**3**	**0**	**1**	**0**	**0**	**0**	**0**	**41.1**	**15.3**	**75.6**	**48.7**
Date: 14 October 2019																																						
00:00	01:00	8	0	7	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	3	2	1	0	0	0	0	0	0	0	0	0	42.6	29.3	52.7	-
01:00	02:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	0	0	0	0	0	0	0	0	46.7	38.7	55.6	-
02:00	03:00	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26.5	26.5	26.5	-
03:00	04:00	6	0	2	0	4	0	0	0	0	0	0	0	0	0	0	0	2	3	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	25.9	19.5	45.4	-
04:00	05:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	41.8	38.6	45.1	-
05:00	06:00	9	0	8	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	4	0	0	2	0	0	0	0	0	0	0	0	0	0	34.6	26.0	48.0	-
06:00	07:00	27	0	25	0	1	1	0	0	0	0	0	0	0	0	0	0	0	2	10	5	2	3	4	0	0	1	0	0	0	0	0	0	0	35.2	24.5	61.3	47.1
07:00	08:00	69	0	64	0	4	1	0	0	0	0	0	0	0	0	0	0	1	8	8	7	12	13	12	6	2	0	0	0	0	0	0	0	0	38.4	19.3	59.3	48.3
08:00	09:00	62	1	55	0	6	0	0	0	0	0	0	0	0	0	1	0	2	2	16	11	3	12	11	2	1	1	0	0	0	0	0	0	0	36.4	9.0	63.2	47.2
09:00	10:00	87	0	74	0	12	0	0	0	0	0	1	0	0	0	0	0	2	5	12	9	18	25	15	1	0	0	0	0	0	0	0	0	0	37.8	16.1	54.2	46.6
10:00	11:00	74	2	64	1	7	0	0	0	0	0	0	0	0	0	0	2	1	1	11	5	12	25	13	1	3	0	0	0	0	0	0	0	0	38.9	10.4	59.0	48.2
11:00	12:00	89	0	71	2	14	0	1	0	1	0	0	0	0	0	0	0	0	3	10	9	17	30	16	3	1	0	0	0	0	0	0	0	0	39.4	20.6	56.0	46.5
12:00	13:00	99	0	83	0	16	0	0	0	0	0	0	0	0	0	0	0	0	5	10	6	17	35	19	6	1	0	0	0	0	0	0	0	0	40.1	21.9	55.4	46.4
13:00	14:00	99	1	92	1	4	0	0	0	0	0	1	0	0	0	1	0	0	4	10	4	19	32	14	9	5	1	0	0	0	0	0	0	0	41.1	6.8	64.5	50.6
14:00	15:00	128	0	112	0	11	1	1	0	1	1	1	0	0	0	0	0	0	4	17	7	32	27	27	10	2	2	0	0	0	0	0	0	0	40.3	23.9	61.4	48.8
15:00	16:00	122	0	106	3	9	2	2	0	0	0	0	0	0	0	0	0	0	4	7	10	28	39	21	12	1	0	0	0	0	0	0	0	0	41.1	22.5	57.4	48.3
16:00	17:00	194	3	175	2	12	1	0	0	0	0	1	0	0	0	0	1	3	9	26	17	37	53	33	10	2	1	1	1	0	0	0	0	0	39.2	13.9	70.2	47.2
17:00	18:00	216	1	203	0	12	0	0	0	0	0	0	0	0	0	0	0	4	8	15	17	27	81	45	12	7	0	0	0	0	0	0	0	0	40.7	15.7	59.3	46.9
18:00	19:00	122	1	115	1	4	1	0	0	0	0	0	0	0	0	0	0	0	4	9	12	24	34	28	8	3	0	0	0	0	0	0	0	0	41.2	23.5	58.9	49.0
19:00	20:00	81	1	75	0	5	0	0	0	0	0	0	0	0	0	0	0	1	2	5	3	20	21	22	5	2	0	0	0	0	0	0	0	0	41.7	18.1	56.1	48.6
20:00	21:00	63	0	60	0	3	0	0	0	0	0	0	0	0	0	0	0	1	1	4	0	10	20	14	9	2	2	0	0	0	0	0	0	0	43.8	19.8	60.9	51.9
21:00	22:00	43	0	42	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	5	1	5	17	6	7	0	1	0	0	0	0	0	0	0	42.4	21.8	64.5	51.7
22:00	23:00	25	0	23	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	6	5	4	6	0	1	0	0	0	0	0	0	0	43.3	24.4	63.9	51.7
23:00	00:00	22	0	21	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3	3	6	4	5	0	0	0	0	0	0	0	0	0	42.7	23.3	54.1	50.6
07:00-19:00		**1361**	**9**	**1214**	**10**	**111**	**6**	**4**	**0**	**2**	**1**	**4**	**0**	**0**	**0**	**2**	**3**	**13**	**57**	**151**	**114**	**246**	**406**	**254**	**80**	**28**	**5**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**39.8**	**6.8**	**70.2**	**47.8**
06:00-22:00		**1575**	**10**	**1416**	**10**	**121**	**7**	**4**	**0**	**2**	**1**	**4**	**0**	**0**	**0**	**2**	**3**	**15**	**63**	**175**	**123**	**283**	**467**	**300**	**101**	**32**	**9**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**40.1**	**6.8**	**70.2**	**48.1**
06:00-00:00		**1622**	**10**	**1460**	**10**	**124**	**7**	**4**	**0**	**2**	**1**	**4**	**0**	**0**	**0**	**2**	**3**	**15**	**66**	**175**	**127**	**292**	**478**	**308**	**112**	**32**	**10**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**40.2**	**6.8**	**70.2**	**48.3**
00:00-00:00		**1652**	**10**	**1483**	**10**	**131**	**7**	**4**	**0**	**2**	**1**	**4**	**0**	**0**	**0**	**2**	**3**	**17**	**69**	**180**	**131**	**295**	**482**	**315**	**113**	**33**	**10**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**40.1**	**6.8**	**70.2**	**48.2**
Date: 15 October 2019																																						
00:00	01:00	6	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	1	1	0	0	0	0	0	0	0	48.4	40.9	64.8	-
01:00	02:00	3	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	43.5	23.4	55.0	-
02:00	03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
03:00	04:00	8	0	3	0	5	0	0	0	0	0	0	0	0	0	0	0	1	3	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	28.4	18.9	43.7	-
04:00	05:00	5	0	4	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	1	0	0	0	0	0	0	0	0	0	40.5	30.1	51.9	-
05:00	06:00	8	0	7	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	1	1	0	0	0	0	0	0	0	0	0	0	36.0	28.3	50.0	-
06:00	07:00	26	0	20	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	3	5	7	5	3	2	1	0	0	0	0	0	0	0	0	39.4	26.7	58.3	49.5
07:00	08:00	63	0	48	0	14	0	0	0	1	0	0	0	0	0	1	0	0	4	8	12	8	15	10	5	0	0	0	0	0	0	0	0	0	37.9	8.2	54.6	46.6
08:00	09:00	83	0	69	0	14	0	0	0	0	0	0	0	0	0	0	0	2	9	17	14	6	17	10	3	5	0	0	0	0	0	0	0	0	36.4	17.0	59.9	47.3
09:00	10:00	68	0	50	0	18	0	0	0	0	0	0	0	0	0	0	0	0	6	11	9	13	19	9	1	0	0	0	0	0	0	0	0	0	37.1	22.3	50.6	45.2
10:00	11:00	96	0	84	0	9	1	0	0	1	1	0	0	0	0	0	1	3	2	6	5	19	31	18	9	1	1	0	0	0	0	0	0	0	40.7	13.8	63.8	48.5
11:00	12:00	109	0	95	1	13	0	0	0	0	0	0	0	0	0	0	0	0	6	12	11	23	31	14	10	2	0	0	0	0	0	0	0	0	39.4	21.2	56.7	48.1
12:00	13:00	131	0	116	1	14	0	0	0	0	0	0	0	0	0	0	0	0	5	20	8	20	43	21	10	4	0	0	0	0	0	0	0	0	40.0	22.9	58.3	48.3
13:00	14:00	118	4	103	1	10	0	0	0	0	0	0	0	0	0	1	0	0	2	7	11	18	45	22	10	2	0	0	0	0	0	0	0	0	41.3	9.4	55.4	48.2
14:00	15:00	114	0	104	1	7	0	0	0	1	1	0	0	0	0	0	0	2	7	13	7	18	39	18	8	2	0	0	0	0	0	0	0	0	39.6	19.1	59.6	48.0
15:00	16:00	141	0	125	3	13	0	0	0	0	0	0	0	0	0	0	0	2	5	11	8	38	34	34	7	1	1	0	0	0	0	0	0	0	40.3	16.7	60.8	47.4
16:00	17:00	195	1	175	0	14	1	2	0	0	0	2	0	0	0	0	1	1	11	18	16	39	59	35	12	3	0	0	0	0	0	0	0	0	39.6	14.8	55.8	47.6
17:00	18:00	196	1	179	1	13	0	1	0	0	1	0	0	0	0	0	0	1	10	13	12	30	71	39	10	7	2	1	0	0	0	0	0	0	41.3	19.6	68.4	47.9
18:00	19:00	136	0	123	1	11	0	0	0	0	1	0	0	0	0	0	0	0	4	15	9	30	36	30	8	2	0	1	1	0	0	0	0	0	41.0	22.3	71.4	48.8
19:00	20:00	75	0	74	0	1	0	0	0	0	0	0	0	0	0	0	0	2	3	8	4	15	19	15	9	0	0	0	0	0	0	0	0	0	40.0	17.0	54.6	49.6
20:00	21:00	69	1	64	0	4	0	0	0	0	0	0	0	0	0	0	0	1	4	1	9	8	23	17	5	1	0	0	0	0	0	0	0	0	41.1	18.2	55.2	48.9
21:00	22:00	49	0	48	0	1	0	0	0	0	0	0	0	0	0	0	1	1	2	0	5	7	13	8	5	4	1	2	0	0	0	0	0	0	43.4	15.0	67.7	54.9
22:00	23:00	28	0	27	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	3	6	10	3	1	0	0	0	0	0	0	0	0	43.0	24.0	55.7	50.3
23:00	00:00	18	0	17	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	5	3	2	2	3	1	0	0	0	0	0	0	0	0	40.9	27.7	58.6	52.5
07:00-19:00		**1450**	**6**	**1271**	**9**	**150**	**2**	**3**	**0**	**3**	**4**	**2**	**0**	**0**	**0**	**2**	**2**	**11**	**71**	**151**	**122**	**262**	**440**	**260**	**93**	**29**	**4**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**39.9**	**8.2**	**71.4**	**47.6**
06:00-22:00		**1669**	**7**	**1477**	**9**	**162**	**2**	**3**	**0**	**3**	**4**	**2**	**0**	**0**	**0**	**2**	**3**	**15**	**80**	**163**	**145**	**299**	**500**	**303**	**114**	**35**	**5**	**4**	**1**	**0**	**0**	**0**	**0**	**0**	**40.0**	**8.2**	**71.4**	**48.0**
06:00-00:00		**1715**	**7**	**1521**	**9**	**164**	**2**	**3**	**0**	**3**	**4**	**2**	**0**	**0**	**0**	**2**	**3**	**15**	**81**	**167**	**152**	**305**	**508**	**315**	**120**	**37**	**5**	**4**	**1**	**0**	**0**	**0**	**0**	**0**	**40.1**	**8.2**	**71.4**	**48.1**
00:00-00:00		**1745**	**7**	**1543**	**9**	**172**	**2**	**3**	**0**	**3**	**4**	**2**	**0**	**0**	**0**	**2**	**3**	**16**	**85**	**171**	**156**	**308**	**516**	**316**	**122**	**39**	**6**	**4**	**1**	**0**	**0**	**0**	**0**	**0**	**40.1**	**8.2**	**71.4**	**48.1**
Date: 16 October 2019																																						
00:00	01:00	7	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3	0	0	2	1	0	0	0	0	0	0	0	0	44.1	28.8	57.5	-
01:00	02:00	8	0	6	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	1	2	0	1	0	0	0	0	0	0	0	0	0	36.3	23.8	53.1	-
02:00	03:00	4	0	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	33.6	23.7	38.7	-
03:00	04:00	6	0	4	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	1	0	1	0	0	0	0	0	0	0	0	0	0	32.4	22.6	46.6	-
04:00	05:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	27.4	22.9	31.8	-
05:00	06:00	12	0	11	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	4	1	2	2	1	1	0	0	0	0	0	0	0	0	40.3	30.0	59.0	51.3
06:00	07:00	31	0	26	0	4	0	0	0	0	1	0	0	0	0	0	0	0	2	7	6	3	2	8	3	0	0	0	0	0	0	0	0	0	37.7	23.5	54.6	47.2
07:00	08:00	68	0	59	0	8	1	0	0	0	0	0	0	0	0	0	0	0	1	13	11	12	16	11	3	1	0	0	0	0	0	0	0	0	38.3	24.2	55.1	48.6
08:00	09:00	95	0	75	1	15	1	0	0	2	0	1	0	0	0	0	0	1	4	25	13	11	21	12	5	3	0	0	0	0	0	0	0	0	37.2	17.9	57.8	47.5
09:00	10:00	79	0	69	0	10	0	0	0	0	0	0	0	0	0	0	0	0	5	10	6	14	26	14	4	0	0	0	0	0	0	0	0	0	39.4	21.7	54.6	47.3
10:00	11:00	86	0	72	0	13	1	0	0	0	0	0	0	0	0	0	0	0	9	15	2	13	26	16	4	1	0	0	0	0	0	0	0	0	38.3	20.5	58.8	47.5
11:00	12:00	100	0	91	0	8	1	0	0	0	0	0	0	0	0	0	0	0	4	14	5	34	26	15	1	1	0	0	0	0	0	0	0	0	38.5	21.7	55.2	45.8
12:00	13:00	124	0	107	1	12	2	0	0	0	1	1	0	0	0	0	0	0	7	15	14	26	32	19	9	1	1	0	0	0	0	0	0	0	39.3	20.9	62.6	48.3
13:00	14:00	102	0	91	0	9	2	0	0	0	0	0	0	0	0	0	0	0	5	6	10	16	34	23	7	1	0	0	0	0	0	0	0	0	40.7	21.5	57.2	48.3
14:00	15:00	111	1	99	0	10	0	1	0	0	0	0	0	0	0	0	0	0	3	8	11	26	39	16	5	3	0	0	0	0	0	0	0	0	40.2	22.5	56.9	46.1
15:00	16:00	146	1	134	0	9	0	0	0	1	0	1	0	0	0	0	0	0	3	13	11	30	49	32	8	0	0	0	0	0	0	0	0	0	40.4	21.4	53.8	46.8
16:00	17:00	163	0	154	0	8	1	0	0	0	0	0	0	0	0	0	0	0	4	18	6	33	58	36	4	4	0	0	0	0	0	0	0	0	40.6	22.3	57.3	47.1
17:00	18:00	207	0	196	0	10	0	0	0	0	0	1	0	0	0	0	0	1	6	15	18	54	62	36	13	2	0	0	0	0	0	0	0	0	40.1	19.9	57.5	46.8
18:00	19:00	143	0	134	0	8	0	1	0	0	0	0	0	0	0	0	0	1	9	13	9	33	43	23	10	2	0	0	0	0	0	0	0	0	39.9	19.0	56.8	48.0
19:00	20:00	83	1	78	0	4	0	0	0	0	0	0	0	0	0	0	0	1	3	3	4	18	25	21	7	1	0	0	0	0	0	0	0	0	41.7	19.8	55.8	48.0
20:00	21:00	68	0	64	1	1	0	2	0	0	0	0	0	0	0	0	0	0	5	5	7	14	16	12	5	4	0	0	0	0	0	0	0	0	40.6	22.6	58.6	48.6
21:00	22:00	55	0	55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	4	11	12	12	8	2	0	0	0	0	0	0	0	0	42.2	25.3	58.1	50.6
22:00	23:00	40	0	38	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	3	4	11	11	5	2	3	0	0	0	0	0	0	0	0	41.0	23.8	57.2	48.9
23:00	00:00	13	0	12	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	4	5	2	0	1	0	0	0	0	0	0	0	0	41.4	21.9	55.0	47.4
07:00-19:00		**1424**	**2**	**1281**	**2**	**120**	**9**	**2**	**0**	**3**	**1**	**4**	**0**	**0**	**0**	**0**	**0**	**3**	**60**	**165**	**116**	**302**	**432**	**253**	**73**	**19**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**39.6**	**17.9**	**62.6**	**47.2**
06:00-22:00		**1661**	**3**	**1504**	**3**	**129**	**9**	**4**	**0**	**3**	**2**	**4**	**0**	**0**	**0**	**0**	**0**	**4**	**70**	**186**	**137**	**348**	**487**	**306**	**96**	**26**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**39.8**	**17.9**	**62.6**	**47.3**
06:00-00:00		**1714**	**3**	**1554**	**3**	**132**	**9**	**4**	**0**	**3**	**2**	**4**	**0**	**0**	**0**	**0**	**0**	**4**	**72**	**189**	**141**	**363**	**503**	**313**	**98**	**30**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**39.8**	**17.9**	**62.6**	**47.4**
00:00-00:00		**1753**	**3**	**1587**	**3**	**137**	**10**	**4**	**0**	**3**	**2**	**4**	**0**	**0**	**0**	**0**	**0**	**4**	**77**	**193**	**150**	**371**	**507**	**316**	**102**	**32**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**39.8**	**17.9**	**62.6**	**47.4**
5 day (Weekday) Average																																						
07:00-19:00		**1389**	**6**	**1245**	**8**	**113**	**6**	**3**	**0**	**4**	**2**	**3**	**0**	**0**	**0**	**1**	**1**	**8**	**66**	**145**	**120**	**293**	**406**	**243**	**77**	**23**	**3**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**39.6**	**11.2**	**68.6**	**47.3**
06:00-22:00		**1611**	**7**	**1454**	**8**	**123**	**6**	**4**	**0**	**4**	**2**	**3**	**0**	**0**	**0**	**1**	**2**	**10**	**75**	**164**	**138**	**342**	**463**	**286**	**96**	**28**	**4**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**39.8**	**11.2**	**68.8**	**47.5**
06:00-00:00		**1658**	**7**	**1498**	**8**	**125**	**6**	**4**	**0**	**4**	**2**	**3**	**0**	**0**	**0**	**1**	**2**	**10**	**77**	**167**	**142**	**351**	**475**	**295**	**102**	**29**	**5**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**39.8**	**11.2**	**68.8**	**47.6**
00:00-00:00		**1691**	**7**	**1526**	**8**	**131**	**7**	**4**	**0**	**4**	**2**	**3**	**0**	**0**	**0**	**1**	**2**	**11**	**81**	**172**	**147**	**355**	**480**	**299**	**104**	**31**	**6**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**39.8**	**11.2**	**68.8**	**47.6**
7 day (Weekly) Average																																						
07:00-19:00		**1308**	**8**	**1185**	**7**	**94**	**4**	**3**	**0**	**3**	**1**	**2**	**0**	**0**	**0**	**1**	**1**	**7**	**60**	**132**	**108**	**264**	**389**	**237**	**79**	**24**	**5**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**40.0**	**11.4**	**71.1**	**47.7**
06:00-22:00		**1515**	**9**	**1381**	**8**	**103**	**5**	**3**	**1**	**3**	**1**	**2**	**0**	**0**	**0**	**1**	**1**	**9**	**69**	**149**	**125**	**311**	**443**	**275**	**95**	**28**	**7**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**40.1**	**11.4**	**71.2**	**47.8**
06:00-00:00		**1561**	**9**	**1424**	**8**	**105**	**5**	**3**	**1**	**3**	**1**	**2**	**0**	**0**	**0**	**1**	**1**	**9**	**71**	**151**	**130**	**321**	**454**	**284**	**100**	**30**	**7**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**40.1**	**11.4**	**71.2**	**47.8**
00:00-00:00		**1603**	**9**	**1460**	**8**	**110**	**5**	**4**	**1**	**3**	**1**	**2**	**0**	**0**	**0**	**1**	**1**	**10**	**75**	**157**	**134**	**327**	**463**	**291**	**103**	**31**	**8**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**40.1**	**11.4**	**71.2**	**47.9**

ATC CLASSIFIED LINK & SPEED SURVEY

Project: Kellas Road, Dundee
Client: Cameron + Ross
Project.Ref. TS-19-058

Location 2: Kellas Road - Approx. 30m south of Unnamed Road
Movement: Southbound

TIME		TOTAL	ARX VEHICLE CLASSIFICATIONS												SPEED BIN TOTALS																				SPEED STATISTICS			
			LIGHT			MEDIUM			HEAVY																													
			1	2	3	4	5	6	7	8	9	10	11	12	0-5 mph	5-10mph	10-15mph	15-20mph	20-25mph	25-30mph	30-35mph	35-40mph	40-45mph	45-50mph	50-55mph	55-60mph	60-65mph	65-70mph	70-75mph	75-80mph	80-85mph	85-90mph	90-95mph	95-100mph	AVERAGE	MINIMUM	MAXIMUM	85th%ile
Date: 10 October 2019																																						
00:00	01:00	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	2	0	0	0	0	0	0	0	0	0	0	39.2	27.2	48.7	-
01:00	02:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21.7	21.7	21.7	-
02:00	03:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	35.3	35.3	35.3	-
03:00	04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
04:00	05:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	39.0	35.2	42.7	-
05:00	06:00	12	0	11	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	4	6	1	0	0	0	0	0	0	0	0	0	0	40.1	30.0	46.5	42.9
06:00	07:00	54	0	49	0	3	0	0	0	0	2	0	0	0	0	0	0	0	2	4	1	16	20	8	2	1	0	0	0	0	0	0	0	0	40.5	23.3	56.4	46.1
07:00	08:00	158	2	134	1	19	2	0	0	0	0	0	0	0	0	0	1	2	6	8	7	28	47	33	21	2	1	1	1	0	0	0	0	0	42.1	12.5	70.3	51.0
08:00	09:00	147	0	133	0	12	1	1	0	0	0	0	0	0	0	0	0	2	9	7	3	19	25	58	17	4	3	0	0	0	0	0	0	0	43.3	16.8	64.4	50.3
09:00	10:00	134	1	120	0	13	0	0	0	0	0	0	0	0	0	0	1	0	16	15	4	19	37	33	9	0	0	0	0	0	0	0	0	0	39.2	14.8	54.8	47.5
10:00	11:00	112	1	93	0	17	0	0	0	1	0	0	0	0	0	0	0	2	7	5	3	16	32	27	17	1	2	0	0	0	0	0	0	0	42.4	17.2	61.0	51.1
11:00	12:00	111	1	100	1	8	0	0	0	1	0	0	0	0	0	0	0	0	8	4	10	25	44	11	8	0	1	0	0	0	0	0	0	0	39.9	20.3	60.6	46.3
12:00	13:00	130	1	120	1	8	0	0	0	0	0	0	0	0	0	0	2	0	16	7	6	40	39	14	5	1	0	0	0	0	0	0	0	0	37.9	13.0	58.0	45.2
13:00	14:00	112	0	100	0	10	0	0	0	1	1	0	0	0	0	0	0	4	10	8	4	29	37	15	4	1	0	0	0	0	0	0	0	0	38.4	18.1	58.5	46.2
14:00	15:00	141	3	128	0	7	1	1	0	1	0	0	0	0	0	0	0	5	17	15	10	35	37	17	3	0	2	0	0	0	0	0	0	0	36.8	16.2	63.5	45.6
15:00	16:00	110	0	98	0	11	1	0	0	0	0	0	0	0	0	0	0	3	9	12	8	19	33	22	4	0	0	0	0	0	0	0	0	0	38.5	18.8	54.3	46.9
16:00	17:00	115	2	102	2	8	1	0	0	0	0	0	0	0	0	0	0	2	18	11	9	35	29	7	3	1	0	0	0	0	0	0	0	0	35.9	16.0	57.1	43.8
17:00	18:00	131	0	122	1	7	0	0	0	0	1	0	0	0	0	0	0	1	14	24	6	28	26	20	9	2	1	0	0	0	0	0	0	0	37.9	18.3	61.6	48.1
18:00	19:00	111	0	104	0	6	0	0	0	0	0	1	0	0	0	0	0	0	10	15	11	16	30	19	9	1	0	0	0	0	0	0	0	0	38.7	23.5	55.5	47.0
19:00	20:00	70	0	67	0	3	0	0	0	0	0	0	0	0	0	0	0	0	4	4	5	17	26	9	5	0	0	0	0	0	0	0	0	0	39.7	20.6	54.1	46.2
20:00	21:00	35	0	32	0	2	1	0	0	0	0	0	0	0	0	0	0	0	6	3	7	6	8	3	2	0	0	0	0	0	0	0	0	0	36.2	21.0	50.8	45.0
21:00	22:00	32	0	31	0	0	1	0	0	0	0	0	0	0	0	0	0	0	4	0	1	4	11	5	4	2	0	1	0	0	0	0	0	0	43.3	23.4	66.6	53.4
22:00	23:00	14	0	13	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	3	3	1	2	2	0	0	0	0	0	0	0	0	42.0	22.1	57.5	54.9
23:00	00:00	10	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	1	0	5	0	0	1	0	0	0	0	0	0	0	41.9	22.3	62.1	-
07:00-19:00		**1512**	**11**	**1354**	**6**	**126**	**6**	**2**	**0**	**4**	**2**	**1**	**0**	**0**	**0**	**0**	**4**	**21**	**140**	**131**	**81**	**309**	**416**	**276**	**109**	**13**	**10**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**39.3**	**12.5**	**70.3**	**48.1**
06:00-22:00		**1703**	**11**	**1533**	**6**	**134**	**8**	**2**	**0**	**4**	**4**	**1**	**0**	**0**	**0**	**0**	**4**	**21**	**156**	**142**	**95**	**352**	**481**	**301**	**122**	**16**	**10**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**39.4**	**12.5**	**70.3**	**47.9**
06:00-00:00		**1727**	**11**	**1556**	**6**	**135**	**8**	**2**	**0**	**4**	**4**	**1**	**0**	**0**	**0**	**0**	**4**	**21**	**159**	**144**	**96**	**356**	**484**	**307**	**124**	**18**	**11**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**39.4**	**12.5**	**70.3**	**48.0**
00:00-00:00		**1748**	**11**	**1576**	**6**	**136**	**8**	**2**	**0**	**4**	**4**	**1**	**0**	**0**	**0**	**0**	**4**	**21**	**160**	**146**	**96**	**364**	**491**	**310**	**124**	**18**	**11**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**39.4**	**12.5**	**70.3**	**48.0**
Date: 11 October 2019																																						
00:00	01:00	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	52.5	40.4	60.6	-
01:00	02:00	4	0	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	27.6	23.4	39.3	-
02:00	03:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	36.2	36.2	36.2	-
03:00	04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
04:00	05:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	35.2	35.2	35.2	-
05:00	06:00	10	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	4	0	0	0	0	0	0	0	0	0	0	42.6	35.7	49.2	-
06:00	07:00	52	0	42	0	8	0	0	0	0	2	0	0	0	0	0	0	0	4	5	0	10	14	14	3	2	0	0	0	0	0	0	0	0	41.0	20.7	58.3	48.2
07:00	08:00	131	0	123	0	7	1	0	0	0	0	0	0	0	0	0	0	2	6	6	5	28	43	32	7	1	1	0	0	0	0	0	0	0	40.9	17.4	60.1	47.3
08:00	09:00	144	1	132	1	9	0	0	0	0	0	1	0	0	0	0	1	0	9	5	6	30	52	33	7	1	0	0	0	0	0	0	0	0	40.6	14.3	57.2	47.7
09:00	10:00	132	0	120	1	8	3	0	0	0	0	0	0	0	0	0	0	3	17	11	6	32	36	22	4	1	0	0	0	0	0	0	0	0	37.6	17.0	56.7	46.6
10:00	11:00	111	1	101	0	9	0	0	0	0	0	0	0	0	0	0	1	0	4	4	5	20	46	21	6	3	0	1	0	0	0	0	0	0	41.4	14.3	65.9	47.2
11:00	12:00	135	0	116	1	15	1	1	0	0	0	1	0	0	0	0	2	0	8	8	5	18	42	36	9	4	3	0	0	0	0	0	0	0	41.8	13.3	62.7	49.3
12:00	13:00	120	2	111	2	3	0	1	0	0	0	1	0	0	0	0	0	1	10	8	6	34	36	18	6	0	1	0	0	0	0	0	0	0	39.1	16.7	60.4	47.3
13:00	14:00	120	2	109	0	6	1	0	0	0	1	1	0	0	0	0	2	1	15	6	12	31	35	13	3	2	0	0	0	0	0	0	0	0	37.2	11.5	59.6	45.2
14:00	15:00	118	1	103	1	13	0	0	0	0	0	0	0	0	0	0	0	1	9	5	6	29	42	17	6	3	0	0	0	0	0	0	0	0	40.1	19.9	59.0	46.9
15:00	16:00	140	2	121	0	15	1	0	0	0	1	0	0	0	0	0	0	1	18	13	6	33	39	18	11	1	0	0	0	0	0	0	0	0	38.4	19.7	59.2	47.9
16:00	17:00	139	0	129	0	9	0	1	0	0	0	0	0	0	0	0	0	2	28	11	7	14	52	18	7	0	0	0	0	0	0	0	0	0	37.2	19.1	54.6	45.6
17:00	18:00	118	0	110	0	5	0	0	0	0	3	0	0	0	0	0	0	1	17	11	5	22	29	17	12	4	0	0	0	0	0	0	0	0	38.8	19.8	57.6	49.2
18:00	19:00	104	0	99	0	5	0	0	0	0	0	0	0	0	0	0	0	1	13	13	3	19	28	21	3	3	0	0	0	0	0	0	0	0	38.5	18.5	56.5	47.5
19:00	20:00	68	0	60	0	6	2	0	0	0	0	0	0	0	0	0	0	1	6	6	7	13	16	8	6	2	3	0	0	0	0	0	0	0	39.8	19.7	63.8	50.6
20:00	21:00	39	0	37	0	1	0	0	1	0	0	0	0	0	0	0	0	1	3	1	2	8	9	9	5	1	0	0	0	0	0	0	0	0	41.0	19.0	58.4	50.4
21:00	22:00	32	0	31	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3	0	1	6	11	6	3	2	0	0	0	0	0	0	0	0	42.4	20.4	59.3	50.9
22:00	23:00	14	0	13	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	3	4	2	2	0	0	0	0	0	0	0	0	0	40.3	17.7	53.8	52.5
23:00	00:00	7	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	3	0	0	0	0	0	0	0	0	0	0	0	0	32.3	24.8	39.4	-
07:00-19:00		**1512**	**9**	**1374**	**6**	**104**	**7**	**3**	**0**	**0**	**5**	**4**	**0**	**0**	**0**	**0**	**6**	**13**	**154**	**101**	**72**	**310**	**480**	**266**	**81**	**23**	**5**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**39.3**	**11.5**	**65.9**	**47.2**
06:00-22:00		**1703**	**9**	**1544**	**6**	**120**	**9**	**3**	**1**	**0**	**7**	**4**	**0**	**0**	**0**	**0**	**6**	**15**	**170**	**113**	**82**	**347**	**530**	**303**	**98**	**30**	**8**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**39.5**	**11.5**	**65.9**	**47.5**
06:00-00:00		**1724**	**9**	**1564**	**6**	**121**	**9**	**3**	**1**	**0**	**7**	**4**	**0**	**0**	**0**	**0**	**6**	**16**	**171**	**116**	**84**	**353**	**534**	**305**	**100**	**30**	**8**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**39.5**	**11.5**	**65.9**	**47.5**
00:00-00:00		**1745**	**9**	**1584**	**6**	**121**	**10**	**3**	**1**	**0**	**7**	**4**	**0**	**0**	**0**	**0**	**6**	**16**	**174**	**116**	**84**	**358**	**539**	**310**	**101**	**31**	**9**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**39.5**	**11.5**	**65.9**	**47.5**
Date: 12 October 2019																																						
00:00	01:00	17	0	17	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	3	1	8	0	1	1	0	0	0	0	0	0	0	42.8	17.3	62.0	52.9
01:00	02:00	4	0	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	31.5	23.6	39.9	-
02:00	03:00	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	1	0	0	0	0	0	0	0	0	0	0	39.1	34.5	45.3	-
03:00	04:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	44.2	40.5	48.0	-
04:00	05:00	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	47.0	46.1	47.5	-
05:00	06:00	6	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	4	0	0	0	0	0	0	0	0	0	0	45.2	35.7	48.4	-
06:00	07:00	20	0	17	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	8	5	1	2	0	0	0	0	0	0	0	0	44.0	30.4	57.5	51.4
07:00	08:00	52	0	44	0	7	0	1	0	0	0	0	0	0	0	0	0	0	3	2	1	9	17	12	4	2	2	0	0	0	0	0	0	0	42.9	20.5	64.3	50.5
08:00	09:00	76	0	69	1	6	0	0	0	0	0	0	0	0	0	0	0	0	6	4	2	19	19	18	7	1	0	0	0	0	0	0	0	0	40.8	20.7	55.3	49.4
09:00	10:00	118	0	111	0	6	1	0	0	0	0	0	0	0	0	0	0	0	7	5	3	23	40	24	12	4	0	0	0	0	0	0	0	0	42.0	20.1	55.9	49.3
10:00	11:00	133	4	119	1	8	1	0	0	0	0	0	0	0	0	0	1	1	7	7	3	12	30	52	14	5	0	1	0	0	0	0	0	0	43.3	13.1	66.9	50.4
11:00	12:00	124	2	111	0	9	1	1	0	0	0	0	0	0	0	0	1	0	4	16	8	20	46	21	6	2	0	0	0	0	0	0	0	0	39.9	14.1	59.3	47.1
12:00	13:00	140	1	128	0	9	0	0	1	0	1	0	0	0	0	0	0	3	10	7	5	18	48	33	14	1	0	1	0	0	0	0	0	0	41.3	17.7	65.9	49.4
13:00	14:00	110	3	98	1	7	0	1	0	0	0	0	0	0	0	0	0	1	10	8	11	17	31	20	9	1	1	1	0	0	0	0	0	0	39.8	16.3	69.4	49.0
14:00	15:00	150	3	138	2	7	0	0	0	0	0	0	0	0	0	0	1	2	10	9	6	24	49	31	11	3	4	0	0	0	0	0	0	0	41.0	14.4	63.4	48.3
15:00	16:00	118	1	109	1	6	0	0	0	0	0	1	0	0	0	0	2	1	8	13	5	27	31	21	5	3	2	0	0	0	0	0	0	0	39.2	12.1	63.4	47.6
16:00	17:00	121	5	113	0	3	0	0	0	0	0	0	0	0	0	0	0	0	6	8	4	24	39	33	4	1	1	1	0	0	0	0	0	0	41.5	20.0	68.1	47.8
17:00	18:00	100	2	91	0	7	0	0	0	0	0	0	0	0	0	0	0	2	5	3	3	19	32	26	8	1	1	0	0	0	0	0	0	0	41.7	16.4	62.9	49.1
18:00	19:00	94	0	90	1	2	1	0	0	0	0	0	0	0	0	0	0	1	13	5	3	21	30	16	4	1	0	0	0	0	0	0	0	0	38.4	19.3	56.2	47.3
19:00	20:00	72	0	70	0	1	1	0	0	0	0	0	0	0	0	0	0	0	5	2	9	16	22	12	3	3	0	0	0	0	0	0	0	0	40.5	20.6	57.9	47.9
20:00	21:00	41	1	38	0	1	1	0	0	0	0	0	0	0	0	0	1	0	3	2	2	12	4	10	5	1	1	0	0	0	0	0	0	0	41.1	11.4	61.9	51.0
21:00	22:00	25	0	23	0	2	0	0	0	0	0	0	0	0	0	0	0	1	5	2	2	2	5	4	3	1	0	0	0	0	0	0	0	0	37.6	18.9	55.1	51.0
22:00	23:00	19	0	17	0	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	2	6	5	3	0	0	0	0	0	0	0	0	0	0	37.7	19.2	48.4	45.7
23:00	00:00	16	0	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	9	3	1	0	0	0	0	0	0	0	0	47.7	31.9	57.0	54.2
07:00-19:00		**1336**	**21**	**1221**	**7**	**77**	**4**	**3**	**1**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**5**	**11**	**89**	**87**	**54**	**233**	**412**	**307**	**98**	**25**	**11**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**41.0**	**12.1**	**69.4**	**48.8**
06:00-22:00		**1494**	**22**	**1369**	**9**	**82**	**6**	**3**	**1**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**6**	**12**	**102**	**93**	**70**	**264**	**451**	**338**	**110**	**32**	**12**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**40.9**	**11.4**	**69.4**	**48.8**
06:00-00:00		**1529**	**22**	**1402**	**9**	**83**	**7**	**3**	**1**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**6**	**13**	**103**	**94**	**73**	**270**	**458**	**350**	**113**	**33**	**12**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**41.0**	**11.4**	**69.4**	**48.8**
00:00-00:00		**1566**	**22**	**1438**	**9**	**84**	**7**	**3**	**1**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**6**	**14**	**106**	**95**	**74**	**278**	**462**	**367**	**113**	**34**	**13**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**41.0**	**11.4**	**69.4**	**48.8**
Date: 13 October 2019																																						
00:00	01:00	19	0	18	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	9	6	1	1	0	0	0	0	0	0	0	0	44.6	35.1	56.8	49.4
01:00	02:00	11	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	7	1	0	0	0	0	0	0	0	0	0	0	39.8	21.7	45.5	44.6
02:00	03:00	6	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	1	0	0	0	0	0	0	0	0	0	0	41.8	38.5	47.1	-
03:00	04:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	1	0	0	0	0	0	0	48.5	40.4	67.4	-
04:00	05:00	4	0	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	1	0	0	0	0	0	0	0	0	50.8	45.3	59.4	-
05:00	06:00	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	1	0	0	0	0	0	0	0	0	0	43.7	38.2	52.5	-
06:00	07:00	17	0	14	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	2	0	4	9	1	1	0	0	0	0	0	0	0	0	45.3	32.0	55.8	50.9
07:00	08:00	24	0	23	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	2	1	0	7	9	1	1	0	1	0	0	0	0	0	0	43.1	22.4	67.8	50.2
08:00	09:00	27	0	24	0	0	3	0	0	0	0	0	0	0	0	0	0	0	4	1	1	7	7	6	1	0	0	0	0	0	0	0	0	0	39.1	21.6	50.4	46.5
09:00	10:00	67	2	60	1	2	0	0	0	1	1	0	0	0	0	0	0	1	2	1	1	11	17	20	11	3	0	0	0	0	0	0	0	0	44.1	19.6	56.1	52.3
10:00	11:00	106	1	93	0	10	1	1	0	0	0	0	0	0	0	0	0	0	5	3	9	7	28	36	14	4	0	0	0	0	0	0	0	0	43.5	21.2	59.2	50.7
11:00	12:00	96	4	87	2	3	0	0	0	0	0	0	0	0	0	0	0	2	6	10	7	14	20	14	18	3	2	0	0	0	0	0	0	0	41.0	15.9	63.1	51.4
12:00	13:00	91	0	86	0	4	1	0	0	0	0	0	0	0	0	0	1	0	5	6	1	15	33	23	6	0	1	0	0	0	0	0	0	0	41.3	13.0	60.5	48.2
13:00	14:00	114	2	109	1	2	0	0	0	0	0	0	0	0	0	0	0	0	4	11	4	10	21	30	26	6	2	0	0	0	0	0	0	0	44.2	21.5	64.8	52.8
14:00	15:00	140	2	131	0	7	0	0	0	0	0	0	0	0	0	0	0	1	7	9	5	30	38	30	11	8	0	1	0	0	0	0	0	0	41.8	19.3	65.4	49.9
15:00	16:00	133	0	129	0	4	0	0	0	0	0	0	0	0	0	0	0	2	9	6	10	19	40	36	8	2	0	1	0	0	0	0	0	0	41.1	18.3	66.1	48.2

TIME		TOTAL	ARX VEHICLE CLASSIFICATIONS												SPEED BIN TOTALS																				SPEED STATISTICS			
			LIGHT			MEDIUM			HEAVY						0-5 mph	5-10mph	10-15mph	15-20mph	20-25mph	25-30mph	30-35mph	35-40mph	40-45mph	45-50mph	50-55mph	55-60mph	60-65mph	65-70mph	70-75mph	75-80mph	80-85mph	85-90mph	90-95mph	95-100mph	AVERAGE	MINIMUM	MAXIMUM	85th%ile
			1	2	3	4	5	6	7	8	9	10	11	12																								
Date: [illegible] October 2019																																						
16:00	17:00	86	0	81	0	4	0	0	0	0	1	0	0	0	0	0	0	0	5	5	2	7	19	21	21	5	1	0	0	0	0	0	0	0	44.5	21.3	61.4	53.3
17:00	18:00	98	0	93	0	3	0	1	0	0	1	0	0	0	0	0	0	3	11	6	1	12	25	16	14	8	2	0	0	0	0	0	0	0	41.8	16.7	62.5	53.8
18:00	19:00	57	0	53	1	1	2	0	0	0	0	0	0	0	0	0	0	1	3	3	2	9	21	9	6	2	1	0	0	0	0	0	0	0	41.8	17.0	60.9	51.0
19:00	20:00	49	0	46	0	2	0	0	1	0	0	0	0	0	0	0	0	0	0	5	1	14	9	11	7	1	1	0	0	0	0	0	0	0	42.6	25.0	63.3	51.2
20:00	21:00	42	0	39	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3	3	10	11	10	5	0	0	0	0	0	0	0	0	0	0	37.0	21.6	48.3	43.7
21:00	22:00	19	0	18	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	6	6	3	1	1	0	0	0	0	0	0	0	0	41.9	22.8	55.5	48.5
22:00	23:00	15	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0	3	6	1	1	0	0	0	0	0	0	0	0	0	37.4	17.6	52.2	45.3
23:00	00:00	6	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	1	1	1	0	0	0	0	0	0	0	0	0	36.8	23.0	54.1	-
07:00-19:00		**1039**	**11**	**969**	**5**	**41**	**7**	**2**	**0**	**1**	**3**	**0**	**0**	**0**	**0**	**0**	**1**	**10**	**63**	**63**	**44**	**141**	**276**	**250**	**137**	**42**	**9**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**42.4**	**13.0**	**67.8**	**50.8**
06:00-22:00		**1166**	**11**	**1086**	**5**	**48**	**7**	**2**	**1**	**2**	**3**	**1**	**0**	**0**	**0**	**0**	**1**	**10**	**67**	**71**	**58**	**172**	**305**	**278**	**146**	**45**	**10**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**42.2**	**13.0**	**67.8**	**50.7**
06:00-00:00		**1187**	**11**	**1107**	**5**	**48**	**7**	**2**	**1**	**2**	**3**	**1**	**0**	**0**	**0**	**0**	**1**	**11**	**69**	**75**	**58**	**175**	**312**	**280**	**148**	**45**	**10**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**42.1**	**13.0**	**67.8**	**50.7**
00:00-00:00		**1236**	**11**	**1154**	**5**	**50**	**7**	**2**	**1**	**2**	**3**	**1**	**0**	**0**	**0**	**0**	**1**	**11**	**70**	**75**	**59**	**182**	**335**	**292**	**150**	**47**	**10**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**42.2**	**13.0**	**67.8**	**50.7**
Date: 14 October 2019																																						
00:00	01:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	1	0	0	0	0	0	0	0	0	0	45.9	33.4	53.3	-
01:00	02:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	44.5	43.0	46.0	-
02:00	03:00	3	0	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	33.8	30.0	40.4	-
03:00	04:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	48.7	48.7	48.7	-
04:00	05:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
05:00	06:00	13	0	11	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	2	6	1	1	0	0	0	0	0	0	0	0	44.9	29.3	55.3	50.7
06:00	07:00	49	0	39	1	6	2	0	0	0	1	0	0	0	0	0	0	0	0	2	2	8	13	12	9	2	1	0	0	0	0	0	0	0	44.7	25.0	61.4	52.3
07:00	08:00	159	1	134	1	20	1	0	0	0	1	1	0	0	0	0	0	0	11	1	2	27	44	52	18	3	1	0	0	0	0	0	0	0	43.4	21.0	60.2	50.0
08:00	09:00	136	2	119	0	13	1	0	0	0	0	1	0	0	0	0	0	2	7	9	2	19	34	48	11	3	1	0	0	0	0	0	0	0	42.2	16.7	60.5	48.8
09:00	10:00	117	2	101	0	9	3	0	0	1	0	1	0	0	0	0	1	1	11	7	4	24	34	22	8	5	0	0	0	0	0	0	0	0	40.2	14.5	57.6	48.8
10:00	11:00	95	0	87	0	7	0	0	0	0	0	1	0	0	0	0	0	0	4	5	4	19	32	16	13	1	0	1	0	0	0	0	0	0	42.1	22.3	68.0	50.2
11:00	12:00	102	1	84	0	15	0	0	0	1	0	1	0	0	0	0	0	1	5	8	6	21	30	24	7	0	0	0	0	0	0	0	0	0	40.5	19.5	52.9	48.8
12:00	13:00	114	1	101	0	11	0	0	0	1	0	0	0	0	0	0	0	1	7	12	2	12	34	28	15	2	1	0	0	0	0	0	0	0	41.7	18.2	62.0	50.2
13:00	14:00	128	1	111	2	13	0	0	0	0	1	0	0	0	0	0	1	2	9	11	10	21	25	19	21	8	1	0	0	0	0	0	0	0	41.0	14.7	61.0	52.6
14:00	15:00	110	0	98	3	9	0	0	0	0	0	0	0	0	0	0	0	1	9	6	4	15	41	23	7	4	0	0	0	0	0	0	0	0	41.2	17.5	59.0	49.3
15:00	16:00	90	1	73	0	14	0	1	0	0	1	0	0	0	0	1	0	2	8	7	4	14	21	23	7	2	1	0	0	0	0	0	0	0	40.1	5.8	63.0	48.9
16:00	17:00	127	0	120	0	5	1	0	0	1	0	0	0	0	0	0	0	2	13	19	3	22	38	16	13	1	0	0	0	0	0	0	0	0	38.4	16.3	57.9	48.8
17:00	18:00	150	2	134	1	10	0	1	0	0	1	1	0	0	0	0	0	4	14	25	14	18	36	29	7	3	0	0	0	0	0	0	0	0	37.7	15.9	58.2	47.7
18:00	19:00	114	2	107	0	5	0	0	0	0	0	0	0	0	0	0	1	1	6	15	3	17	24	35	11	0	1	0	0	0	0	0	0	0	40.3	12.3	60.2	49.3
19:00	20:00	72	0	67	0	4	1	0	0	0	0	0	0	0	0	0	0	1	8	5	1	11	20	13	7	6	0	0	0	0	0	0	0	0	41.1	16.3	59.4	50.6
20:00	21:00	33	0	31	0	2	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0	5	11	7	4	1	0	0	0	0	0	1	0	0	43.7	19.1	87.8	50.4
21:00	22:00	25	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	1	0	9	6	4	1	0	0	0	0	0	0	0	0	42.2	21.4	58.1	53.2
22:00	23:00	21	0	19	0	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	4	11	3	1	0	0	0	0	0	0	0	0	0	40.4	17.7	52.9	47.2
23:00	00:00	13	0	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	3	3	3	1	1	0	0	0	0	0	0	0	0	41.7	20.4	59.0	54.3
07:00-19:00		**1442**	**13**	**1269**	**7**	**131**	**6**	**2**	**0**	**4**	**4**	**6**	**0**	**0**	**0**	**1**	**3**	**17**	**104**	**125**	**58**	**229**	**393**	**335**	**138**	**32**	**6**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**40.7**	**5.8**	**68.0**	**49.3**
06:00-22:00		**1621**	**13**	**1431**	**8**	**143**	**9**	**2**	**0**	**4**	**5**	**6**	**0**	**0**	**0**	**1**	**3**	**19**	**116**	**135**	**62**	**253**	**446**	**373**	**162**	**42**	**7**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**40.9**	**5.8**	**87.8**	**49.4**
06:00-00:00		**1655**	**13**	**1463**	**8**	**145**	**9**	**2**	**0**	**4**	**5**	**6**	**0**	**0**	**0**	**1**	**3**	**20**	**118**	**135**	**63**	**260**	**460**	**379**	**164**	**43**	**7**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**40.9**	**5.8**	**87.8**	**49.4**
00:00-00:00		**1678**	**13**	**1483**	**8**	**147**	**10**	**2**	**0**	**4**	**5**	**6**	**0**	**0**	**0**	**1**	**3**	**20**	**118**	**137**	**65**	**262**	**464**	**389**	**166**	**44**	**7**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**41.0**	**5.8**	**87.8**	**49.4**
Date: 15 October 2019																																						
00:00	01:00	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	43.3	40.4	46.8	-
01:00	02:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	41.0	41.0	41.0	-
02:00	03:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	43.5	41.1	45.8	-
03:00	04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
04:00	05:00	3	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	42.9	40.9	45.9	-
05:00	06:00	12	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3	7	1	0	0	0	0	0	0	0	0	0	45.3	33.5	53.0	49.6
06:00	07:00	51	0	46	0	5	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	2	15	15	10	5	0	0	0	1	0	0	0	0	47.0	24.2	77.1	53.5
07:00	08:00	159	1	136	1	19	1	0	0	0	0	0	1	0	0	0	0	0	8	6	7	12	49	44	21	11	1	0	0	0	0	0	0	0	44.1	21.4	62.7	51.7
08:00	09:00	151	0	134	1	13	1	0	0	0	0	2	0	0	0	0	0	0	5	5	8	16	57	28	23	5	4	0	0	0	0	0	0	0	43.8	22.5	64.0	51.2
09:00	10:00	130	0	112	0	15	1	1	0	1	0	0	0	0	0	0	0	1	9	11	4	16	38	34	14	2	1	0	0	0	0	0	0	0	41.3	16.0	61.6	49.5
10:00	11:00	143	0	122	1	18	2	0	0	0	0	0	0	0	0	0	0	1	8	8	9	14	40	34	22	5	2	0	0	0	0	0	0	0	42.7	18.6	61.9	51.4
11:00	12:00	113	1	96	0	15	0	1	0	0	0	0	0	0	0	0	0	0	6	9	1	21	30	29	12	4	1	0	0	0	0	0	0	0	42.3	21.8	60.2	50.2
12:00	13:00	117	1	101	0	14	0	0	0	1	0	0	0	0	0	0	0	1	4	12	5	9	40	22	15	8	1	0	0	0	0	0	0	0	42.5	19.3	62.3	51.9
13:00	14:00	145	1	120	1	20	0	1	0	0	1	1	0	0	0	0	0	0	11	15	6	38	45	17	4	9	0	0	0	0	0	0	0	0	39.7	20.5	58.6	47.3
14:00	15:00	118	0	107	0	11	0	0	0	0	0	0	0	0	0	0	0	0	8	10	5	23	39	20	10	3	0	0	0	0	0	0	0	0	40.5	20.5	59.5	49.1
15:00	16:00	107	1	91	0	14	1	0	0	0	0	0	0	0	0	0	0	0	14	8	9	26	26	13	7	3	0	1	0	0	0	0	0	0	38.6	22.1	68.1	47.0
16:00	17:00	121	1	105	0	12	1	0	0	1	1	0	0	0	0	0	0	0	20	17	6	18	30	20	6	3	0	1	0	0	0	0	0	0	37.8	20.4	65.8	47.5
17:00	18:00	129	0	116	2	10	0	1	0	0	0	0	0	0	0	0	1	0	23	25	8	17	22	23	6	3	1	0	0	0	0	0	0	0	36.3	14.6	64.1	47.1
18:00	19:00	117	0	107	2	7	0	0	0	0	0	1	0	0	0	0	0	1	11	20	6	20	35	16	5	3	0	0	0	0	0	0	0	0	37.8	16.0	58.4	46.9
19:00	20:00	50	0	46	2	1	1	0	0	0	0	0	0	0	0	0	0	0	1	6	5	3	16	12	4	3	0	0	0	0	0	0	0	0	41.7	22.0	56.7	50.0
20:00	21:00	38	0	37	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	2	6	8	7	10	2	1	0	0	0	0	0	0	0	0	40.2	22.0	55.9	47.9
21:00	22:00	24	0	22	0	0	2	0	0	0	0	0	0	0	0	0	0	0	1	3	4	2	4	3	3	2	2	0	0	0	0	0	0	0	41.9	23.5	62.7	55.5
22:00	23:00	20	0	19	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	4	1	7	2	3	1	0	0	0	0	0	0	0	0	40.7	22.3	55.5	51.3
23:00	00:00	13	0	12	0	0	1	0	0	0	0	0	0	0	0	0	0	0	4	0	1	2	2	3	1	0	0	0	0	0	0	0	0	0	37.1	21.0	54.9	47.3
07:00-19:00		**1550**	**6**	**1347**	**8**	**168**	**7**	**4**	**0**	**3**	**2**	**4**	**1**	**0**	**0**	**0**	**1**	**4**	**127**	**146**	**74**	**230**	**451**	**300**	**145**	**59**	**11**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**40.8**	**14.6**	**68.1**	**49.6**
06:00-22:00		**1713**	**6**	**1498**	**10**	**175**	**10**	**4**	**0**	**3**	**2**	**4**	**1**	**0**	**0**	**0**	**1**	**4**	**132**	**158**	**90**	**245**	**493**	**340**	**164**	**70**	**13**	**2**	**0**	**1**	**0**	**0**	**0**	**0**	**41.0**	**14.6**	**77.1**	**49.8**
06:00-00:00		**1746**	**6**	**1529**	**10**	**176**	**11**	**4**	**0**	**3**	**2**	**4**	**1**	**0**	**0**	**0**	**1**	**4**	**137**	**159**	**95**	**248**	**502**	**345**	**168**	**71**	**13**	**2**	**0**	**1**	**0**	**0**	**0**	**0**	**41.0**	**14.6**	**77.1**	**49.8**
00:00-00:00		**1767**	**6**	**1549**	**10**	**177**	**11**	**4**	**0**	**3**	**2**	**4**	**1**	**0**	**0**	**0**	**1**	**4**	**137**	**159**	**96**	**248**	**511**	**355**	**169**	**71**	**13**	**2**	**0**	**1**	**0**	**0**	**0**	**0**	**41.0**	**14.6**	**77.1**	**49.8**
Date: 16 October 2019																																						
00:00	01:00	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	34.6	21.1	41.9	-
01:00	02:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	32.2	32.2	32.2	-
02:00	03:00	3	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	35.7	28.1	44.4	-
03:00	04:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	37.4	37.4	37.4	-
04:00	05:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	40.1	36.1	44.2	-
05:00	06:00	15	0	14	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	8	3	2	0	0	0	0	0	0	0	0	0	43.8	32.9	51.4	49.8
06:00	07:00	59	0	49	0	9	1	0	0	0	0	0	0	0	0	0	0	0	1	4	1	3	14	18	15	2	1	0	0	0	0	0	0	0	45.7	23.6	62.0	53.0
07:00	08:00	154	2	133	0	15	1	1	0	0	2	0	0	0	0	0	0	1	9	9	6	13	29	46	28	13	0	0	0	0	0	0	0	0	44.0	19.5	58.7	52.4
08:00	09:00	155	0	125	2	23	2	1	0	1	0	1	0	0	0	0	0	1	7	5	6	22	43	32	28	6	4	0	1	0	0	0	0	0	43.9	16.0	74.2	52.3
09:00	10:00	172	0	163	0	8	0	1	0	0	0	0	0	0	0	0	0	0	11	11	2	24	53	50	15	6	0	0	0	0	0	0	0	0	42.2	20.1	59.2	49.5
10:00	11:00	116	0	97	0	19	0	0	0	0	0	0	0	0	0	0	0	1	11	4	2	17	28	34	15	3	1	0	0	0	0	0	0	0	42.3	16.0	61.2	50.4
11:00	12:00	117	0	100	1	13	1	1	0	0	1	0	0	0	0	0	0	0	5	9	5	13	36	30	19	0	0	0	0	0	0	0	0	0	42.6	20.7	54.9	50.3
12:00	13:00	121	0	103	0	16	1	0	0	1	0	0	0	0	0	0	0	1	6	5	2	17	39	28	15	7	1	0	0	0	0	0	0	0	43.5	19.4	60.8	51.4
13:00	14:00	109	0	96	0	10	0	1	0	0	1	1	0	0	0	0	0	0	5	13	1	16	25	28	17	4	0	0	0	0	0	0	0	0	42.3	23.3	59.1	50.4
14:00	15:00	107	0	99	0	6	0	1	0	0	1	0	0	0	0	0	0	2	7	7	3	21	33	25	8	1	0	0	0	0	0	0	0	0	40.7	17.0	58.7	47.9
15:00	16:00	119	0	108	1	10	0	0	0	0	0	0	0	0	0	0	1	0	9	12	5	22	42	23	5	0	0	0	0	0	0	0	0	0	39.2	12.3	53.3	46.3
16:00	17:00	129	0	114	1	12	0	0	0	0	1	1	0	0	0	0	0	0	18	14	7	21	41	18	6	3	1	0	0	0	0	0	0	0	38.4	20.5	61.2	46.2
17:00	18:00	147	0	138	1	8	0	0	0	0	0	0	0	0	0	0	0	0	24	24	4	22	32	33	7	1	0	0	0	0	0	0	0	0	37.6	20.5	55.1	48.4
18:00	19:00	99	1	91	0	7	0	0	0	0	0	0	0	0	0	0	1	2	7	16	10	20	25	17	1	0	0	0	0	0	0	0	0	0	36.9	14.8	52.6	46.9
19:00	20:00	74	0	70	0	4	0	0	0	0	0	0	0	0	0	0	0	0	6	2	5	17	30	10	3	1	0	0	0	0	0	0	0	0	40.1	23.6	57.0	46.0
20:00	21:00	38	0	32	2	4	0	0	0	0	0	0	0	0	0	0	0	1	1	2	4	6	14	8	2	0	0	0	0	0	0	0	0	0	40.5	19.1	52.4	47.1
21:00	22:00	25	0	21	0	4	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	7	12	2	1	1	0	0	0	0	0	0	0	0	40.6	23.7	55.9	46.5
22:00	23:00	20	0	19	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	3	1	4	4	2	3	0	0	1	0	0	0	0	0	0	39.6	20.5	68.5	52.2
23:00	00:00	7	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	2	2	0	0	0	0	0	0	0	0	0	0	39.3	30.4	48.5	-
07:00-19:00		**1545**	**3**	**1367**	**6**	**147**	**5**	**6**	**0**	**2**	**6**	**3**	**0**	**0**	**0**	**0**	**2**	**8**	**119**	**129**	**53**	**228**	**426**	**364**	**164**	**44**	**7**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**41.3**	**12.3**	**74.2**	**49.7**
06:00-22:00		**1741**	**3**	**1539**	**8**	**168**	**6**	**6**	**0**	**2**	**6**	**3**	**0**	**0**	**0**	**0**	**2**	**9**	**129**	**137**	**63**	**261**	**496**	**402**	**185**	**48**	**8**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**41.3**	**12.3**	**74.2**	**49.7**
06:00-00:00		**1768**	**3**	**1565**	**8**	**168**	**7**	**6**	**0**	**2**	**6**	**3**	**0**	**0**	**0**	**0**	**2**	**9**	**131**	**140**	**66**	**266**	**502**	**406**	**188**	**48**	**8**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**41.3**	**12.3**	**74.2**	**49.7**
00:00-00:00		**1793**	**3**	**1588**	**8**	**169**	**7**	**6**	**0**	**2**	**7**	**3**	**0**	**0**	**0**	**0**	**2**	**9**	**132**	**141**	**69**	**269**	**514**	**409**	**190**	**48**	**8**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**41.3**	**12.3**	**74.2**	**49.7**
5 day (Weekday) Average																																						
07:00-19:00		**1512**	**8**	**1342**	**7**	**135**	**6**	**3**	**0**	**3**	**4**	**4**	**0**	**0**	**0**	**0**	**3**	**13**	**129**	**126**	**68**	**261**	**433**	**308**	**127**	**34**	**8**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**40.3**	**11.3**	**69.3**	**48.8**
06:00-22:00		**1696**	**8**	**1509**	**8**	**148**	**8**	**3**	**0**	**3**	**5**	**4**	**0**	**0**	**0**	**0**	**3**	**14**	**141**	**137**	**78**	**292**	**489**	**344**	**146**	**41**	**9**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**40.4**	**11.3**	**75.1**	**48.9**
06:00-00:00		**1724**	**8**	**1535**	**8**	**149**	**9**	**3**	**0**	**3**	**5**	**4**	**0**	**0**	**0**	**0**	**3**	**14**	**143**	**139**	**81**	**297**	**496**	**348**	**149**	**42**	**9**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**40.4**	**11.3**	**75.1**	**48.9**
00:00-00:00		**1746**	**8**	**1556**	**8**	**150**	**9**	**3**	**0**	**3**	**5**	**4**	**0**	**0**	**0**	**0**	**3**	**14**	**144**	**140**	**82**	**300**	**504**	**355**	**150**	**42**	**10**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**40.4**	**11.3**	**75.1**	**48.9**
7 day (Weekly) Average																																						
07:00-19:00		**1419**	**11**	**1272**	**6**	**113**	**6**	**3**	**0**	**2**	**3**	**3**	**0**	**0**	**0**	**0**	**3**	**12**	**114**	**112**	**62**	**240**	**408**	**300**	**125**	**34**	**8**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**40.7**	**11.7**	**69.1**	**49.1**
06:00-22:00		**1592**	**11**	**1429**	**7**	**124**	**8**	**3**	**0**	**2**	**4**	**3**	**0**	**0**	**0**	**0**	**3**	**13**	**125**	**121**	**74**	**271**	**457**	**334**	**141**	**40**	**10**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**40.7**	**11.6**	**73.2**	**49.1**
06:00-00:00		**1619**	**11**	**1455**	**7**	**125**	**8**	**3**	**0**	**2**	**4**	**3**	**0**	**0**	**0**	**0**	**3**	**13**	**127**	**123**	**76**	**275**	**465**	**339**	**144**	**41**	**10**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**40.7**	**11.6**	**73.2**	**49.1**
00:00-00:00		**1648**	**11**	**1482**	**7**	**126**	**9**	**3**	**0**	**2**	**4**	**3**	**0**	**0**	**0**	**0**	**3**	**14**	**128**	**124**	**78**	**280**	**474**	**347**	**145**	**42**	**10**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**40.8**	**11.6**	**73.2**	**49.1**

Greg

From: Gavin Elrick [redacted]
Sent: 23 August 2019 11:49
To: Paul Fretwell
Subject: RE: Report for Crematorium Site
Attachments: Burnside of Duntrune LCA extract.pdf

Importance: High

Follow Up Flag: Follow up
Flag Status: Completed

Paul

Just had a look on the LCA and soils map and the site is mapped as 3.2 in the Soils of Scotland Website you shouldn't need an investigation carried out.

Kind regards

Gavin

Gavin Elrick
Senior Consultant, *CEnv, MIAgrE*

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Glack Hill
133m
125m
120m
115m
110m
Path
130m
104m
Duntrune Hill
100m
125m
120m
115m
110m
Track
99m
100m
109m
100m
100m
W
Westhall
Cottage
Westhall House
105m
Duntrune House
100m
95m
90m
85m
80m
Sluices
Saw Mill
90m
85m
80m

Meeting Report	Representing C+R Bruce Clark

CAMERON+ROSS
CONSULTING CIVIL & STRUCTURAL ENGINEERS

Date of Meeting 09.10.2019	Place of Meeting SITE – Burnside of Duntrune Crematorium	Contract No. A/ 190889
Contract Title Burnside of Duntrune Crematorium		Distribution Aberdeen File 1 Paul Fretwell 1
Other Parties Present Digger Driver from Iain Smith Buiders		

Geotechnical Investigation

1. The following confirms the findings of the trial pit investigation and infiltration testing undertaken on the 10th of October 2019.

2. The trial pits were undertaken to ascertain ground bearing conditions for foundation design purposes only and no samples and/or geotechnical or environmental testing was undertaken.

3. The scope of the investigation as agreed with the Architect included the lower half of the site where development is anticipated to be limited too due the sloping nature of the site which rises from the road to the South with increasing steepness to the North boundary. The proposals for the site is for a Crematorium plus associated car parking.

4. See attached site layout drawing over marked with the trial pit locations.

5. See record photos saved in project folder.

6. Infiltration tests were undertaken at Trial Pits 1, 2, 3 & 4.

Trial Pit 1 – in Field South of Road

0.0-0.3mbgl:	dark brown topsoil
0.3m – 1.20mbg:	light brown medium dense silty very clayey sand and gravel with occasional cobbles.

Trial pit dry at time of excavation. Very slight water ingress at 1.2m depth when returning to carry out infiltration tests ½ hr later. Trial pit sides stable.

Infiltration Test Undertaken at1.2mbgl = Failed due to /gw level

Trial Pit 2 – in Field South of Road

0-0.2mbgl:	dark brown topsoil
0.2-1.20mbgl	light brown medium dense silty very clayey sand and gravel with occasional cobbles.

Trial pit dry at time of excavation. Very slight water ingress at 1.2m depth when returning to carry out infiltration tests ½ hr later. Trial pit sides stable

Infiltration Test undertaken at 1.2mbgl = Failed due to GW level

Meeting Report	Representing C+R Bruce Clark

Date of Meeting 09.10.2019	Place of Meeting SITE – Burnside of Duntrune Crematorium	Contract No. A/ 190889
Contract Title Burnside of Duntrune Crematorium		Distribution Aberdeen File 1 Paul Fretwell 1
Other Parties Present Digger Driver from Iain Smith Buiders		

Trial Pit 3

0-0.3mbgl	over grown grass on topsoil
0.3- 1.3mbgl	brown loose to medium dense very clayey silty sand. becoming denser with depth.

TP dry and stable. Infiltration test failed due to groundwater level.

Trial Pit 4

0-0.3mbgl	overgrown grass on topsoil
0.3-0.7mbgl	brown soft to firm silty sandy clay with occasional gravel
0.7-1.3mbgl	firm silty sandy clay occasional cobbles

TP stable.
Infiltration Test done at1.3mbgl. Infiltration Test undertaken at 1.3mbgl to BRE Digest 365 f = $8.85x10^{-5}$m/s. This converts to a Vp value of 113s/mm.

Trial Pit 4A

0-0.4mbgl	overgrown grass on topsoil
0.4-0.7mbgl	soft to firm silty sandy clay
0.7-2.50mbgl	firm very silty sandy clay with occasional cobbles

TP dry and stable. Slow groundwater ingress at 2.2mbgl. After 1hr groundwater had settled within the pit to 1.9mbgl.

Trial Pit 5

0-0.5mbgl	overgrown grass onto topsoil
0.5-0.8mbgl	soft sandy clay with some topsoil intermixed.
0.8-1.2mbgl	loose to medium dense sand and gravel

Strong groundwater entry at 1.2mbgl. Groundwater level settled at 0.9mbgl. TP5 was undertaken close to the SE corner of the site where there is a permanent pool situated which is believed to be attributing to the high water table in this area. This is recorded as a well on the historical maps as shown below:

Meeting Report	Representing C+R Bruce Clark

Date of Meeting 09.10.2019	Place of Meeting SITE – Burnside of Duntrune Crematorium	Contract No. A/ 190889
Contract Title Burnside of Duntrune Crematorium		Distribution Aberdeen File 1 Paul Fretwell 1
Other Parties Present Digger Driver from Iain Smith Buiders		

Trial Pit 6

0-0.25mbgl	overgrown grass on topsoil
0.25-2.4mbgl	medium dense light brown silty clayey sand with occasional cobbles and boulders.

TP dry and stable.

Trial Pit 7

0-0.25mbgl	overgrown grass on topsoil
0.25-2.4mbgl	medium dense light brown silty clayey sand with occasional cobbles and boulders.

TP dry and stable.

Trial Pit 8

0-0.30mbgl	overgrown grass on topsoil
0.30-2.3mbgl	medium dense light brown silty clayey sand with occasional cobbles and boulders.

TP dry and stable. After being left open groundwater level had risen to 1.9mbgl

Trial Pit 9

0-0.30mbgl	overgrown grass on topsoil
0.30-2.0mbgl	loose to medium dense light brown silty clayey sand with occasional cobbles.

TP dry and stable.

Trial Pit 10

0-0.90mbgl	overgrown grass on topsoil
0.90-1.5mbgl	soft to firm grey silty sandy clay
1.5-2.5mbgl	loose to medium dense light brown silty clayey sand with occasional cobbles and boulders. Trial pit ended on potential weathered rock.

TP dry and stable.

Meeting Report	Representing C+R Bruce Clark

Date of Meeting 09.10.2019	Place of Meeting SITE – Burnside of Duntrune Crematorium	Contract No. A/ 190889
Contract Title Burnside of Duntrune Crematorium		Distribution Aberdeen File 1 Paul Fretwell 1
Other Parties Present Digger Driver from Iain Smith Buiders		

Trial Pit 11

0-0.30mbgl	overgrown grass on topsoil
0.30-2.0mbgl	medium dense silty clayey sand with occasional cobbles. TP ended on potential weathered rock

TP dry and stable.

Trial Pit 12

0-0.30mbgl	overgrown grass on topsoil
0.30-2.0mbgl	medium dense silty clayey sand with occasional cobbles. TP ended on potential weathered rock

TP dry and stable.

Recommendations for Building Foundations

At the time of the investigation there is no proposed site plan available and any foundation recommendations should be reviewed once a site plan is provided.

It is recommended that foundations are situated at a minimum depth of 0.7m below the original ground level on either the firm clay or medium dense gravels. This should ensure foundations are situated below the softer clays and sand and gravels that were typically encountered in the upper substrata horizons immediately below the topsoil layer. These substrata are considered suitable for an allowable bearing pressure of 100kN/m^2

The average topsoil depth encountered across the site is 0.35m with a max depth of 0.9m encountered in TP10.

There was no made ground encountered within the trial pits.

Review of Geological Maps

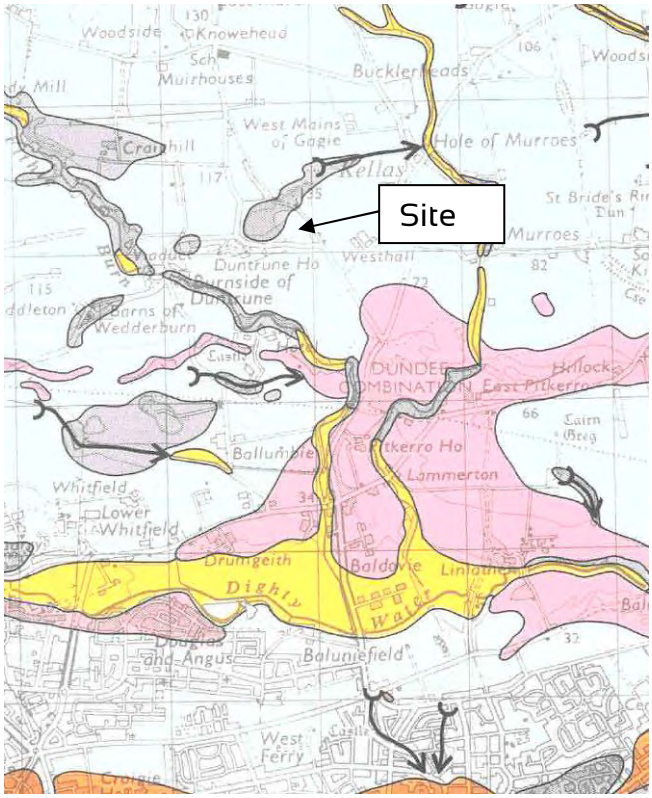
A review of the British Geological Maps (see extract below) shows that the lower portion of the site drift deposits are recorded as "*Till compact sandy clay containing clasts of local rocks and far-travelled erratics.".* This is in line with the generally mix of clays and sand encountered in the substrata within the trial pits.

The upper part of the site is recorded as "Bedrock at or near surface". This area is out with the anticipated area for development.

Meeting Report	Representing C+R Bruce Clark

CAMERON+ROSS
CONSULTING CIVIL & STRUCTURAL ENGINEERS

Date of Meeting 09.10.2019	Place of Meeting SITE – Burnside of Duntrune Crematorium	Contract No. A/ 190889
Contract Title Burnside of Duntrune Crematorium		Distribution Aberdeen File 1 Paul Fretwell 1
Other Parties Present Digger Driver from Iain Smith Buiders		



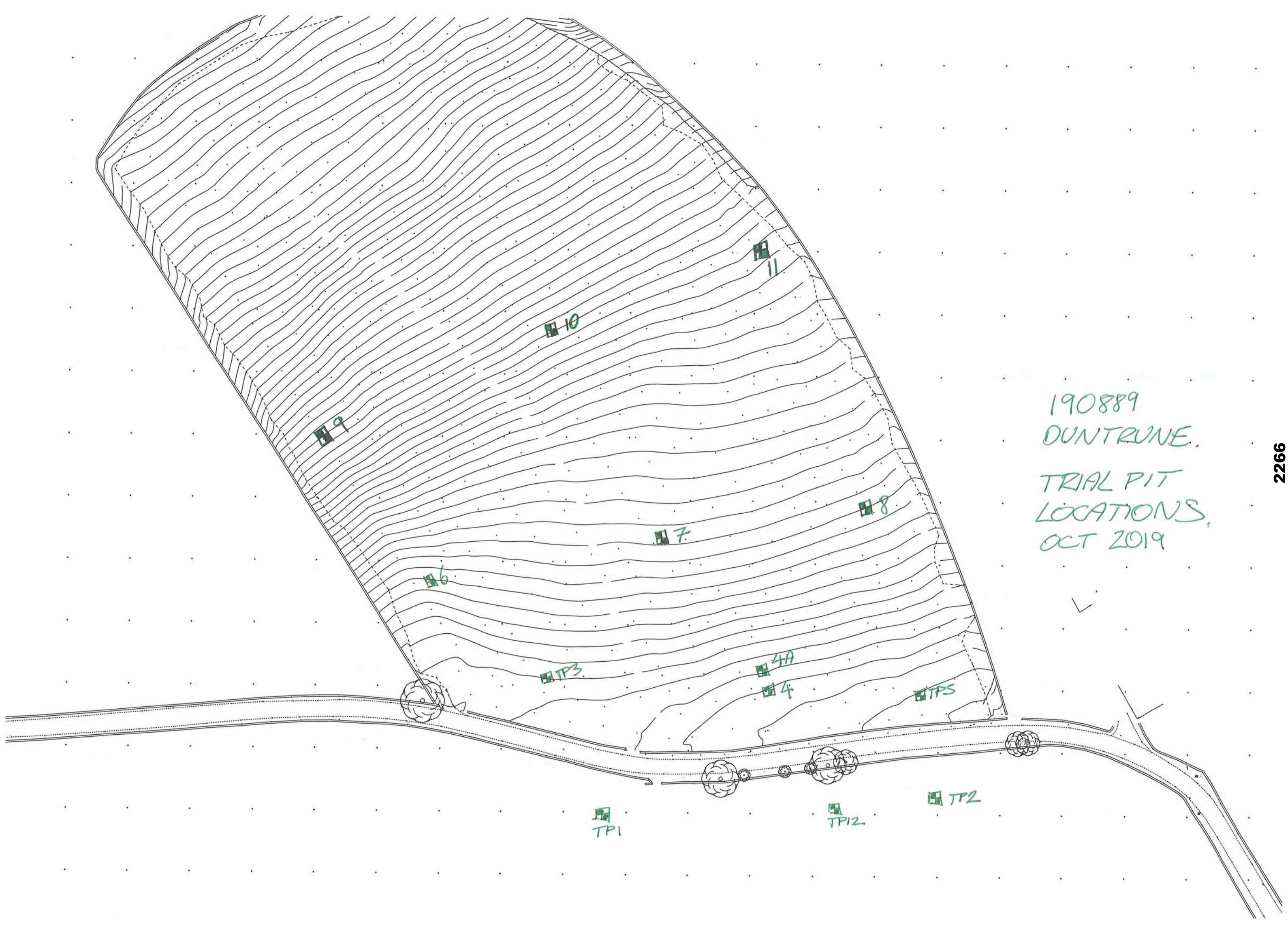
Infiltration Test Results

As a result of groundwater presence within trial pits 1,2 & 3 the infiltration tests undertaken in these pits failed.

The infiltration test undertaken in TP4 provided a moderate infiltration value which suggests infiltration systems maybe viable for surface water discharge. This is subject to site level design and provided that good land drainage is provided to take groundwater around the proposed car parking and building areas. Soakaways would only be considered suitable where they are shallow in nature.

For foulwater design will require to comply with Buillding Regs and SEPA requirements. Any infiltration bed would require to be sited in areas where the proposed ground level is raised to ensure the invert level of any distribution pipes is at least 1m above the existing ground water level which can generally be considered over the likely developed part of the site to be around1.2m below original ground level.

END OF REPORT
BAC 31.10.2019



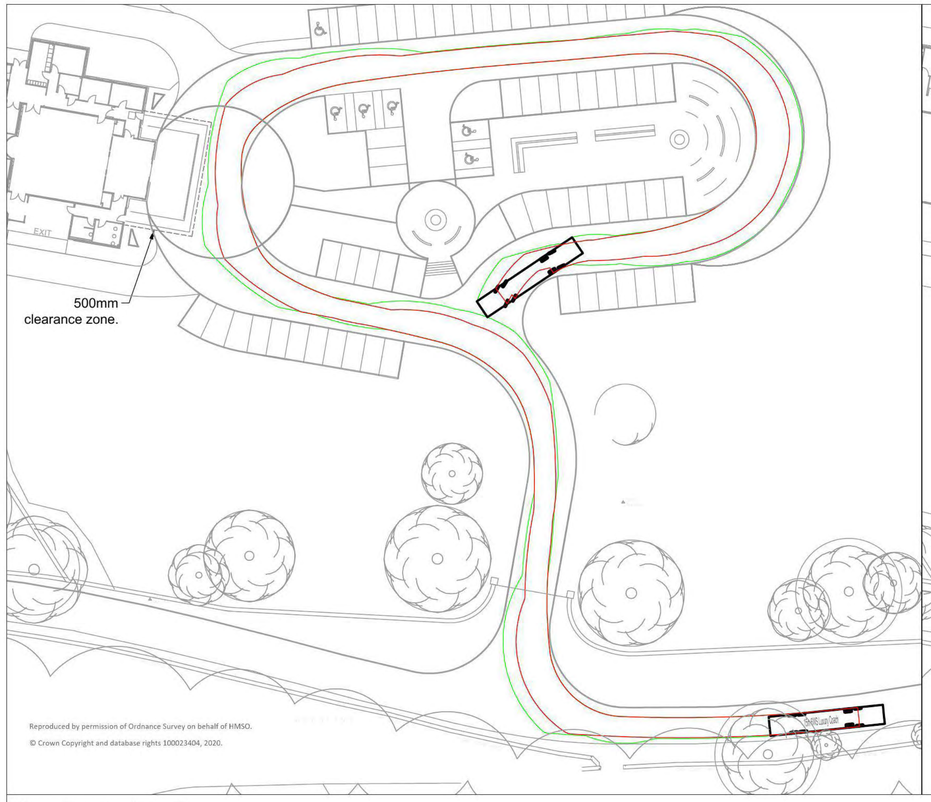
190889
DUNTRUNE.

TRIAL PIT
LOCATIONS.
OCT 2019

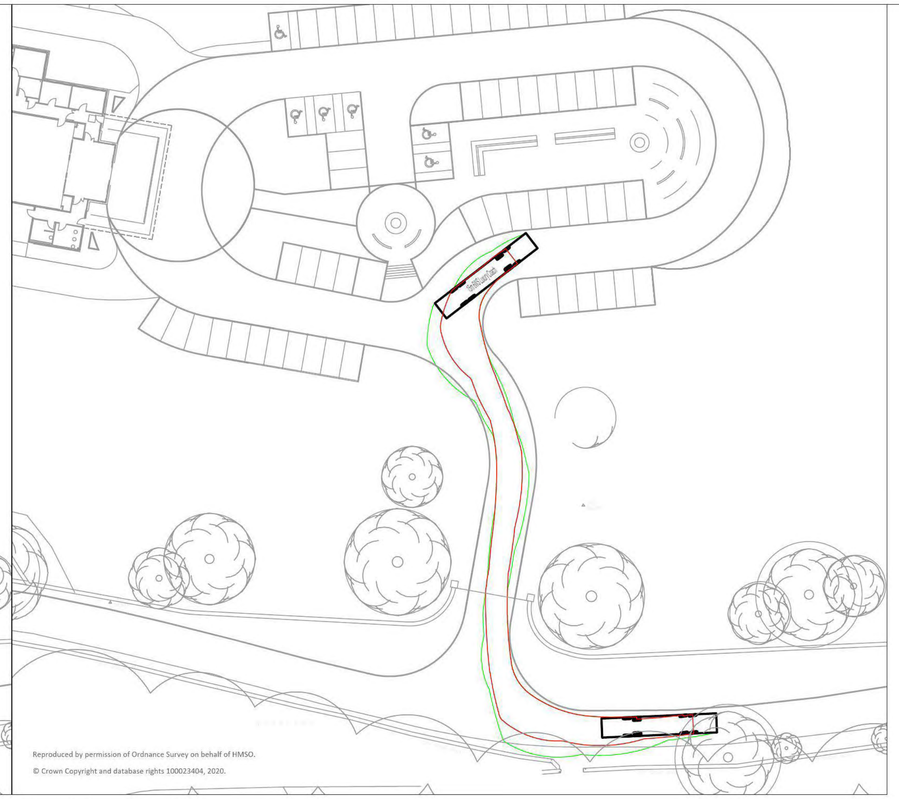
2266

FIGURED DIMENSIONS ONLY TO BE USED

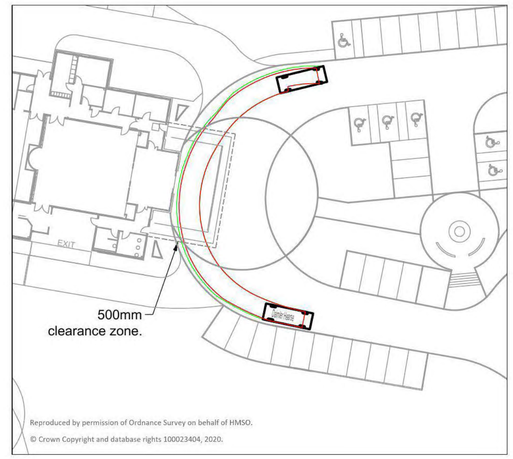
D21



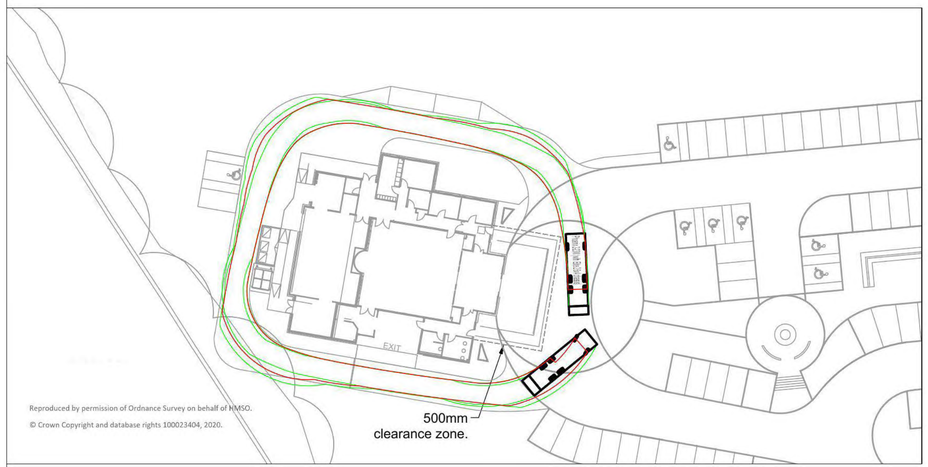
Coach entering site



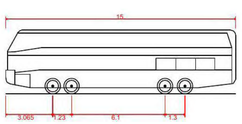
Coach leaving site



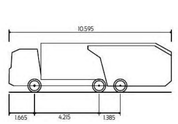
Hearse driving through entrance canopy



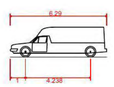
Refuse vehicle entering and leaving service area



15m 6WS Luxury Coach	
Overall Length	15.000m
Overall Width	2.500m
Overall Body Height	4.157m
Min Body Ground Clearance	0.397m
Track Width	2.500m
Lock to lock time	5.00s
Wall to Wall Turning Radius	12.490m



Phoenix 2-23W (with Elite 2 6x4 chassis)	
Overall Length	10.595m
Overall Width	2.530m
Overall Body Height	3.205m
Min Body Ground Clearance	0.410m
Track Width	2.500m
Lock to Lock Time	4.00s
Kerb to Kerb Turning Radius	9.250m



Daimler Hearse	
Overall Length	6.290m
Overall Width	2.108m
Overall Body Height	1.950m
Min Body Ground Clearance	0.251m
Track Width	2.100m
Lock to lock time	6.00s
Wall to Wall Turning Radius	7.450m

LEGEND

LINE OF BODY OVERHANG

LINE OF WHEELS

Issue	Revision	Initial	Date
2	Updated to suit amendment to service area	SAD/BAC	19/11/2020
1	Updated to suit new layout	SAD/BAC	31/08/2020

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Mulberry House | 39-41 Harbour Road | Inverness | IV1 1UF
T: 01463 870 100 | E: cr@cameronross.co.uk

Client:
FM & G Batchelor

Project:
Crematorium at Burnside of Duntrune, Duntrune, Angus

Drawing Title:
Swept Paths Analysis

North

Status:
Planning

Scale:	1:200 @ A1	Date:	25/06/2020
By: SAD	Checked: BAC	Approved: RAG	

Dwg. No. A/190889 – 907

Rev. 2

Cameron+Ross

DRAINAGE STATEMENT

A/190889 – PORPOSED CREMATORIUM, BURNSIDE OF DUNTRUNE, ANGUS.

1. EXISTING SITE CONDITIONS.

The site is 4.5 hectares and is proposed to be developed for a 120-seating capacity crematorium.

Located on the north side of the C4 and the site is set in a rural location around 7km to the northeast of Dundee City Centre and around 0.5km to the east of the village of Burnside of Duntrune. The site location plan is contained below:

Figure 1 – Site Location Plan.

The site is surrounded by wooded areas to the north, east and west beyond which is generally agricultural land. Agricultural land also bounds the site this site to the south of the C4. The site falls from north to south with a typical 1in 12 gradient. The highest level is approximately 114.0m AoD (Above Ordinance Datum) along the north boundary falling to a low of 96.2m AoD in the SE corner.

There are no open watercourses or ditches within the site or its immediate vicinity. There is a small pond/flooded area within the SE corner of the site and this is at the location of a well which is identified on the OS Maps of the site. The well appears to be unused. The client has no knowledge of the well which suggests it has been abandoned.

Although it appears to be abandoned the drainage design will ensure that the minimum offset distances are achieved between the well and any surface or foul water soakaways to ensure that the well can be re-used in the future.

2. GROUND CONDITIONS.

Trial pit investigations were undertaken by Cameron + Ross Ltd on 10th October 2019 and reference should be made to the geotechnical investigation report contained within **Appendix A**. A summary of the trial pit investigation findings is contained below:

Four No trial pits were excavated with the purpose of undertaking infiltration tests in accordance with BRE Digest 365.

Topsoil was encountered as the uppermost horizon on the site with thickness between 0.25m and 0.90m with an average depth of 0.35m. The natural sub-soils are a mix of firm clays and loose to medium dense gravels and were encountered directly below the topsoil down to a typical depth of around 2.0m to 2.5m below ground level(mbgl).

Trial Pits 1, 2 and 12 were undertaken in the field to the south of the C4 which the developer also owns. Trial Pit was excavated to a depth of 2.0mbgl where it was terminated possibly on weathered bedrock. Similarly, Trial Pit Nos 10 and 11 to the north end of the site which is the higher area of the site were also terminated in possible weathered bedrock at 2.5mbgl and 2.0mbgl.

Groundwater

Groundwater was noted within the following trial pits:

TP1 – very slight groundwater entry at 1.2mbgl
TP2 – very slight groundwater entry at 1.2mbgl
TP4A – slow groundwater entry at 2.2mblg after 1 hr water level had settled at 1.9mbgl
TP5 – strong groundwater entry at 1.2mbgl. Water level settled at 0.9mbgl. This is the trial pit undertaken nearest to the well

The remaining 9No trial pits remained dry throughout. The highwater table was therefore limited to the field to the south of the C4 and the SE corner of the site near to the well within the lower part of the site.

Infiltration Testing

Infiltration testing was undertaken in Trial Pit Nos 1 to 4 as this was within the lowest part of the site. The test undertaken in trial pits 1,2 & 3 failed as a result of the groundwater presence.

The infiltration test undertaken in accordance with BRE Digest 365 in TP4 provided a moderately good infiltration value $f=8.85x10^{-5}m/s$. This converts to a Vp value of 113s/mm. As this test result was proven in a clayey soil it is taken that this will eb suitable that this can be used for soakaway design purposes throughout the site provided suitable depth clearance can be provided between the base of any soakaway/infiltration system and the water table.

Given the nature of the development it is expected there will be sufficient space to accommodate shallow infiltration systems within the site layout.

3. FLOOD RISK

A review of the SEPA flood maps (See extract below) has been undertaken which shows that there is no Flood Risk associated with development site. The only surface flooding noted is to the SW of the site which is out with the site and to a lower level than the site therefore this will flow away from the development.

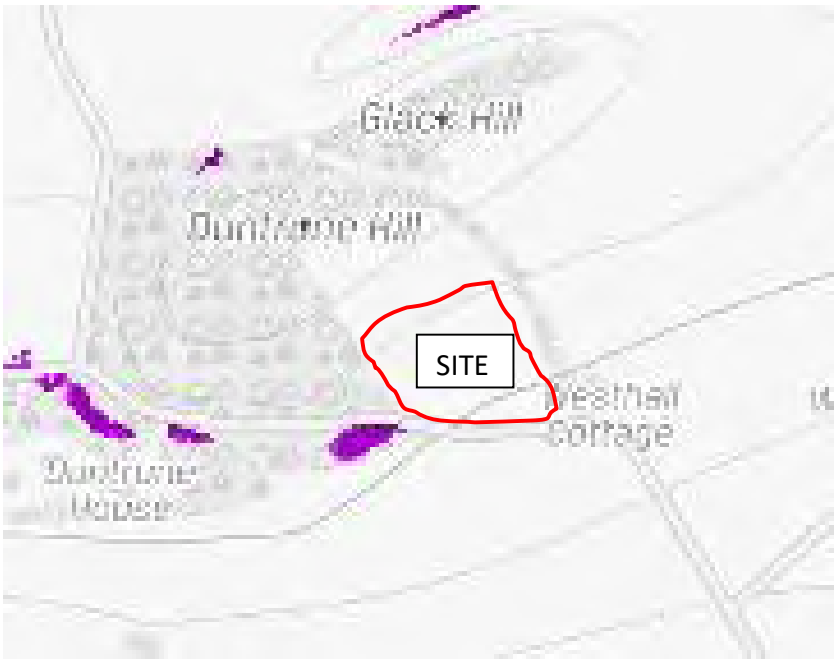

Fig 1 – SEPA Flood Map Extract

4. FOUL DRAINAGE PROPOSALS.

There are no existing Scottish Water sewers within the vicinity of the site given its rural nature.

Therefore it is proposed to design a drainage system based on the Vp value of 113s/mm and ensure that the various criteria as set out in the sections 3.7 and 3.8 of the Non Domestic Building Regulations can be adhered to.

Determine Population Equivalent

The population equivalent is determined using British Flows and Loads Document Version 4.

Based on a worst-case scenario of 5No maximum capacity funerals per day. Therefor the max number of attendees per day = 5x120 = 600 attendees.

From information provided for other crematoriums the rate of usage of toilets is 5% of attendees. Therefore, max number of attendees using toilets per day = 0.05x 600 = 30 attendees. Assume that these toilet usages are before and after funerals then allow for 60 attendees using the toilet per day.

There are 4 full time staff.

4 full time staff (industrial)

- FLOW = 90l/person/day x4 = 360 l/day
- BOD = 38Grams/person/day x4 = 152 Grams/day
- Ammonia = 5/person/day = 5x4 = 20N

60 funeral attendees (Conservatively Assuming all use a WC rather than urinal)

- FLOW = 10l/person/day x 60 = 600l/day
- BOD = 12Grams/person/day x 60 = 720Grams/day
- Ammonia = 2.5/person/day x 60 = 150N

Totals converted to residential equivalent

- FLOW = 960l/day / 150 = 6.4persons
- BOD = 872Grams / 60 = 14.5persons
- Ammonia = 170N / 8 = 21.3persons

Therefore, the foul drainage system is to be designed for a population equivalent (PE) of 22 persons = 22PE.

Foul Drainage System Design

As Vp =113s/mm which is classed as a slow percolation rate as noted in clause 3.9.2 of the Non-Domestic Technical Handbook. Therefore, it is recommended that treatment plant is provided followed by an infiltration bed followed by a reed bed system as per clause 3.9.2a for slow percolation values.

The infiltration bed area must be at least = A = PxVpx0.25 = 22x113x0.25 = 50.25m^2.

The Proposed Drainage Layout is contained within **Appendix B**.

5. SURFACE WATER PROPOSALS.

In accordance with CIRIA document C753 the risk posed by surface water runoff to the receiving environment is a function of the land use, the effectiveness of SuDS treatment components and the sensitivity of the receiving watercourse. Determining the hazard posed by the land use activities at a site can be established by using a simple index approach by allocating pollution hazards indices for the proposed land use as outlined in Table 6.1 below.

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Other Roofs – i.e. for Crematorium	Low	0.3	0.2	0.05
Individual property driveways, residential car parks, low traffic volume roads (eg culdesacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie <300 traffic movements/day	Low	0.5	0.4	0.4

Table 6.1: Pollution hazard Indices for different land use classifications (Ref Table 26.2 C753)

Where infiltration measures are shown to be viable then the following mitigation indices as per Table 6.2 should be used.

Proposed SUDS Component	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Filter Drain/Soakaway	0.4	0.4	0.4
Swale	0.5	0.6	0.6
Permeable Pavement	0.7	0.6	0.7
Detention Basin	0.5	0.5	0.6

Table 6.2: Indicative SuDS mitigation indices for discharge to surface waters (Ref Table 26.3 C753)

It is proposed where possible to utilise permeable pavement construction and this is expected to be used for the private road and car parking areas. The extended depth of sub-base will be designed to accommodate the 1 in 200-year storm event. The porous paving mitigation indices in Table 6.2 exceed the required treatment levels required for road and car park areas as outlined in Table 6.1 above.

For any tarmac access road areas, the gradients will be designed as such that the surface water will fall to porous paved areas where possible. The lower section of access road will be tarmac and will drain to a roadside filter drain/soakaway which will be designed to store up to the 1 in 200-year storm event.

All soakaways are designed with an allowance for 30% for climate change plus a 10% urban creep factor.

The roofwater runoff will drain to a separate roofwater soakaway again designed for the 1 in 200-year storm duration. The filter drain (soakaway) treatment mitigation score as outlined in Table 6.2 above exceeds the required treatment level for roofs as outlined in Table 6.1 above.

There was high ground water table found in the lower part of the south focused in the SE corner. However as the site development is focused further up the hill where the water table was not encountered, therefore the high water table should not pose a problem to the use of soakaways, porous paving further up the site, however these will be restricted in depth to minimise the risk of the water table reaching the depth of the soakaways.

The proposed drainage layout is contained within **Appendix B and the drainage calculations are contained in Appendix C**.

6. CONSTRUCTION PHASE.

The measures for controlling surface water run-off will be continually reviewed in line with each stages of construction and any influencing factors. A site-specific surface water management strategy will be prepared by the contractor prior to commencement of works on site.

The above strategy will be based on the preliminary Surface Water Runoff Method Statement prepared by Cameron + Ross and will incorporate the following measures in order to protect the existing water environment and prevent run-off and sediment from the construction works impacting on the existing water environment.

Control: The contractor should give consideration, in the main, to surface water runoff during and after topsoil strip, as well as after re-grading of the land during site construction. Stripping of topsoil and vegetation is to be limited wherever possible and undertaken just prior to the construction in that particular area. This is to provide a means of reducing run off and to remove silts/fines from the water and aid natural absorption into the soils.

Interception: Temporary ditches / channels should be constructed around areas of work to provide localised interception. The use of temporary settlement ponds, check dams and / or silt traps will encourage settlement from retained water. Additional protection can be provided by use of straw bales (or similar) with high level outlets which will allow treated runoff to pass through prior to discharge.

The existing network of field drainage will inevitably be cut off by the development, therefore, should it prove necessary, these will be redirected and / or connected to a new perimeter land drain to intercept any ground water.

Prevention: Protection of the permanent drainage system is extremely important, as such, surface water run-off from the construction areas, where practicable, will not drain to the permanent drainage system thus avoiding build-up of silt and other

construction debris. Where the use of the permanent drainage system cannot be avoided the removal of any silts, leaves, or litter as well as rodding / jetting should be carried out at regular intervals. If required Geotextile Membrane will be temporally inserted into gully frames / silt traps to remove silts prior to entering the surface water system.

The installation of the drains, SUDS measures and roadways will follow the earthworks operation continually improving the overall site drainage. SUDS facilities will be installed at the outset of the sewer works and will be utilised as temporary sediment control. It is therefore essential these are reinstated or reconstructed at the end of construction works and before adoption by the local authority.

7. FUTURE MAINTENANCE.

It is proposed that the foulwater sewers together with treatment plant foul infiltration bed (soakaway) a proprietary reed bed system will be maintained by the developer.

The private road and roofwater drainage will be adopted and maintained by the developer as will any SUDs measures.

The developer will require a suitable maintenance regime and therefore the soakaways/porous paving should be inspected on an annual basis. The distribution pipe system should be monitored for blockages and if necessary, the end caps removed and the pipes flushed through with a high volume, high pressure pump to dislodge any silts / sludge which may be causing blockage.

Communal areas of car parking/private access roads will not be adopted by the local authority and therefore, will remain the responsibility of the developer or appointed factor / maintenance company. These will be maintained by regular inspection to clear any debris, areas of porous blocks will be power washed on a six monthly basis and vacuumed out on an annual basis to remove all silts. Private gullies will be inspected on a six-monthly basis and cleared of any silt debris as required.

In addition to the above it is recommended that a suitably qualified person carries out regular visual inspections of all SUDS devices to reduce the risks of blockage.

In the event of a failure, the failed element will be excavated and replaced to the same specification as existing.

A more detailed outline maintenance schedule as taken from CIRIA SUDS C753 for porous paving and filter drains (soakaways) is shown below.

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TABLE 16.1 Operation and maintenance requirements for filter drains

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter (including leaf litter) and debris from filter drain surface, access chambers and pre-treatment devices	Monthly (or as required)
	Inspect filter drain surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage	Monthly
	Inspect pre-treatment systems, inlets and perforated pipework for silt accumulation, and establish appropriate silt removal frequencies	Six monthly
	Remove sediment from pre-treatment devices	Six monthly, or as required
Occasional maintenance	Remove or control tree roots where they are encroaching the sides of the filter drain, using recommended methods (eg NJUG, 2007 or BS 3998:2010)	As required
	At locations with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium	Five yearly, or as required
	Clear perforated pipework of blockages	As required

TABLE 20.15 Operation and maintenance requirements for pervious pavements

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

End of Report
BAC 19.11.2020

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APPENDIX A - SITE INVESTIGATION REPORT

Meeting Report	Representing C+R Bruce Clark

CAMERON+ROSS
CONSULTING CIVIL & STRUCTURAL ENGINEERS

Date of Meeting 09.10.2019	Place of Meeting SITE – Burnside of Duntrune Crematorium	Contract No. A/ 190889
Contract Title Burnside of Duntrune Crematorium		Distribution Aberdeen File 1 Paul Fretwell 1
Other Parties Present Digger Driver from Iain Smith Builders		

Geotechnical Investigation

1. The following confirms the findings of the trial pit investigation and infiltration testing undertaken on the 10th of October 2019.
2. The trial pits were undertaken to ascertain ground bearing conditions for foundation design purposes only and no samples and/or geotechnical or environmental testing was undertaken.
3. The scope of the investigation as agreed with the Architect included the lower half of the site where development is anticipated to be limited too due the sloping nature of the site which rises from the road to the South with increasing steepness to the North boundary. The proposals for the site is for a Crematorium plus associated car parking.
4. See attached site layout drawing over marked with the trial pit locations.
5. See record photos saved in project folder.
6. Infiltration tests were undertaken at Trial Pits 1, 2, 3 & 4.

Trial Pit 1 – in Field South of Road

0.0-0.3mbgl:	dark brown topsoil
0.3m – 1.20mbg:	light brown medium dense silty very clayey sand and gravel with occasional cobbles.

Trial pit dry at time of excavation. Very slight water ingress at 1.2m depth when returning to carry out infiltration tests ½ hr later. Trial pit sides stable.

Infiltration Test Undertaken at1.2mbgl = Failed due to /gw level

Trial Pit 2 – in Field South of Road

0-0.2mbgl:	dark brown topsoil
0.2-1.20mbgl	light brown medium dense silty very clayey sand and gravel with occasional cobbles.

Trial pit dry at time of excavation. Very slight water ingress at 1.2m depth when returning to carry out infiltration tests ½ hr later. Trial pit sides stable

Infiltration Test undertaken at 1.2mbgl = Failed due to GW level

Cameron+Ross

Meeting Report	Representing C+R Bruce Clark

CAMERON+ROSS
CONSULTING CIVIL & STRUCTURAL ENGINEERS

Date of Meeting 09.10.2019	Place of Meeting SITE – Burnside of Duntrune Crematorium	Contract No. A/ 190889
Contract Title **Burnside of Duntrune Crematorium**		Distribution Aberdeen File 1 Paul Fretwell 1
Other Parties Present Digger Driver from Iain Smith Builders		

Trial Pit 3

0-0.3mbgl	over grown grass on topsoil
0.3- 1.3mbgl	brown loose to medium dense very clayey silty sand. becoming denser with depth.

TP dry and stable. Infiltration test failed due to groundwater level.

Trial Pit 4

0-0.3mbgl	overgrown grass on topsoil
0.3-0.7mbgl	brown soft to firm silty sandy clay with occasional gravel
0.7-1.3mbgl	firm silty sandy clay occasional cobbles

TP stable.
Infiltration Test done at1.3mbgl. Infiltration Test undertaken at 1.3mbgl to BRE Digest 365 f = 8.85×10^{-5}m/s. This converts to a Vp value of 113s/mm.

Trial Pit 4A

0-0.4mbgl	overgrown grass on topsoil
0.4-0.7mbgl	soft to firm silty sandy clay
0.7-2.50mbgl	firm very silty sandy clay with occasional cobbles

TP dry and stable. Slow groundwater ingress at 2.2mbgl. After 1hr groundwater had settled within the pit to 1.9mbgl.

Trial Pit 5

0-0.5mbgl	overgrown grass onto topsoil
0.5-0.8mbgl	soft sandy clay with some topsoil intermixed.
0.8-1.2mbgl	loose to medium dense sand and gravel

Strong groundwater entry at 1.2mbgl. Groundwater level settled at 0.9mbgl. TP5 was undertaken close to the SE corner of the site where there is a permanent pool situated which is believed to be attributing to the high water table in this area. This is recorded as a well on the historical maps as shown below:

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Meeting Report	Representing C+R Bruce Clark

CAMERON+ROSS
CONSULTING CIVIL & STRUCTURAL ENGINEERS

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Contract Title **Burnside of Duntrune Crematorium**		Distribution Aberdeen File 1 Paul Fretwell 1
Other Parties Present Digger Driver from Iain Smith Builders		

Trial Pit 6

0-0.25mbgl	overgrown grass on topsoil
0.25-2.4mbgl	medium dense light brown silty clayey sand with occasional cobbles and boulders.

TP dry and stable.

Trial Pit 7

0-0.25mbgl	overgrown grass on topsoil
0.25-2.4mbgl	medium dense light brown silty clayey sand with occasional cobbles and boulders.

TP dry and stable.

Trial Pit 8

0-0.30mbgl	overgrown grass on topsoil
0.30-2.3mbgl	medium dense light brown silty clayey sand with occasional cobbles and boulders.

TP dry and stable. After being left open groundwater level had risen to 1.9mbgl

Trial Pit 9

0-0.30mbgl	overgrown grass on topsoil
0.30-2.0mbgl	loose to medium dense light brown silty clayey sand with occasional cobbles.

TP dry and stable.

Trial Pit 10

0-0.90mbgl	overgrown grass on topsoil
0.90-1.5mbgl	soft to firm grey silty sandy clay
1.5-2.5mbgl	loose to medium dense light brown silty clayey sand with occasional cobbles and boulders. Trial pit ended on potential weathered rock.

TP dry and stable.

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Meeting Report	Representing C+R Bruce Clark

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Date of Meeting 09.10.2019	Place of Meeting SITE – Burnside of Duntrune Crematorium	Contract No. A/ 190889
Contract Title **Burnside of Duntrune Crematorium**		Distribution Aberdeen File 1 Paul Fretwell 1
Other Parties Present Digger Driver from Iain Smith Builders		

Trial Pit 11

0-0.30mbgl	overgrown grass on topsoil
0.30-2.0mbgl	medium dense silty clayey sand with occasional cobbles. TP ended on potential weathered rock

TP dry and stable.

Trial Pit 12

0-0.30mbgl	overgrown grass on topsoil
0.30-2.0mbgl	medium dense silty clayey sand with occasional cobbles. TP ended on potential weathered rock

TP dry and stable.

Recommendations for Building Foundations

At the time of the investigation there is no proposed site plan available and any foundation recommendations should be reviewed once a site plan is provided.

It is recommended that foundations are situated at a minimum depth of 0.7m below the original ground level on either the firm clay or medium dense gravels. This should ensure foundations are situated below the softer clays and sand and gravels that were typically encountered in the upper substrata horizons immediately below the topsoil layer. These substrata are considered suitable for an allowable bearing pressure of 100kN/m^2

The average topsoil depth encountered across the site is 0.35m with a max depth of 0.9m encountered in TP10.

There was no made ground encountered within the trial pits.

Review of Geological Maps

A review of the British Geological Maps (see extract below) shows that the lower portion of the site drift deposits are recorded as "*Till compact sandy clay containing clasts of local rocks and far-travelled erratics.*". This is in line with the generally mix of clays and sand encountered in the substrata within the trial pits.

The upper part of the site is recorded as "Bedrock at or near surface". This area is out with the anticipated area for development.

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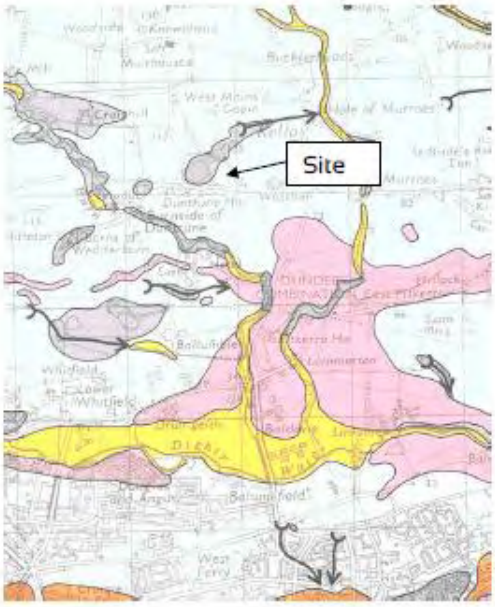
Meeting Report	Representing C+R Bruce Clark

CAMERON+ROSS
CONSULTING CIVIL & STRUCTURAL ENGINEERS

Date of Meeting 09.10.2019	Place of Meeting SITE – Burnside of Duntrune Crematorium	Contract No. A/ 190889
Contract Title **Burnside of Duntrune Crematorium**		Distribution Aberdeen File 1 Paul Fretwell 1
Other Parties Present Digger Driver from Iain Smith Builders		



Infiltration Test Results

As a result of groundwater presence within trial pits 1,2 & 3 the infiltration tests undertaken in these pits failed.

The infiltration test undertaken in TP4 provided a moderate infiltration value which suggests infiltration systems maybe viable for surface water discharge. This is subject to site level design and provided that good land drainage is provided to take groundwater around the proposed car parking and building areas. Soakaways would only be considered suitable where they are shallow in nature.

For foulwater design will require to comply with Buillding Regs and SEPA requirements. Any infiltration bed would require to be sited in areas where the proposed ground level is raised to ensure the invert level of any distribution pipes is at least 1m above the existing ground water level which can generally be considered over the likely developed part of the site to be around1.2m below original ground level.

END OF REPORT
BAC 31.10.2019

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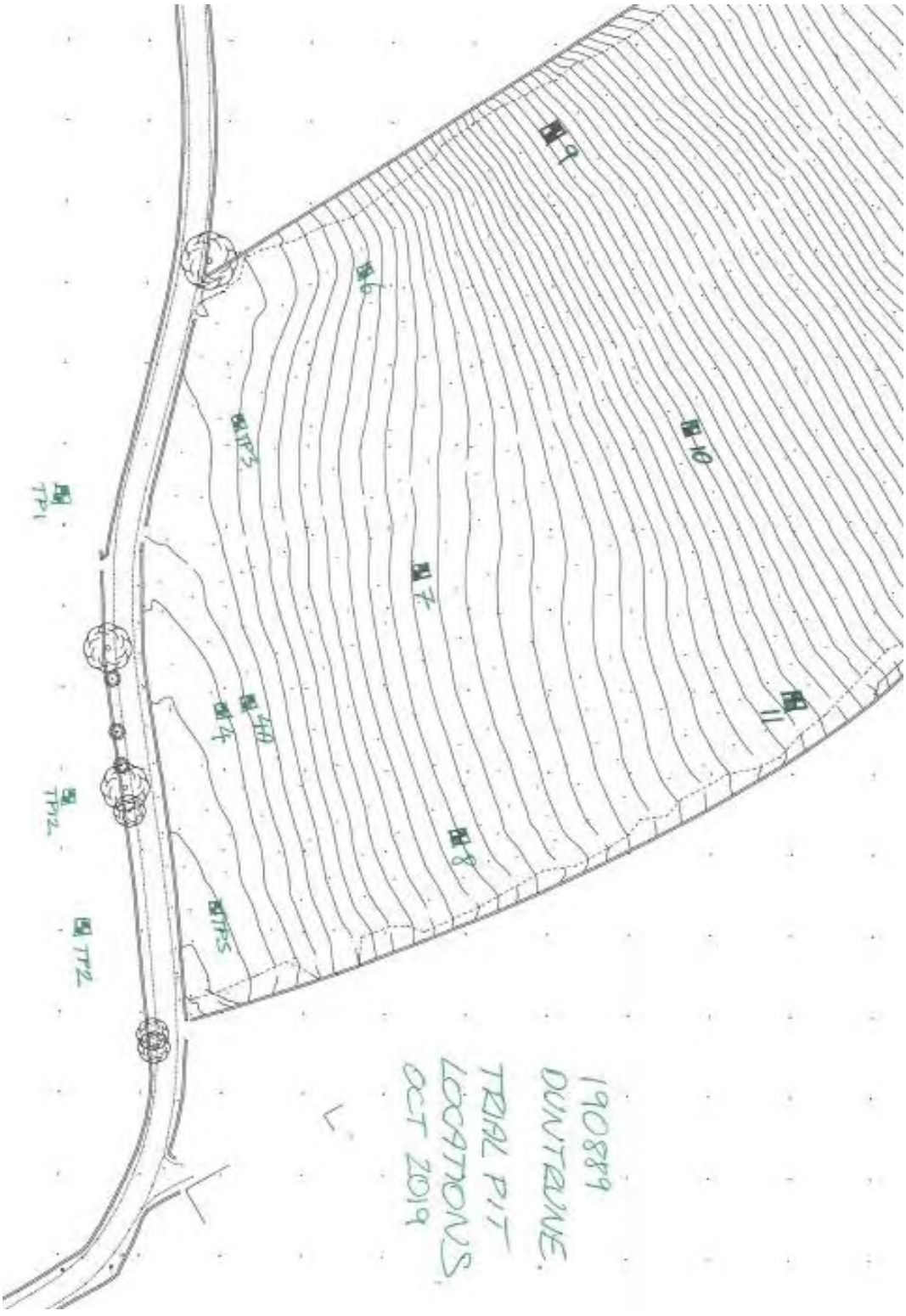

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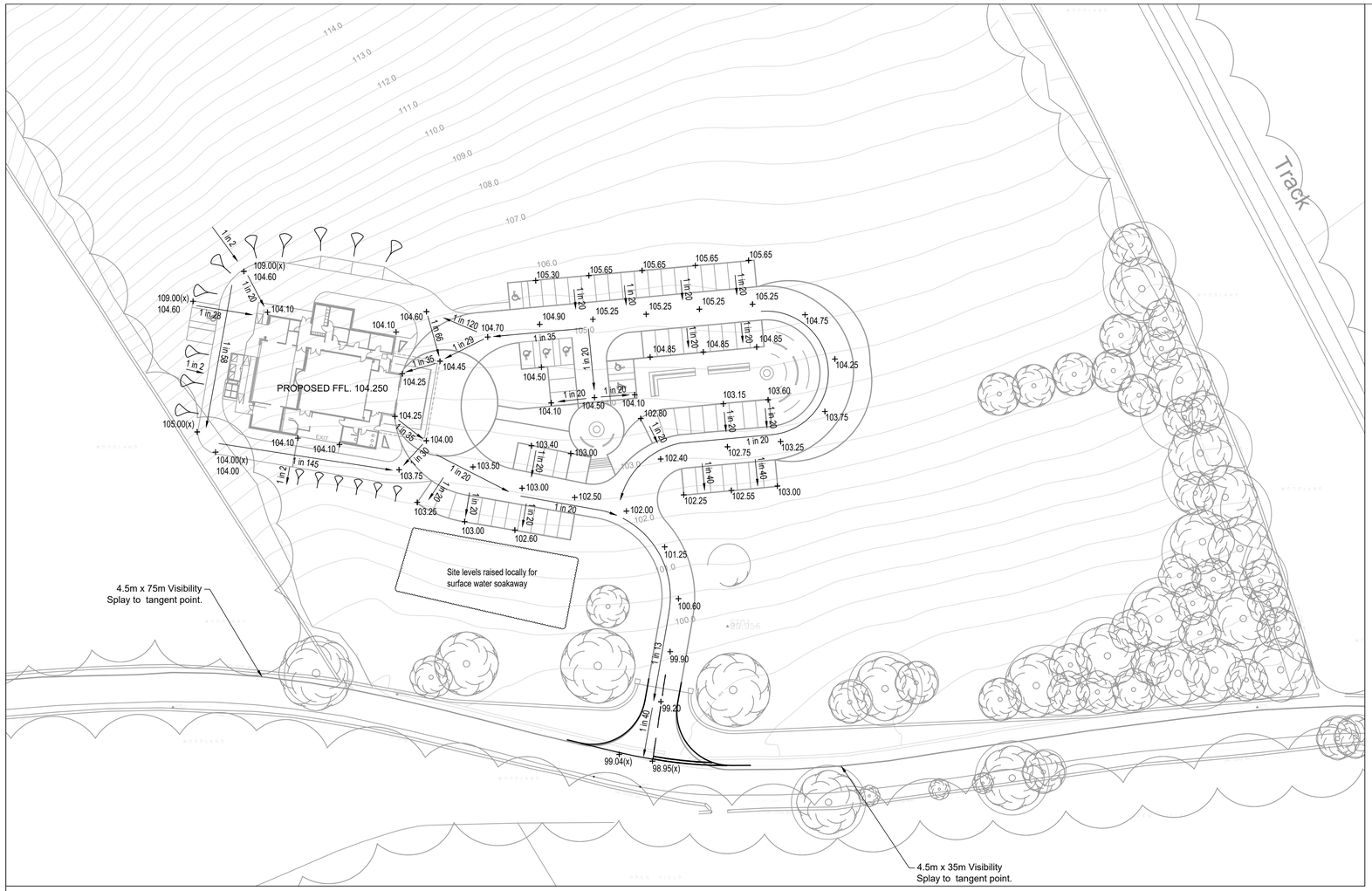
APPENDIX B

Proposed Drainage Layout



Site Layout
Scale 1:500

FIGURED DIMENSIONS ONLY TO BE USED

Legend

FFL ??.??	Finished Floor Level
+ ??.??	Proposed Ground Level
+ ??.??(x)	Existing Ground Level
1 in ??	Gradient

Issue	Revision	Initial	Date
1	Site Levels updated to suit amended layout	SAD/BAC	19/11/2020

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t 01463 570 100 | w cameronross.co.uk

Client:
FM & G Batchelor

Project:
Crematorium at Burnside of Duntrune, Duntrune, Angus

Drawing Title:
Site Access Road Layout Plan

Status: Planning

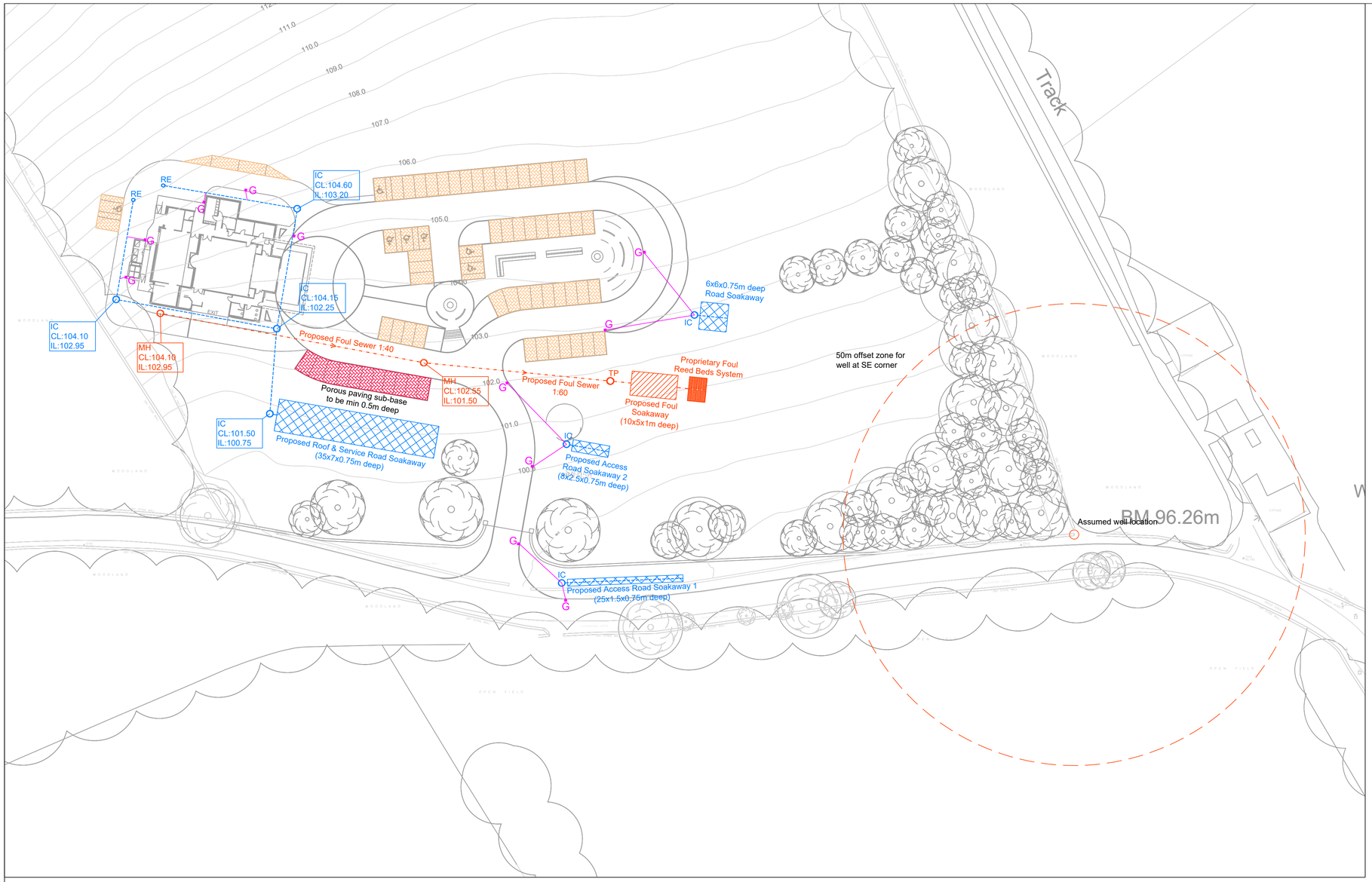
North

Scale:	1:500 @ A1	Date:	31/08/2020
By:	SAD	Checked: BAC	Approved: RAG

Dwg. No. A/190889 – 910

Rev. 1

FIGURED DIMENSIONS ONLY TO BE USED



Drainage Layout

Scale 1:500

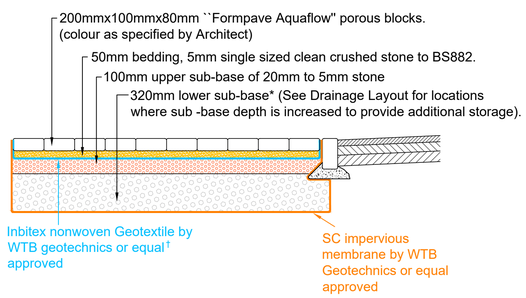
Notes:

Supplied by WTB Geotextiles

* Specification for sub-base, laying course and blinding layer: the crushed stone must possess well defined edges and have a minimum 10% fines value of 150kN when tested in accordance with BS812 Part 111.

Grading of Sub-base stone

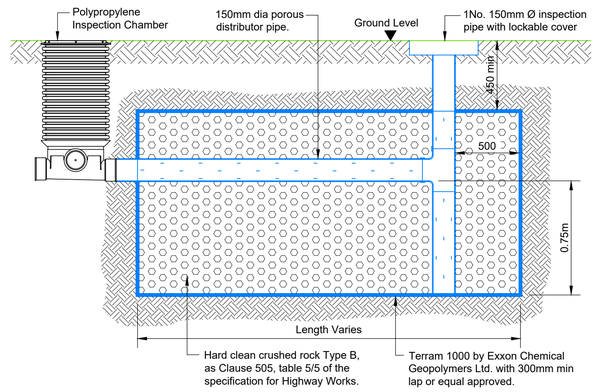
SIEVE SIZE	% PASSING
100mm	100
75mm	80-100
60mm	60-80
37.5mm	30-60
20mm	0-20
10mm	0-5



SECTION THROUGH POROUS PAVING

Scale 1:20

Note:- Sub-base to be increased to as per depth noted on plan



TYPICAL PRIVATE SURFACE WATER SOAKAWAY LONGITUDINAL SECTION

Scale 1:20

Note:

Soakaway dimensions based on a soil infiltration rate (f) = 8.85×10^{-5} m/sec as determined by Cameron + Ross' site investigation of 09/10/2019 in accordance with in BRE Digest 365 with 30% free volume of fill material.

General notes:

This drawing is to be read in conjunction with all relevant engineers and architects drawings.

Drainage - all sewers to be constructed in accordance with Scottish water's publication ``Sewers for Scotland (4th edition) a policy, design and construction guide for developers in Scotland"

Sewers laid within roads should have a minimum cover of 1.5m from final road surface to pipe soffit level. Where this cannot be achieved then ridged pipes shall be protected by a full concrete surround, similarly, flexible pipes shall be protected by a concrete slab at a depth less than 1.2m.

The contractor is responsible for checking the line and level of all existing services prior to commencement of works. Any discrepancies from design information must be reported to the site manager and site engineer in writing.

The contractor should allow for CCTV camera survey of entire drainage system upon substantial completion of works. If any remedial works are required a repeat survey should also be carried out prior to formal submission to Engineer together with as-built drawing including manhole co-ordinates, cover and invert levels and pipe gradients .

Surface Drainage Legend

- Surface water sewer (uPVC Marley Quantum rigid solid pipework) unless otherwise noted on drawing.
- Surface Water Soakaway
- Porous Paving with standard 450mm deep sub-base
- Porous Paving with increased depth of sub-base
- S1 — Surface Water Manhole with Reference Number
- IC — Surface Water Inspection Chamber
- RE — Surface Water Rodding Eye
- G — Road Gully with associated tail

Foul Drainage Legend

- Foul water sewer (uPVC Marley Quantum rigid solid pipework) unless otherwise noted on drawing.
- Foul Infiltration Bed
- 8No Klargester Foul Reed Beds
- F1 — Foul Water Manhole with Reference Number
- TP — Denotes Klargester BioFicient 6 Treatment Plant (30 Person Unit)

Drainage tail positions to be confirmed on site to suit house type discharge points. A surface water and foul water branch should be established for each plot.

Refer to Architects drawings for internal drainage runs and details.

Note:-

Soakaway to be least 5m from building foundations.

Maintenance of proposed surface water drainage

1.Soakaway
Inlet chamber to be checked at six monthly intervals and any organic matter and silt build up removed. Soakaway to be checked also to ensure that there is no build up of standing water once a rainfall event has passed (six monthly). Surface over soakaway to be constructed of material that is easily removed (e.g. lock block) to allow filter gravel to be replaced if required in the future. No trees or large shrubs to be planted within 5 metres of the soakaway.

2.Drainage Pipes
Inlet pipes to be checked at six month intervals for blockages and silt build up. Blockages and structural damage to be repaired or cleaned as necessary.

Issue	Revision	Initial	Date
1	Drainage updated to suit amended layout	SAD/BAC	19/11/2020

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Client:
FM & G Batchelor

Project:
Crematorium at Burnside of Duntrune, Duntrune, Angus

Drawing Title:
Drainage Layout

Status: Planning

North

Scale:	1:500 @ A1	Date:	31/08/2020
By:	SAD	Checked:	BAC
Approved:	RAG		

Dwg. No. A/190889 – 920

Rev. 1

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APPENDIX C

Drainage Calculations

CALCULATION

Cameron + Ross

Contract	Crematorium, Burnside of Duntrune, Angus
Part of Structure	Drainage Calculations Summary

Sheet No.	Rev 0
Contract No.	A190889
Date	28/08/2020
Designer	SAD
Checker	BAC

SURFACE WATER DRAINAGE DESIGN

Total Impermeable Area = 0.295hectares = 2965sqm

Total Road Impermeable Area = 0.234hectares = 2300sqm

Total Roof Impermeable Area = 0.066hectares = 665sqm

Add 10% Urban Creep Allowance = 1.1x665 = **730sqm**

Proposed Hardstanding Road Areas

Area A1 - Tarmac Access Road = 355sqm

Area A2 - Tarmac Access Road = 165sqm

Area B - Tarmac Road Adj to Building Entrance draining to 11 spaces (not including area under canopy) = 440sqm

Area C1 - Service Area behind Building = 205sqm

Area C2 - Service Area behind Building = 140sqm

Area C3 - Service Area behind Building = 210sqm + 10% for main access rd drainage = 230sqm

Area D - Tarmac Road Adj to 5 disabled and 3 normal porous parking spaces = 225sqm

Area E - Tarmac Road draining to 9 porous parking spaces = 140sqm

Area F - Tarmac Road Adj to coach waiting area = 255sqm

Area G - Tarmac Road draining to 7 porous parking spaces = 110sqm

Total Area = **2300sqm**

Proposed Hardstanding Road Car Park Spacing Areas

Area CP1 - 11No Spaces = 140 + Area B = 580sqm

Area CP2 - 6No Spaces + 3 disable = 120sqm + Area D = 345 sqm

Area CP3 - 9No Spaces = 110sqm + Area E = 250 sqm

Area CP3 - 9No Spaces = 85sqm + Area G = 195 sqm

Total Area = **1370sqm**

Proposed Self-Draining Road Areas

Area H - 4No Spaces = 50sqm

Area I - 2No Spaces = 45sqm

Area J - 1No Spaces + 1 Disabled = 40sqm

Area K - 17No Spaces + 1 Disabled = 230sqm

Area L - 9No Spaces = 120sqm

Total Area = **485sqm**

2287

CAMERON + ROSS

CONSULTING CIVIL AND STRUCTURAL ENGINEERS

Project:	**Crematorium**	Job No:	**A 190889**
Address:	**Duntrune**	Date:	**Aug 2020**
	Dundee	Calcs by:	**SAD**
Location:	Roof & Service Road Soakaway	Page No:	

Design Rainfall

Additional flow multiplier **30%**

From Wallingford Procedure, Volume 3 - Maps
Rainfall Depths (M5 - 60minutes) ***M5_60 =*** **15 mm**

from BRE Digest 365, fig. 1 ***rainfall ratio r =*** ***0.225***

Design Storm Return Period, ***P =*** ***200 years***

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	4.1 mm	2.574	10.6 mm	128 mm/hr
10	6.3 mm	2.619	16.5 mm	99 mm/hr
15	7.9 mm	2.670	21.0 mm	84 mm/hr
30	11.0 mm	2.749	30.3 mm	61 mm/hr
60	15.0 mm	2.761	41.4 mm	41 mm/hr
120	20.0 mm	2.683	53.8 mm	27 mm/hr
240	26.5 mm	2.603	69.1 mm	17 mm/hr
360	31.2 mm	2.546	79.4 mm	13 mm/hr
600	38.2 mm	2.462	94.0 mm	9 mm/hr
1440	53.9 mm	2.340	126.0 mm	5 mm/hr
2880	70.7 mm	2.237	158.0 mm	3 mm/hr

(●) Scotland and Nth Ireland

( ) England and Wales

Measured Infiltration Rate: 8.85E-05

Infiltration Rate (eff)	8.05E-05	m/s
Impermeable Area	1320	m^2
Width	7.00	m
Depth	0.75	m
Fixed Lgth (optional)	0	m

(OR Outlet Flow Rate 0 l/s)
ie 0 m^3/hr

Gravel Pit or Trench Soakaway
Gravel, free volume 30%
Insert 100% for Net Storage Chamber Volume

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	9	14.0	0.3	13.8	2.01	13.8	
10	13	21.8	0.7	21.1	2.38	21.1	
15	17	27.7	1.3	26.4	2.56	26.4	
30	23	40.0	3.3	36.7	2.79	36.7	
60	30	54.7	8.0	46.7	2.93	46.7	
120	34	71.0	17.7	53.3	3.00	53.3	
240	35	91.2	36.3	54.9	3.02	54.9	
360	33	104.8	52.5	52.4	2.99	52.4	
600	29	124.1	78.3	45.8	2.92	45.8	
1440	19	166.4	136.2	30.1	2.65	30.1	
2880	11	208.6	190.8	17.8	2.24	17.8	

Time until system can cope with additional influx of 50% design storage volume < 24 hrs ~ OK

Provide gravel filled soakaway, 35 m x 7 m x 0.75 m deep

Minimum Free Volume = 30%
Total Pit Volume = 183.8m^3

CAMERON + ROSS

CONSULTING CIVIL AND STRUCTURAL ENGINEERS

Project:	**Crematorium**	Job No:	**A 190889**
Address:	**Duntrune**	Date:	**Aug 2020**
	Dundee	Calcs by:	**SAD**
Location:	Area A1 - Access Road	Page No:	

Design Rainfall

Additional flow multiplier **30%**

From Wallingford Procedure, Volume 3 - Maps
Rainfall Depths (M5 - 60minutes) ***M5_60 =*** **15 mm**

from BRE Digest 365, fig. 1 ***rainfall ratio r =*** ***0.225***

Design Storm Return Period, ***P =*** ***200 years***

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	4.1 mm	2.574	10.6 mm	128 mm/hr
10	6.3 mm	2.619	16.5 mm	99 mm/hr
15	7.9 mm	2.670	21.0 mm	84 mm/hr
30	11.0 mm	2.749	30.3 mm	61 mm/hr
60	15.0 mm	2.761	41.4 mm	41 mm/hr
120	20.0 mm	2.683	53.8 mm	27 mm/hr
240	26.5 mm	2.603	69.1 mm	17 mm/hr
360	31.2 mm	2.546	79.4 mm	13 mm/hr
600	38.2 mm	2.462	94.0 mm	9 mm/hr
1440	53.9 mm	2.340	126.0 mm	5 mm/hr
2880	70.7 mm	2.237	158.0 mm	3 mm/hr

(●) Scotland and Nth Ireland

( ) England and Wales

Measured Infiltration Rate: 8.85E-05

Infiltration Rate (eff)	8.85E-05	m/s	(OR Outlet Flow Rate	0	l/s)
Impermeable Area	355	m^2	ie	0	m^3/hr
Width	1.50	m			
Depth	0.75	m	Gravel Pit or Trench Soakaway		
Fixed Lgth (optional)	0	m	Gravel, free volume	30%	
			Insert 100% for Net Storage Chamber Volume		

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	10	3.8	0.2	3.5	0.62	3.5	
10	15	5.9	0.7	5.2	0.64	5.2	
15	19	7.5	1.2	6.3	0.65	6.3	
30	23	10.8	2.9	7.8	0.66	7.8	
60	25	14.7	6.3	8.4	0.67	8.4	
120	23	19.1	11.5	7.6	0.66	7.6	
240	18	24.5	18.5	6.0	0.65	6.0	
360	15	28.2	23.2	5.0	0.64	5.0	
600	11	33.4	29.7	3.7	0.62	3.7	
1440	6	44.7	42.7	2.0	0.56	2.0	
2880	3	56.1	55.0	1.1	0.49	1.1	

Provide gravel filled soakaway, 25 m x 1.5 m x 0.75 m deep

Minimum Free Volume = 30%
Total Pit Volume = 28.1m^3

CAMERON + ROSS

CONSULTING CIVIL AND STRUCTURAL ENGINEERS

Project:	**Crematorium**	Job No:	**A 190889**
Address:	**Duntrune**	Date:	**Aug 2020**
	Dundee	Calcs by:	**SAD**
Location:	Area A2 - Access Road	Page No:	

Design Rainfall

Additional flow multiplier **30%**

From Wallingford Procedure, Volume 3 - Maps
Rainfall Depths (M5 - 60minutes) ***M5_60 =*** **15 mm**

from BRE Digest 365, fig. 1 ***rainfall ratio r =*** ***0.225***

Design Storm Return Period, ***P =*** ***200 years***

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	4.1 mm	2.574	10.6 mm	128 mm/hr
10	6.3 mm	2.619	16.5 mm	99 mm/hr
15	7.9 mm	2.670	21.0 mm	84 mm/hr
30	11.0 mm	2.749	30.3 mm	61 mm/hr
60	15.0 mm	2.761	41.4 mm	41 mm/hr
120	20.0 mm	2.683	53.8 mm	27 mm/hr
240	26.5 mm	2.603	69.1 mm	17 mm/hr
360	31.2 mm	2.546	79.4 mm	13 mm/hr
600	38.2 mm	2.462	94.0 mm	9 mm/hr
1440	53.9 mm	2.340	126.0 mm	5 mm/hr
2880	70.7 mm	2.237	158.0 mm	3 mm/hr

(●) Scotland and Nth Ireland

( ) England and Wales

Measured Infiltration Rate: 8.85E-05

Infiltration Rate (eff)	8.85E-05	m/s	(OR Outlet Flow Rate	0	l/s)
Impermeable Area	165	m^2	ie	0	m^3/hr
Width	2.50	m			
Depth	0.75	m	Gravel Pit or Trench Soakaway		
Fixed Lgth (optional)	0	m	Gravel, free volume	30%	
			Insert 100% for Net Storage Chamber Volume		

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	3	1.8	0.1	1.6	0.63	1.6	
10	4	2.7	0.3	2.5	0.75	2.5	
15	5	3.5	0.5	3.0	0.80	3.0	
30	7	5.0	1.1	3.9	0.86	3.9	
60	8	6.8	2.5	4.4	0.89	4.4	
120	7	8.9	4.7	4.2	0.88	4.2	
240	6	11.4	8.1	3.3	0.83	3.3	
360	5	13.1	10.4	2.7	0.77	2.7	
600	3	15.5	13.7	1.8	0.66	1.8	
1440	1	20.8	20.2	0.6	0.34	0.6	
2880	0	26.1	28.7	0.0	0.00	0.0	

Provide gravel filled soakaway, 8 m x 2.5 m x 0.75 m deep

Minimum Free Volume = 30%
Total Pit Volume = 15m^3

CAMERON + ROSS

CONSULTING CIVIL AND STRUCTURAL ENGINEERS

Project:	**Crematorium**	Job No:	**A 190889**
Address:	**Duntrune**	Date:	**Aug 2020**
	Dundee	Calcs by:	**SAD**
Location:	Area CP1 - 11No Car Park Spaces	Page No:	
	Drainage Adj Tarmac Road		

Design Rainfall

Additional flow multiplier **30%**

From Wallingford Procedure, Volume 3 - Maps
Rainfall Depths (M5 - 60minutes) ***M5_60 =*** **15 mm**

from BRE Digest 365, fig. 1 ***rainfall ratio r =*** ***0.225***

Design Storm Return Period, ***P =*** ***200 years***

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	4.1 mm	2.574	10.6 mm	128 mm/hr
10	6.3 mm	2.619	16.5 mm	99 mm/hr
15	7.9 mm	2.670	21.0 mm	84 mm/hr
30	11.0 mm	2.749	30.3 mm	61 mm/hr
60	15.0 mm	2.761	41.4 mm	41 mm/hr
120	20.0 mm	2.683	53.8 mm	27 mm/hr
240	26.5 mm	2.603	69.1 mm	17 mm/hr
360	31.2 mm	2.546	79.4 mm	13 mm/hr
600	38.2 mm	2.462	94.0 mm	9 mm/hr
1440	53.9 mm	2.340	126.0 mm	5 mm/hr
2880	70.7 mm	2.237	158.0 mm	3 mm/hr

(●) Scotland and Nth Ireland

( ) England and Wales

Measured Infiltration Rate: 8.85E-05

Infiltration Rate (eff)	8.85E-05	m/s	(OR Outlet Flow Rate	0	l/s)
Impermeable Area	580	m^2	save	ie 0	m^3/hr
Width	5.00	m			
Depth	0.50	m	Gravel Pit or Trench Soakaway		
Fixed Lgth (optional)	0	m	Gravel, free volume	30%	
			Insert 100% for Net Storage Chamber Volume		

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	8	6.2	0.2	6.0	1.45	6.0	
10	12	9.6	0.5	9.1	1.67	9.1	
15	15	12.2	0.8	11.4	1.77	11.4	
30	21	17.6	2.0	15.5	1.90	15.5	
60	26	24.0	4.9	19.2	1.97	19.2	
120	28	31.2	10.4	20.8	1.99	20.8	
240	27	40.1	20.1	19.9	1.98	19.9	
360	24	46.1	27.9	18.2	1.95	18.2	
600	20	54.5	39.6	14.9	1.88	14.9	
1440	12	73.1	64.3	8.9	1.65	8.9	
2880	6	91.7	86.9	4.8	1.32	4.8	

Provide gravel filled soakaway, 27.75 m x 5 m x 0.5 m deep

Minimum Free Volume = 30%

Total Pit Volume = 69.4m^3

The design is for a 28m x 5m length of porous paving taking an additional 435m2 tarmac road

The above design shows that a min sub base depth of 0.5m must be provided for the porous car park area .

where accepting tarmac road runoff this includes storage for upto the 1 in 200 year storm duration.

CAMERON + ROSS

CONSULTING CIVIL AND STRUCTURAL ENGINEERS

Project:	**Crematorium**	Job No:	**A 190889**
Address:	**Duntrune**	Date:	**Aug 2020**
	Dundee	Calcs by:	**SAD**
Location:	Area F - Road Adj to Coach	Page No:	

Design Rainfall

Additional flow multiplier **30%**

From Wallingford Procedure, Volume 3 - Maps
Rainfall Depths (M5 - 60minutes) ***M5_60 =*** **15 mm**

from BRE Digest 365, fig. 1 ***rainfall ratio r =*** ***0.225***

Design Storm Return Period, ***P =*** ***200 years***

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	4.1 mm	2.574	10.6 mm	128 mm/hr
10	6.3 mm	2.619	16.5 mm	99 mm/hr
15	7.9 mm	2.670	21.0 mm	84 mm/hr
30	11.0 mm	2.749	30.3 mm	61 mm/hr
60	15.0 mm	2.761	41.4 mm	41 mm/hr
120	20.0 mm	2.683	53.8 mm	27 mm/hr
240	26.5 mm	2.603	69.1 mm	17 mm/hr
360	31.2 mm	2.546	79.4 mm	13 mm/hr
600	38.2 mm	2.462	94.0 mm	9 mm/hr
1440	53.9 mm	2.340	126.0 mm	5 mm/hr
2880	70.7 mm	2.237	158.0 mm	3 mm/hr

(●) Scotland and Nth Ireland

( ) England and Wales

Measured Infiltration Rate: 8.85E-05

Infiltration Rate (eff)	8.85E-05	m/s
Impermeable Area	255	m^2
Width	6.00	m
Depth	0.75	m
Fixed Lgth (optional)	0	m

(OR Outlet Flow Rate 0 l/s)
ie 0 m^3/hr

Gravel Pit or Trench Soakaway
Gravel, free volume 30%
Insert 100% for Net Storage Chamber Volume

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	2	2.7	0.2	2.6	0.68	2.6	
10	3	4.2	0.4	3.9	0.91	3.9	
15	4	5.4	0.6	4.8	1.05	4.8	
30	5	7.7	1.3	6.4	1.25	6.4	
60	6	10.6	2.8	7.8	1.38	7.8	
120	6	13.7	5.7	8.0	1.40	8.0	
240	5	17.6	10.7	7.0	1.31	7.0	
360	4	20.3	14.6	5.7	1.16	5.7	
600	3	24.0	20.5	3.5	0.85	3.5	
1440	0	32.1	34.4	0.0	0.00	0.0	
2880	0	40.3	68.8	0.0	0.00	0.0	

Provide gravel filled soakaway, 6 m x 6 m x 0.75 m deep

Minimum Free Volume = 30%
Total Pit Volume = 27m^3

CAMERON + ROSS

CONSULTING CIVIL AND STRUCTURAL ENGINEERS

Project:	**Crematorium**	Job No:	**A 190889**
Address:	**Duntrune**	Date:	**Aug 2020**
	Dundee	Calcs by:	**SAD**
Location:	Car Park Spaces Drainage	Page No:	
	Self Draining		

Design Rainfall

Additional flow multiplier **30%**

From Wallingford Procedure, Volume 3 - Maps
Rainfall Depths (M5 - 60minutes) ***M5_60 =*** **15 mm**

from BRE Digest 365, fig. 1 ***rainfall ratio r =*** ***0.225***

Design Storm Return Period, ***P =*** ***200 years***

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	4.1 mm	2.574	10.6 mm	128 mm/hr
10	6.3 mm	2.619	16.5 mm	99 mm/hr
15	7.9 mm	2.670	21.0 mm	84 mm/hr
30	11.0 mm	2.749	30.3 mm	61 mm/hr
60	15.0 mm	2.761	41.4 mm	41 mm/hr
120	20.0 mm	2.683	53.8 mm	27 mm/hr
240	26.5 mm	2.603	69.1 mm	17 mm/hr
360	31.2 mm	2.546	79.4 mm	13 mm/hr
600	38.2 mm	2.462	94.0 mm	9 mm/hr
1440	53.9 mm	2.340	126.0 mm	5 mm/hr
2880	70.7 mm	2.237	158.0 mm	3 mm/hr

(●) Scotland and Nth Ireland

( ) England and Wales

Measured Infiltration Rate: 8.85E-05

Infiltration Rate (eff)	8.85E-05	m/s	(OR Outlet Flow Rate	0	l/s)
Impermeable Area	50	m^2	ie	0	m^3/hr
Width	5.00	m			
Depth	0.11	m	Gravel Pit or Trench Soakaway		
Fixed Lgth (optional)	0	m	Gravel, free volume	30%	
			Insert 100% for Net Storage Chamber Volume		

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	3	0.5	0.0	0.5	0.90	0.5	
10	5	0.8	0.1	0.8	1.14	0.8	
15	6	1.0	0.1	1.0	1.26	1.0	
30	8	1.5	0.2	1.3	1.44	1.3	
60	9	2.1	0.5	1.6	1.54	1.6	
120	10	2.7	1.0	1.6	1.57	1.6	
240	9	3.5	2.0	1.5	1.51	1.5	
360	8	4.0	2.7	1.3	1.43	1.3	
600	6	4.7	3.8	0.9	1.26	0.9	
1440	2	6.3	6.0	0.3	0.69	0.3	
2880	0	7.9	8.4	0.0	0.00	0.0	

Provide gravel filled soakaway, 10 m x 5 m x 0.11 m deep

Minimum Free Volume = 30%

Total Pit Volume = 5.5m^3

The design is for a 10m x 5m length of porous paving draining its own area only

The above design shows that a min sub base depth of 0.11m must be provided for the porous car park area .

where draining its own area this includes storage for upto the 1 in 200 year storm duration.

From: Paul Fretwell
Sent: Wed, 17 Feb 2021 11:18:43 +0000
To: MacKenzieF
Subject:FW: Crematorium - Duntrune

From: Paul Fretwell
Sent: 16 February 2021 12:31
To: BarnesA <BarnesA@angus. gov. uk> (BarnesA@angus.gov.uk) <barnesa@angus.gov.uk>
Subject: FW: Crematorium - Duntrune

Hi Andy

Please find below the email from Bruce at Cameron Ross with regard to the Transport Assessment and the impact of the Shank of Omachie approval.

Regards

Paul Fretwell

for @rchitects Scotland Ltd.

15 West High Street, Forfar, DD8 1BE

Mob. [redacted]

Tel. 01307 466480

www.scotland-architects.co.uk

From: Bruce A. Clark [redacted]
Sent: 13 February 2021 16:48
To: Paul Fretwell <paul@rchitects.org.uk>
Subject: RE: Crematorium - Duntrune

Paul,

I have reviewed the Transport Assessment undertaken for the Shank of Omachie Planning Applications referenced 15/01045/PPM and 19/00095/PPPM. Whilst there is some overlap in the junctions considered (Those on Kellas Road) within our own assessment the addition of the committed development flows would not change the conclusions of our own assessment. The conclusion of our own assessment showed that without the addition of committed development flows ie comparing the base traffic flows only showed there to be a less than 5% impact of the Kellas Drive traffic flows as a result of the crematorium traffic flows. As a result in accordance with the IHT guidelines there is no requirement for traffic capacity assessment of these junction to be undertaken which was accepted by both Angus Council□s Transport Planning officer and the Dundee City Council Transport Planning Officer. Neither whom thought it necessary to include the Shanks of Omachie site as a committed development. AS the Crematorium would be typically in use out with peak traffic hours then this and the fact that the main route under consideration being Kellas Drive had a less than 5% impact already shown then the exercise of adding the committed development flows does not change the conclusion of the TA for the crematorium that it has a negligible impact on the surrounding road network in fact it would only have the affect of further reducing the % impact of the crematorium traffic by increasing the existing flows to which the crematorium traffic cis being compared to.

The TA undertaken for the Shank of Omachie development concluded that the junction on Kellas Road had sufficient capacity for the development traffic which considered typical peak hour traffic times as a result of having a considerable residential element to it.

I trust this answers sufficiently planners request to have the TA consider the Shank of Omachie site I why I believe this to be a futile exercise in the sense the conclusion remain the same and would only help to reduce impact the crematorium has on the surrounding road network as the base traffic levels would be increased from those already considered and as we concluded the impact was so insignificant that junction modelling was not required then this case would be strengthened.

Regards

Bruce Clark B.Eng.(Hons.), C.Eng., M.I.C.E.
ASSOCIATE DIRECTOR

e BClark@cameronross.co.uk
t 01224 642400
m [redacted]

Cameron+Ross

Civil Structural Engineering Expertise

Aberdeen **Inverness**

cameronross.co.uk

From: Paul Fretwell <paul@rchitects.org.uk>
Sent: 08 February 2021 17:22
To: Bruce A. Clark <B[redacted]
Subject: FW: Crematorium - Duntrune

Hi Bruce

Will give you a call. Please see planners email below with regard to TA.

Regards

Paul Fretwell

for @rchitects Scotland Ltd.

15 West High Street, Forfar, DD8 1BE

Mob. [redacted]

Tel. 01307 466480

www.scotland-architects.co.uk

From: MacKenzieF <MacKenzieF@angus.gov.uk>
Sent: 08 February 2021 16:31
To: Paul Fretwell <paul@rchitects.org.uk>
Subject: RE: Crematorium - Duntrune

Good Afternoon Paul,

Still awaiting SEPA response and am in discussion with Roads regarding their finalised response.

Something that has been noticed is the applicant☐s Transport Assessment does not take account of the approved housing and leisure site at Shank of Omachie in terms of the ☐Committed Developments☐ section. The TA should be updated to take account of this. I☐ve also made the Roads Authority and Dundee City Council aware of this.

Kind Regards,

Fraser MacKenzie I Planning Officer (Development Standards) I Angus Council I 01307 492198 I mackenzief@angus.gov.uk I www.angus.gov.uk

From: Paul Fretwell <paul@rchitects.org.uk>
Sent: 05 February 2021 01:19

To: MacKenzieF <MacKenzieF@angus.gov.uk>
Subject: Crematorium - Duntrune

05 February 2021

Hi Fraser

Just wondered if you had received consultations from roads or SEPA yet?

Regards

Paul Fretwell

for @rchitects Scotland Ltd.

15 West High Street, Forfar, DD8 1BE

Mob. [redacted]

Tel. 01307 466480

www.scotland-architects.co.uk

bsi. ISO 9001 Quality Management FS 547812 | ISO 14001 Environmental Management EMS 563106 | OHSAS 18001 Occupational Health & Safety Management OHS 563107

ethosenvironmental

TECHNICAL REPORT P8346.02

ODOUR IMPACT ASSESSMENT: Proposed Cremation Facility, Duntrune

Prepared For

@rchitects Scotland Ltd.
15 West High Street, Forfar, DD8 1BE
Mob. 07860

Prepared By

***ETHOS* ENVIRONMENTAL LIMITED**
Unit 16 Dumbryden Industrial Estate
Dumbryden Road
EDINBURGH EH14 2AB

Tel: 0131 453 5111
e-mail: brian@ethosenvironmental.co.uk

MARCH 2021

DOCUMENT VERIFICATION

Project Title		P8346 Duntrune Odour		**Project Number**	
				P8346	
Document Title		P8346.01 Odour Impact Assessment		**Date of Assessment**	**Date of Report Issue**
				March 2021	6 April 2021
Revision	Date Written	Filename	P8346.02 Odour Impact Assessment		
2.0	06/04/21	Description	Version 2		
			Prepared By	Reviewed By	
		Name	B Gardner	Scott Carlin	
		Signature	[redacted]	[redacted]	

EXECUTIVE SUMMARY

An assessment of the likely impact of odour on residential receptors around the proposed site of the client's crematorium development at Duntrune has been undertaken.

The proposed cremator technology incorporates a number of pollutant abatement technologies covering particulate and vapour-phase species, which can be expected to have a significant impact on the controlled odour releases from the process. Fugitive emissions are considered to be negligible.

A simple semi-quantitative screening air quality assessment was used, utilising standard "FIDOL" scoring system in accordance with Institute of Air Quality Management (IAQM) guidance.

The assessment concluded that the aggregated odour impact - for worst-case constant operation of the facility (6 cycles per day) - is small and the receptor sensitivity is high, resulting in an overall *slight adverse* impact magnitude.

IAQM guidance indicates that this is not sufficiently *significant* to warrant recommendation of additional pro-active mitigation and control measures specific to odour within this design and planning phase.

CONTENTS

1.0 INTRODUCTION

1.1 At the request of Mr Paul Fretwell, @rchitects Scotland Ltd, Forfar, an air quality impact assessment has been undertaken for the proposed crematoria development at agricultural land to north-east of Duntrune House, Duntrune, Angus.

1.2 The client is acting as agent for the developer.

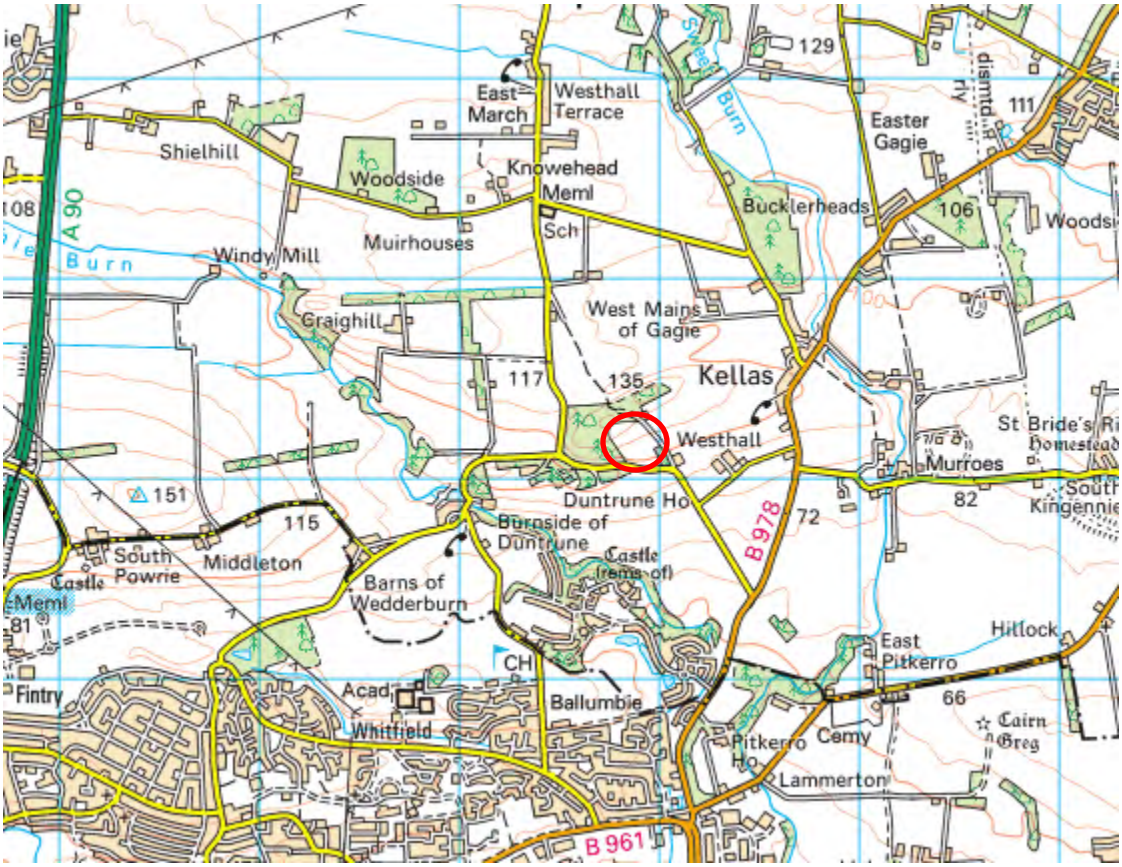
1.3 This assessment was undertaken by Dr Brian Gardner, Senior Consultant, Ethos Environmental Ltd. He holds first and research degrees in Environmental and Atmospheric Chemistry. He has worked as a health, safety & environmental consultant for 25 years and heads-up the company's air quality management consultancy services.

2.0 GENERAL BACKGROUND INFORMATION

2.1 The site is set in a rural location around 7km to the northeast of Dundee City Centre and around 0.5km to the east of the village of Burnside of Duntrune. The Site Location Plan is provided in Figures 1 and 2 below:

Figure 1. Site Location Plan (Satellite)

Figure 2. Site Location Plan (Mapping)



he proposed development is understood to have 120-seating capacity and is located across the southern half (approximately 2.0 Hectares) of ground (total 4.5 Hectares) owned by the developers. Figure 3 shows the site in closer detail and the proposed layout

Figure 3. Site and Development Layout

The site is surrounded by wooded areas to the north, east and west beyond which is generally agricultural land and to the south a road with agricultural land beyond that also.

The planning portal reference documentation relating to the site, the proposed development, and statutory consultation responses has been reviewed.

The Planning Officer has indicated that the development does not require submission of an Environmental Impact Assessment Report as required by regulation 5(1) and Schedule 4 of the Regulations. The *Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017*.

The cremation operations and associated processes have the potential to give rise to air quality impacts and Angus Council, Housing, Regulatory and Protective Services has requested an assessment of:

a. air quality impacts in accordance with Local Air Quality Management Technical Guidance TG(16), and
b. potential odour nuisance impacts.

The odour impact assessment is reported here (P8346.02); the air quality impact assessment is reported separately (P8346.01)

3.0 REGULATION & GUIDANCE

SEPA has published specific guidance on assessment of odour (SEPA, Odour Guidance, January 2010). This addresses primarily odour in relation to environmental permitting (eg PPC) and does not relate specifically to odour and planning.

The Institute of Air Quality Management (IAQM) has published more recent guidance (updated 2018) which more clearly addresses odour issues within the planning process (Bull et al [2018]. *IAQM Guidance on the assessment of odour for planning* – version 1.1, Institute of Air Quality Management, London. www.iaqm.co.uk/text/guidance/odour-guidance-2018)

4.0 ODOUR ASSESSMENT SCOPE & METHOD

4.1 Site Sensitivity

The crematorium is located to the west side of the development; the nearest receptors are estimated to be located at a distance of 213m to the east (A, two of) and 197m to the north (B, one of) of the proposed crematorium stack emission point (C) as shown in Figure 4.

Figure 4. Location of nearest residential receptors at A (2 properties) and B (single property)

From review of satellite images (GoogleMap data, 2021) there are estimated to be approximately 200 dwellings located within 1000m of the development site (See blue radius, Figure 5); these are almost exclusively located to south and south-west of the site and in the upper distance range of 700-1000m.

Figure 5. 1000m radius (blue) around development source

Preliminary review of the site of the proposed development does not indicate any sensitive receptors other than dwellings with limited exceptions. There is a hotel at 300m distance to west of site (Duntrune House). There is a primary school (Murroes Primary) at distance 1400m to north of the site.

There is no air quality management area in the vicinity of the site and there are not considered to be any existing odour impacts (eg waste treatment) on these receptors, other than potential seasonal agricultural impact.

The odour air quality assessment was undertaken in accordance with IAQM guidance on the assessment of odour for planning (Ver 1.1, 2018).

Air quality odour sampling/olfactory analysis, dispersion modelling or other quantitative assessment strategy was not considered appropriate. Initial review of the location and nature of the operations suggested also low likelihood (risk) of adverse odour effects. The site topography is not considered to discourage dispersal of emissions with a gentle gradient rising from south-east to north west of the immediate environs.

Specifically, the relatively low nuisance typically associated with crematoria odours, indicated that a single qualitative/semi-quantitative predictive assessment tool would suffice in providing sufficient weight of evidence without recourse to a formal modelling or monitoring approach.

The approach involved identifying the components of a source-pathway-receptor model for the development as follows:

- Baseline odour characteristics for the site and environs
- Potential site odour sources, characterised under FIDOL criteria (see section 5)
- Site meteorological characteristics (wind direction primarily) including pathway dispersion and dilution
- Nearest odour-sensitive receptors, characterised in terms of likely sensitivity

The assessment concludes with an evaluation of the overall odour *magnitude* and the likely risk of adverse *impacts* arising. A semi-quantitative scoring/ranking system is utilised for this.

5.0 ODOUR IMPACT ASSESSMENT

5.1 General

Review of the development layout (Site and Building Plans, lodged on planning portal file 20/00830 on 27 November 2020 and 2 December 2020) and process technology (Facultatieve, Technical Information A-C, lodged 2 December 2020) indicates that the main odour emission source will be the cremulator process exhaust emission stack. There will be negligible opportunity for fugitive emissions.

The technology incorporates a range of particulate-phase and vapour-phase abatement technologies for specific pollutants potentially present in either or both phases. The plant includes a range of temperature, oxygen and flue gas monitoring sensors and controls in support of this.

The client anticipates an average daily throughput of 3 cycles per day. The plant is designed to have capacity for a total of 6 cycles per day, each of which requires up to approximately 80 minutes to complete.

No specific odour control or mitigation measures have been identified as warranted by the client at this stage. Process Guidance PG5/2 (Crematoria) does not consider odour management plans or monitoring programmes as appropriate requirement for routine operation except as part of a mitigating response in the event of complaints arising.

5.2. Potential odour sources (existing and proposed)

There are not considered to be any significant potential existing odour sources associated with the existing site or environs.

It is understood that the site and local community otherwise has no particular known history of odour or more generally air quality complaints whether informally/anecdotally, or whether formally logged. From cursory review of the extensive range of responses in the Angus Council Planning Portal to the application it does not appear as if odour is a pertinent concern of the community.

There are no commercial receptors within 1000m, except for one hotel, and the nearest residential receptors are located in areas bounded by agricultural land-use activities. As such the pre-existing odour profile of the environs is not considered to be pristine: occasional odour impacts associated with application of manures, slurries, silage effluent etc must be expected. It is concluded that an odour-free environment cannot be reasonably considered a high-priority element of the overall area amenity.

It should be noted that crematoria did attract some small measure of notoriety for emissions to atmosphere in the 1980s and 1990s prior to widespread upgrade in abatement technologies following the 1990 Environmental Protection Act. Much of this also related to complaints of visible smoke rather than odour, or which exacerbated perceived odour impacts.

5.3 Odour Assessment

For the purposes of odour assessments, odours are typically described in terms of " FIDOL" factors (see Table 1).

Table 1. Description of the FIDOL Factors (reproduced from IAQM Odour Guidance, 2018)

Frequency	How often an individual is exposed to odour
Intensity	The individual's perception of the strength of the odour
Duration	The overall duration that individuals are exposed to an odour over time.
Odour unpleasantness	Odour unpleasantness describes the character of an odour as it relates to the 'hedonic tone' (which may be pleasant, neutral or unpleasant) at a given odour concentration/ intensity. This can be measured in the laboratory as the hedonic tone, and when measured by the standard method and expressed on a standard nine-point scale it is termed the hedonic score.
Location	The type of land use and nature of human activities in the vicinity of an odour source. Tolerance and expectation of the receptor. The 'Location' factor can be considered to encompass the receptor characteristics, receptor sensitivity, and socio-economic factors.

This assessment evaluates the odour impact on the residential receptors located at locations A & B (see Figure 4)

5.3.1 Frequency

In terms of frequency of exposure, it is noted that the cremation process requires approximately 80 minutes per cycle. It is considered unreasonable to assume consistent odour emission for all parts of the cremation cycle. Additionally, while the facility has capacity for 6 cycles per day, the developer is assuming a typical average throughput of 3 cycles per day. Full production can be expected to be a relatively rare occurrence therefore

Additionally, given the distance to nearest receptors, the impact frequency will be majorly impacted by dispersion and dilution of odours.

This assessment did not incorporate site-specific meteorological data. Nevertheless, prevailing wind directions for the site are assumed to be south to south-west, which can be expected to disperse any odour emissions for a significant proportion of the time in the direction of the nearest residential receptors in the immediate proximity (A, B)

5.3.2 Intensity

In terms of intensity, it is noted that the nearest receptors are located at distance 197-213m from the stack source. As such, dispersal and dilution of the odour concentration before reaching ground-level at the receptor will be very significant under nearly all meteorological conditions.

Air quality modelling (see report P8346.01 Table 4, page 15) suggests that likely worst-case distance downwind from the emission point will be approximately 100m. The distance to the three closest receptors is such that - when downwind - the average long-term ground-level air quality concentrations (of both particulate and vapour-phase pollutants) will typically be approximately 60% of the worst-case downwind location identified.

5.3.3 Duration

In terms of duration of exposure, any potential loss of amenity associated with odour will occur for at most 28.5% of the week (6 days per week at 8 hours per day) and will not occur outwith working hours. On the basis of the discussion regarding frequency factor, this factor is assumed to be further reduced for the majority of the time that the plant is not operating at capacity. On the basis of the above discussion the duration parameter is classed as potentially *low-to-medium.*

5.3.4 Odour Unpleasantness

In terms of odour unpleasantness, SEPA 2010 Guidance provides a summary of industrial processes in three categories of odour unpleasantness. This is reproduced at our Table 2 below.

Table 2. Relative offensiveness of industrial process odours (Reproduced from Table 2, SEPA Guidance on Odour, 2010)

Relative offensiveness of odour	Indicative criterion of significant pollution[note 2]
More offensive odours: Activities involving putrescible wastes Processes involving animal or fish remains Brickworks Creamery Fat & Grease Processing Waste water treatment Oil refining Livestock feed Factory	1.5 OU_E/m^3 (1.0 OUE $/m^3$)[note 3]
Odours which do not obviously fall within a high or low category: Intensive Livestock rearing Fat Frying (food processing) Sugar Beet Processing	3 OU_E/m^3 (2.5 OUE $/m^3$)[note 3]
Less offensive odours (but not inoffensive): Chocolate Manufacture Brewery Confectionary Fragrance and Flavourings Coffee Roasting Bakery	6 OU_E/m^3 (5.5 OUE $/m^3$)[note 3]
Note 1: Reference: EA H4 Guidance Appendix 6. Note 2: Odour Units (OUE) as 98th percentile of hourly averages. Note 3: Local adjustment for hypersensitive populations (odour generated a high level of complaint) - Reference: EA H4 Guidance Appendix 6.	

Reference to this guidance would suggest that this odorous process would be reasonably classed in the *medium* category on the basis that while the inherent objective offensiveness of the odour is low, there can be an understandable subjective unpleasantness associated with the knowledge of the odour origins.

No potential cumulative odour effects are anticipated to arise associated with other similar odour sources in the vicinity.

A simple scoring system is used in this assessment to try and semi-quantitatively take into account all the "FIDO" factors incorporated above. This provides a range from 1 (low) to 5 (high) of scoring options for each factor, which are therefore given similar relative weightings. This is shown in Table 3.

Table 3. Scoring

Factor	Score	Main considerations
Frequency	2	Daytime operations only further offset by distance to receptors/meteorological dispersion benefits
Intensity	2	Distance to receptors/meteorological dispersion benefits; prevailing wind direction; relatively low distinctiveness of odour type
Duration	2	Daytime operations, occasionally constant, offset by distance to receptors/meteorological dispersion benefits
Offensiveness	2	Medium category

An overall average score of 2 is obtained by this means. IAQM Guidance (2018) suggests that the overall odour impact obtained in this manner can be described along a spectrum as follows:

1- Negligible
2 - Small
3 - Medium
4 - Large
5 - Very Large

As such the impact can be concluded to be *Small*.

The fifth "FIDOL" factor (location) is discussed in section 5.4.

5.4. Odour-sensitive receptors

The nearest receptors are considered to be primarily residential. There are estimated at 1 dwelling within 200m and two just outwith 200m of the proposed emission source location, predominantly in prevailing downwind direction (north to east quadrants). No receptors within 1000m are considered to have specific odour sensitivities. Odour impacts outwith 200m radius are considered highly unlikely.

IAQM Guidance (IAQM, 2018) provides a summary criteria for evaluating receptor sensitivity (reproduced at Table 4) which would indicate that the receptor should be classed as "high-sensitivity".

Table 4. Receptor sensitivity to odours (Reproduced from IAQM Guidance, London 2018)

High sensitivity receptor	Surrounding land where: • users can reasonably expect enjoyment of a high level of amenity; and • people would reasonably be expected to be present here continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. Examples may include residential dwellings, hospitals, schools/education and tourist/cultural.
Medium sensitivity receptor	Surrounding land where: • users would expect to enjoy a reasonable level of amenity, but wouldn't reasonably expect to enjoy the same level of amenity as in their home; or • people wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. Examples may include places of work, commercial/retail premises and playing/recreation fields.
Low sensitivity receptor	Surrounding land where: • the enjoyment of amenity would not reasonably be expected; or • there is transient exposure, where the people would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. Examples may include industrial use, farms, footpaths and roads.

5.5 Odour Impact Assessment: Summary

it is concluded that the Relative Odour Exposure (Impact) is *Small* and the Receptor Sensitivity is *High.*

IAQM Guidance (Table 3) provides a means for combining these two aggregated factors to give the final *magnitude* of the odour effect. This is reproduced in Table 5 below.

Table 5. IAQM suggested descriptors for magnitudes of odour effects (Reproduced from IAQM 2018 Guidance)

		Receptor Sensitivity		
		Low	**Medium**	**High**
Relative Odour Exposure (Impact)	**Very Large**	Moderate adverse	Substantial adverse	Substantial adverse
	Large	Slight adverse	Moderate adverse	Substantial adverse
	Medium	Negligible	Slight adverse	Moderate adverse
	Small	Negligible	Negligible	Slight adverse
	Negligible	Negligible	Negligible	Negligible

This would suggest a "slight adverse" impact magnitude. The IAQM guidance suggests that a magnitude greater than "slight adverse" should be considered *significant,* and where odour effects are initially assessed as *significant*, details of appropriate further mitigation and control measures should be developed that could allow the proposal to proceed without causing significant loss of amenity.

6.0 CONCLUSIONS & RECOMMENDATIONS

6.1 It is concluded that the aggregated odour impact for worst-case constant operation of the facility (6 cycles per day) is small and the receptor sensitivity is high, resulting in an overall *slight adverse* impact magnitude.

6.2 This is considered insufficiently *significant* to warrant recommendation of further pro-active mitigation and control measures within this design and planning phase.

bsi. ISO 9001 Quality Management FS 547812 | ISO 14001 Environmental Management EMS 563106 | OHSAS 18001 Occupational Health & Safety Management OHS 563107

ethosenvironmental

TECHNICAL REPORT P8346.01

ASSESSMENT OF AIR QUALITY IMPACT: Proposed Cremation Facility, Duntrune

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			Prepared By	Reviewed By	
		Name	B Gardner	Scott Carlin	
		Signature	[redacted]		
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			Prepared By	Reviewed By	
		Name	B Gardner	Scott Carlin	
		Signature	[redacted]		

EXECUTIVE SUMMARY

An assessment of the likely impact of air quality on residential receptors around the proposed site of the client's crematorium development at Duntrune has been undertaken.

A simple screening air quality assessment was used, utilising emission limit values for the process, along with typical efflux volume flows. A worst-case ADMS dispersion model was run assuming constant uni-directional wind direction, and modelling of ground level concentrations of NO_2, carbon monoxide, PM_{10} and mercury directly downwind of the source across a range of distances (0-250m) including those typical of the direct line-of-sight distance to the nearest three residential receptors (~180-200m). The worst-case downwind ground-level location (100m) was then used in the evaluation of impact

Baseline air quality data was obtained where available from Scottish Air Quality Network to allow comparison against existing baseline levels and relevant air quality standards and objectives.

The assessment demonstrated that:

- existing ambient levels of the relevant pollutants were less than 75% of the relevant air quality assessment level (AQAL) specified by LAQM/EPS Guidance, and
- simplified, worst-case downwind ground-level air quality concentrations would not exceed 5% of the AQAL

In summary, the overall air quality impact associated with the development – even conservatively assuming various worst-case conditions - can be assumed to be *negligible* and no further modelling evaluation of impact significance is considered to be merited. Consideration as to potential specific mitigation measures for air quality, is also not deemed to be warranted.

CONTENTS

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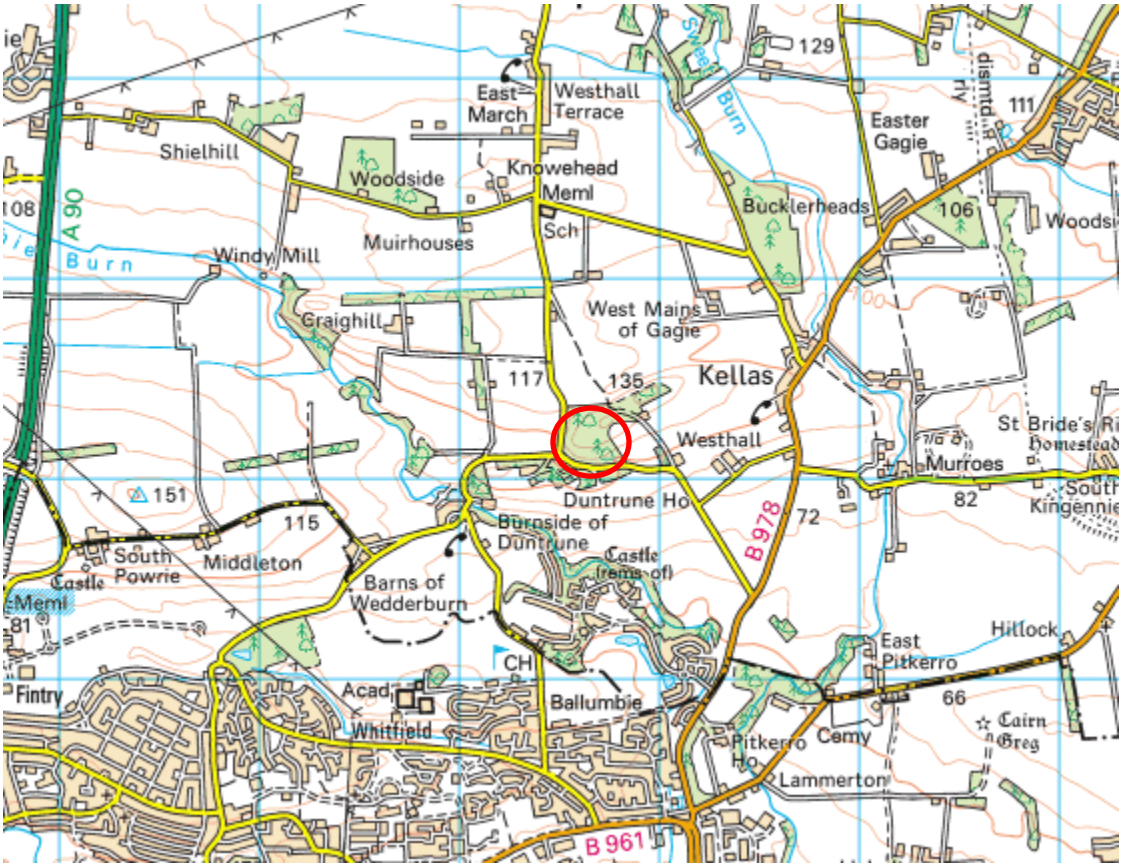

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The air quality impacts are reported here (P8346.01); the odour impact assessment is reported separately (P8346.02)

3.0 ASSESSMENT SCOPE

3.1 Site Sensitivity

The crematorium is located to the west side of the development; the nearest receptors are estimated to be located at a distance of 213m to the east (A, two of) and 197m to the north (B, one of) of the crematorium stack emission point (C) as shown in Figure 4.

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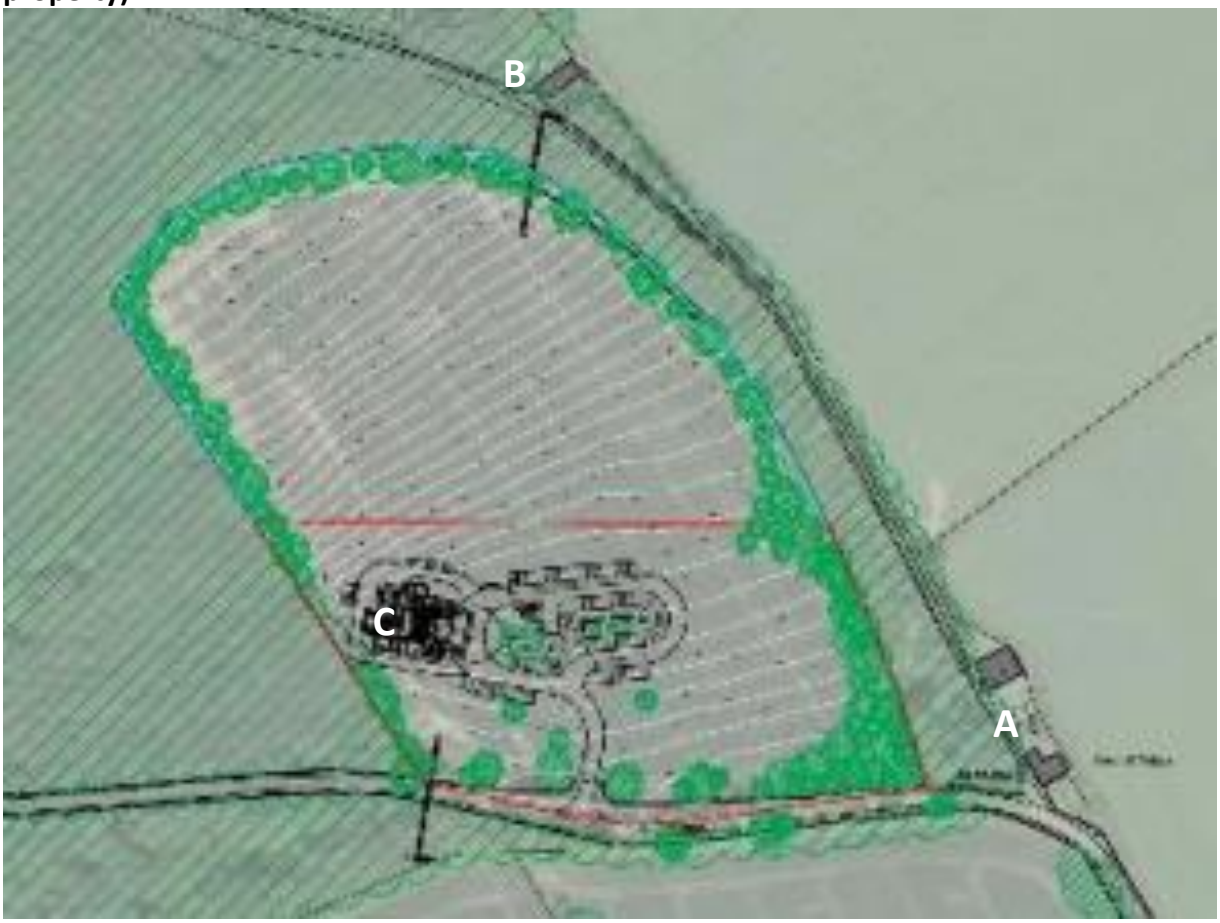

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Figure 5. 1000m radius (blue) around development source

Preliminary review of the site of the proposed development does not indicate any sensitive receptors other than dwellings. There is a primary school at distance 1400m to north of the site. There is no air quality management area in the vicinity of the site and there are not considered to be any existing air quality impacts (eg odour, waste treatment) on these receptors, other than potential seasonal agricultural impact.

3.2 Traffic-related Air Quality Impacts

A preliminary review of the traffic impact assessment undertaken by Cameron & Ross (Ref: A/190889, March 2020) identifies that traffic impacts associated with the development are unlikely to be significant with respect to air quality impact and are therefore not included within the scope of this assessment.

3.3 Crematoria Air Quality Impacts

Crematoria plant emit a range of pollutants to atmosphere from a single emission point (stack) with no significant fugitive, or other, emission types of concern. The crematoria process will be regulated by SEPA the *Pollution Prevention and Control (Scotland) Regulations (2000) (As Amended),* and the main emitted pollutants of relevance to air quality impact have emission concentration limits assigned which will be regulated by emission testing at commissioning and thereafter a regular compliance emission monitoring programme.

Odour impacts are not regulated in this manner, nor are “nuisance” type impacts such as dust deposition and potential soiling of windows and washing (clothing) of neighbouring residents.

4.0 AIR QUALITY ASSESSMENT STRATEGY & METHOD

4.1 General

The current objectives adopted in Scotland for the protection of human health are based on the *Air Quality Standards (Scotland) Regulations 2010* for the purpose of Local Air Quality Management (LAQM)

Of prime concern as expressed by and agreed with the Planning Authority in this respect are four pollutants: Nitrogen Dioxide (NO_2), Carbon Monoxide, Particulate Matter (expressed as PM_{10}) and mercury. Table 1 summarises the air quality objectives as presented in Table 1-1 of Technical Guidance on Local Air Quality Management (TG16).

Table 1. Air Quality Objectives (from Table 1-1, Local Air Quality Management Technical Guidance TDG16)

Pollutant	Objective	Averaging Period	Obligation
Nitrogen dioxide (NO_2)	200µg/m^3 not to be exceeded more than 18 times a year	1-hour mean	All local authorities
	40µg/m^3	Annual mean	All local authorities
Particulate Matter (PM_{10})	50µg/m^3 not to be exceeded more than 35 times a year	24-hour mean	All local authorities
	50µg/m^3 not to be exceeded more than 7 times a year	24-hour mean	Scotland only
	40µg/m^3	Annual mean	All local authorities
	18µg/m^3	Annual mean	Scotland only
Particulate Matter ($PM_{2.5}$)	Work towards reducing emissions/concentrations of fine particulate matter ($PM_{2.5}$)	Annual mean	England only
	10µg/m^3	Annual mean	Scotland only
Sulphur dioxide (SO_2)	266µg/m^3 not to be exceeded more than 35 times a year	15-minute mean	All local authorities
	350µg/m^3 not to be exceeded more than 24 times a year	1-hour mean	All local authorities
	125µg/m^3 not to be exceeded more than 3 times a year	24-hour mean	All local authorities
Benzene (C_6H_6)	16.25µg/m^3	Running annual mean	All local authorities
	5µg/m^3	Annual mean	England and Wales only
	3.25µg/m^3	Running annual mean	Scotland and Northern Ireland only
1,3-Butadiene (C_4H_6)	2.25µg/m^3	Running annual mean	All local authorities
Carbon Monoxide (CO)	10mg/m^3	Maximum daily running 8-hour mean	England, Wales and Northern Ireland only
	10mg/m^3	Running 8-hour mean	Scotland only
Lead (Pb)	0.5µg/m^3	Annual mean	All local authorities
	0.25µg/m^3	Annual mean	All local authorities

4.2 Modelling Scope

EA/SEPA has issued guidance on techniques for the assessment of air quality in the form of Local Air Quality Management Technical Guidance, TG(16).

This has been taken into account in considering an appropriate assessment strategy as follows.

- No assessment will be made for dust deposition given the distances to the nearest receptors and the pre-existing agricultural land-use in the area.

- No assessment will be made for traffic impacts on air quality given the low overall traffic volume impact anticipated.

- The air quality assessment does not include for the construction phase of the development.

4.3 Model Type and Parameters

The air quality assessment is not considered to warrant baseline or other air quality monitoring. Modelling has been undertaken on a screening basis, for assumed worst-case and typical volume throughputs using ADMS 5.0.0.1 dispersion modelling (Build number 5129 Licence No: A01-1616-C-ROADS-UK, valid to September 2021).

The emission limits for abated crematoria detailed in Process Guidance PG5 (Crematoria) are emission concentrations only with no limit applicable for the mass emission. The table 3 emission limits (non-abated) include a limit for mass emissions and uses a conversion factor assuming an efflux volume flow of 1500m^3/hour. For the purposes of this assessment we will use the more stringent Table 4 emission concentration limits (reproduced below at Table 2) and will assume the same volume flow factor to obtain mass emissions for inputting to the dispersion model.

Table 2. Emission Limits for Abated Crematoria (Table 4 to PG 5/12 Process Guidance Note (Crematoria))

Row	Substance	Mass emission limits per cremator	Concentration limits	Type of monitoring	Monitoring frequency
1	Mercury	n/a	50 micrograms/m^3	Periodic monitoring **(Note 1)**	Annual
2	Hydrogen chloride (excluding particulate matter)	n/a	30 mg/m^3 hourly average	Periodic monitoring	Annual
3	Total particulate matter	n/a	20 mg/m^3 hourly average	Filter leak monitor • Provide visual alarms and record levels and alarms • Set reference levels on commissioning (i.e. set levels at which alarms will activate) **Plus** Instrument health check - i.e. service according to manufacturer's instructions **Plus** Periodic monitoring • Set reference levels for continuous emission monitor (CEM) (i.e. set levels at which alarms will activate	Continuous **Plus** Annual **Plus** Every 3 years
For abated crematoria with a "multiple cremators/single abatement plant" configuration, the provisions of Row 4a apply. For abated crematoria with a "single cremator/single abatement plant" configuration, the provisions of either Row 4a **OR** Row 4b can apply but should be specified to the regulator at the earliest opportunity.					
4a	Carbon monoxide	n/a	100 mg/m^3 reported as 2 x 30-minute averages	Qualitative monitoring • Record data at 15 second intervals or less • Provide visual alarms and record alarm events **Plus** Periodic test: • Validation of continuous emissions monitor (CEM) output through comparison with periodic test results	Continuous **Plus** Annual

This conservatively uses emission concentration limits as the emission concentrations for the parameters shown in Table 3.

There is no emission limit value in PG5 for NO_2. As such we have used the limit expressed in DEFRA Waste Incineration Directive 2010 Guidance.

The process has capacity for 6 cycles per day and each cycle operates for a total of approximately 80 minutes. The client has advised however that typical daily average throughput is anticipated to be 3 cycles per day. For the purposes of the modelling we have assumed that emission concentrations equivalent to the emissions concentration limits will be being emitted constantly, with no correction for percentage of the reference period (eg 24 hour day, 365 day year) in which the process is operating. For those modelled air quality concentrations referenced over periods in excess of a typical cycle (eg 80 minutes), such as 24-hour averages or annual averages, the modelled assumptions therefore represent a significant simplification – and exaggeration – compared to real conditions.

Table 3. Modelling Parameters

Pollutant	Source
Carbon monoxide	Mass emission level of 150g/hour based on process volume flow rate assumptions (1500m^3/hour) and carbon monoxide emission concentration limit of 100mg/m3 [1]
PM_{10}	Mass emission level of 30g/hour based on process volume flow rate assumptions (1500m^3/hour) and total particulate emission concentration limit of 20mg/m3 [1]
NO_2	Mass emission level of 300g/hour based on process volume flow rate assumptions (1500m^3/hour) and 200mg/m^3 emission limit [2]
Mercury	Mass emission level of 75mg/hour based on process volume flow rate assumptions (1500m^3/hour) and 50ug/m^3 mercury emission concentration limit [1]

1. Table 4, PG 05/2
2. Value for Nitrogen monoxide (NO) and nitrogen dioxide (NO2), expressed as nitrogen dioxide for existing incineration plants with a nominal capacity exceeding 6 tonnes per hour or new incineration plants Par 4.50 Waste Incineration Guidance, 2010 (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/201215/pb-13570-wid-guidance-201003.pdf)

Efflux gas velocity is assumed to be approximately 370^{o}C based on review of stack emission monitoring reports for similar processes (Scientifics Report Ref@ 091121 *Stack emission monitoring report – Part 3,* as lodged in Planning Portal for Application 20/00830 on 2nd December 2020)

The stack height is assumed to be 10.0m as detailed in Building Plan layout. The stack dimensions are assumed to be 0.4m diameter with 15 m/s efflux velocity. A 0.3m surface roughness (agricultural areas maximum) is used in the model. There is no allowance made for local topography in the screening model.

For the screening model, instantaneous worst-case wind direction conditions are used, with meteorological dataset R91A-G representing a highly-localised westerly wind distribution (see Wind Rose image at Appendix 1) and modelling for ground-level concentrations at various distances (50-250m) directly downwind of the source including the distances of relevance to both residential receptors A and B (~200m). Baseline air quality levels are obtained from the Scottish Air Quality Network data, modelled for 2022. The resulting air quality impacts (baseline plus development source) are then variously evaluated by comparison against:

a. Air quality standards
b. Percentage increase over baseline levels

This is reported and evaluated at Section 5.0

5.0 DISPERSION MODELLING & EVALUATION

5.1 Modelling Results

As discussed at section 4.1, results are modelled for worst-case wind direction conditions using a highly-localised wind distribution with modelling for ground-level concentrations at various distances downwind of the source including the distances of relevance (~200m) to both residential receptors A and B.

The modelling for PM10 further conservatively assumes that all the total particulate material emitted can be classed as PM_{10}.

The model uses the emission limit values contained in the Process Guidance to obtain mass emission limits (for carbon monoxide, PM_{10} and Mercury). It should be noted that actual emission concentrations can be expected to be some margin lower than these limits.

It should additionally be noted that in referencing against annual or 24-hour average air quality standards, there is no weighting applied in this model to take into account periods when the crematorium is <u>not</u> in operation, though this is likely to be approximately:

50% of the working day
<20% of the 24 hour day, and
<20% of the annual period

Modelling for NO_2 assumes that all NO and NO_2 is expressed as NO_2. The model uses the emission concentration limit for NO_2. from waste incineration, in the absence of such a standard specifically for crematoria

Modelling results are shown in table 4 for a range of distances directly downwind

Table 4. Modelled ground-level concentrations of the target pollutants at various distances downwind of the stack point source

	Distance to Receptor				
Pollutant	**50m**	**100m**	**150m**	**180m**	**250m**
Carbon monoxide, ug/m^3	1.72	2.00	1.49	1.23	0.82
PM_{10}, ug/m^3	0.33	0.38	0.29	0.24	0.16
NO_2, ug/m^3	3.62	4.24	2.96	2.45	1.61
Mercury, ug/m^3	0.83×10^{-03}	0.96×10^{-03}	0.71×10^{-03}	0.59×10^{-03}	0.40×10^{-03}

These results therefore show the worst-case constant downwind concentrations; these conditions will obviously occur at the A&B receptor locations for significantly less than 50% of a year-round reference period.

5.2 Referencing

The results presented in Table 4 are referenced in Table 5 against a range of assessment criteria.

Table 5. Evaluation of modelled results

Pollutant	Assessment Criteria	Comment
Carbon monoxide	Air quality standard of 10,000 ug/m^3 running 8-hour mean	Worst-case modelled results (PC) at peak ground-level location (~100m downwind) are 2.0ug/m3. There is insufficient ambient data to express this on top of background levels as Predicted Environmental Concentration (PEC). The process contribution (PC) represents **0.02%** of the air quality criteria
PM_{10}	Air quality standard of 18ug/m^3 annual mean	Worst-case modelled results at peak ground-level location (~100m downwind) assuming all total particulate material is PM_{10} (PC) are 0.4ug/m3. This is **2.2%** of the air quality criteria
PM_{10}	Typical background level of 11ug/m^3 based on Scottish Air Quality Network Data [3]	Worst-case modelled results at peak ground-level location (~100m downwind) assuming all total particulate material is PM_{10} is 4.2ug/m3. This is **3.6%** of the background, will give a Predicted Environmental Concentration (PEC) of 11.4ug/m3 , and will increase the background from **61 to 63%** of the air quality standard
NO_2	40ug/m^3 annual mean	Worst-case modelled results at peak ground-level location (~100m downwind) (PC, process contribution) are 4.2ug/m3. This represents **10%** of the air quality annual mean criteria
NO_2	200ug/m^3 1-hour average not to be exceeded more than 18 times per annum	Worst-case modelled results at peak ground-level location (~100m downwind) (PC) are **2.1%** of the 1-hour average air quality criteria
NO_2	Typical background level of 6.8 ug/m^3 based on Scottish Air Quality Network Data [3]	Worst-case modelled results at peak ground-level location (~100m downwind) will raise the ambient level to 11ug/m3 (Predicted Environmental Concentration, PEC). The PC is **62%** of the background level and will increase the background as a percentage of the annual mean air quality standard from 17% to 27%
Mercury	Average background level 2.0 x 10^{-03} ug/m^3 (Brown et al, 2015 [1])	Worst-case modelled results at peak ground-level location (~100m downwind) are 1 x 10^{-3} ug/m^3 (PC), and approximately 50% of the UK average background level. This will result in a PEC of 3.0 x 10^{-03} ug/m^3 **,**
Mercury	20ug/m^3 HSE Workplace exposure limit[2]	Worst-case modelled results at peak ground-level location (~100m downwind) will deliver a PEC that is approximately **~0.15%** of the workplace exposure limit. See discussion below for interpretation.

1. Richard J.C. Brown, Sharon L. Goddard, David M. Butterfield, Andrew S. Brown, Chris Robins, Chantal L. Mustoe, Elizabeth A. McGhee, Ten years of mercury measurement at urban and industrial air quality monitoring stations in the UK, Atmospheric Environment, Volume 109, 2015, Pages 1-8, ISSN 1352-2310, https://doi.org/10.1016/j.atmosenv.2015.03.003.
2. HSE Guidance Note EH40/2005, Jan 2020
3. Baseline air quality data for PM10 and NO_2: http://www.scottishairquality.scot/data/mapping?view=data

5.3 Evaluation

Environmental Protection Scotland and the Institute for Air Quality Management have published guidance (*Land-Use Planning & Development Control: Planning For Air Quality*) to assist in evaluation of air quality in planning and development control processes.

The modelled results can be interpreted against the relevant air quality objectives in terms of Table 6.3 to the EPS/LAQM Guidance. This is reproduced in Table 6 below

Table 6. Impact descriptors for individual receptors (from Table 6.3 to *Land-Use Planning & Development Control: Planning For Air Quality*)

Long term average Concentration at receptor in assessment year	% Change in concentration relative to Air Quality Assessment Level (AQAL)			
	1	2-5	6-10	>10
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

This table should normally be used with modelled annual average concentrations. Modelled ground-level (Z=0) air concentrations across the site indicated *negligible* increase in levels of pollutants.

It can be seen from Table 5 that for carbon monoxide and PM_{10} existing ambient levels are less than 75% of the relevant air quality AQAL, and the modelled levels are less than 5% of the AQAL. As such the relevant impact descriptor for these parameters – even with various simplified worst-case scenarios – is *negligible*.

For NO_2, existing ambient levels are less than 75% (17%) of the relevant long-term air quality AQAL. The simplified worst-case air quality concentration used to date is 10% of the AQAL. If we introduce a more representative modelled concentration by assuming active cremation for only 8 hours per day (6 cycles at 80 minutes each) for 6 days per week (rather than 365 days x 24 hours), the worst-case ground-level concentration (100m distance) drops proportionately (28.5%) and the revised worst-case air quality concentration will therefore be 2.8% of the AQAL. As such the relevant impact descriptor for this parameter – even with a number of other simplified worst-case conditions – can be considered *negligible*.

For mercury the worst-case modelled air quality concentrations (Process Contributions) are less than 50% of the average UK background level. There is no formal long-term annual assessment

level for mercury. We can however in the absence of such, adapt existing workplace exposure limit (WEL) criteria used for occupational exposure settings. These are published by the Health and Safety Executive (EH40). We cannot use these directly, as these are meant to be applied for working exposure durations (ie 40 hours per week rather than potential 24 x 7 exposure), and are also applicable to a working population who are typically more healthy than the non-working population, which may include infants, elderly, immune-compromised etc. Traditionally an approximate 30-fold factor is used as a safety margin to account for these two factors when applying occupational exposure criteria to the environmental setting. Applying this to the 20ug/m^3 EH40 WEL results in an ad-hoc AQAL of 600ng/m^3. It can be seen that the worst-case (100m) ground-level modelled mercury concentration (1ng/m^3) is <5% of the ad-hoc AQAL. As such the relevant impact descriptor for this parameter – even obtained with a range of simplified worst-case conditions – can be considered *negligible*.

In summary, the overall air quality impact associated with the development – even conservatively assuming various worst-case conditions - can be assumed to be *negligible* and no further modelling evaluation of impact significance is considered to be merited. Consideration as to potential specific mitigation measures for air quality, is also not deemed to be warranted.

5.4 Stack Height Assessment

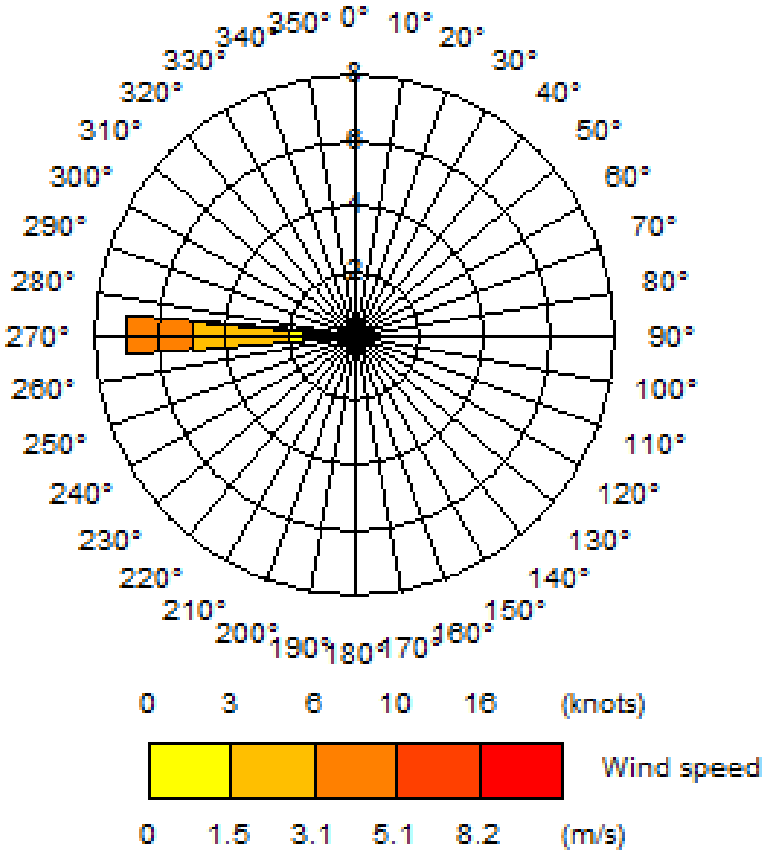
The screening assessment scope does not include for advising the client on optimum stack height - which can be subject to other planning complications (visual intrusion) – or under best available technique criteria.

The screening assessment reported here relates to the 10m stack height proposed by the client. The scoping study indicated that the 10m stack height - combined with the proposed abatement technology – could be expected to readily satisfy BAT requirements.

The subsequent screening assessment indicates negligible air quality impact despite a number of major worst-case assumptions. As such there is considered to be no technical merit in evaluating impact for proposals with greater stack height options, and no environmental benefit (in terms of air quality) in evaluating the impact from reduced stack heights.

APPENDIX 1. Wind Rose used to establish worst-case (downwind) concentrations

C:\Program Files (x86)\CERC\ADMS-Urb\Data\R91A-G.MET



From: Paul Fretwell
Sent:30 Apr 2021 18:27:52 +0100
To: Fraser MacKenzie
Cc:PLNProcessing
Subject: Proposed Crematorium - Burnside of Duntrune - ref. 20/00830/FULL
Attachments: Planning & Design Statement.pdf, 906 Rev 1 - Visibility Splays Sheet 3.pdf, Crem Post App Report.pdf, P8346 Air Quality Assessment Report Duntrune Crematorium.pdf, P8346.02 Odour Assessment Report Duntrune Crematorium.pdf, PD01 Rev C - Building & Ext works.pdf, PD02 Rev C - Site Plan.pdf, PD06 Rev C - Road Access.pdf

30 April 2021

Hi Fraser

Apologies in the delay in getting back to you. However as discussed previously we felt it would be beneficial to all that we pulled together a package of information rather that drip feed it to you.

Attached is the relevant updated / new information as previously discussed. Additionally and specifically in relation to some of the queries raised we would loke to provide the additional following comments:

Local Availability

On the 9th of Feb the earliest available booking at for Dundee Crematorium was 26th. February.

Drive time analysis Report

While we do not agree with the conclusions drawn the current likely total annual cremations for the proposed site stated in the report are approximately 538, which the operator would be highly satisfied with in terms of their business plan and viability of the proposals. The report however fails to recognise both the projected year on year growth in deaths and the local situation both in terms of the draw beyond the limited and more urban and in this instance arbitrary half hour travel time used. The impact of the rural location, topography, road infrastructure etc. have significant effect on draw. The report provided does not even include Forfar or Kirriemuir as a potential demand location. Additionally, factors relating to costs and size limitations will potentially further increase the demand; as will also the fact that the next crematorium north of the area considered in the report is the crematorium at Crathes (nearly 46 miles away, over an hour by car) extending the potential catchment area potentially as far as Laurencekirk particularly when considering accessibility and road infrastructure. This also applies to the area of Angus north of Dundee and also into Perth and Kinross.

Traffic Counts and Speed/Link Flow Surveys

While traffic counts can be lower in school holidays. If a higher base flow was assumed this would only lessen the percentage impact of the development on the surrounding road network in comparison to the existing traffic flows and therefore the conclusion that no further junction assessment is required as a result of a low percentage increase on the local road network would still remain the conclusion of the TA. The speed survey results if higher traffic volumes were encountered would likely only reduce the 85% tile speeds however only a marginal difference could be expected which again would not alter the conclusions drawn from the speed survey results which were used to agree the visibility splay requirements with Angus Council.

Traffic Distribution

The distribution model used in the TA was accepted by both Angus Council Traffic Team and Dundee City Council Development Roads Team. It would not be expected that an alternative distribution would greatly affect the conclusion of the TA.

Traffic Generation

The Paragraph 4.6 and 4.7 are not inconsistent. There will be a minimum of a 1hour gap between services as maintained by the operator□s procedures and explained in paragraph 4.6. As this is the gap between services it would be expected that within the minimum 1 hour period between services that those arriving for the next funeral and those leaving after the previous funeral could occur within a one hour period and hence for robustness these trips were added together into what would be considered to be a robust peak hour traffic generation for the development. Where large funerals are expected the gap between services would commonly be expected to be increased although these are not expected to occur with any great frequency.

Road Layout

The proposed road layout drawings also mitigate the impact of the development traffic by the provision of road widening along the frontage and 5 No new passing places within the single track roads. This of course enhances the safety of the surrounding road network for existing road users as well as those generated by the development. The location and extent of new passing places has been agreed with Angus Council Traffic Team. The extent of the road network assessed, and distribution was agreed with Angus Council Traffic Team.

Regards

Paul Fretwell

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Ecology and Protected Species Report

Plot of Land
Burnside of Duntrune.
Dundee
DD4 0PJ

May 2021

Figure 1. Site Plan.

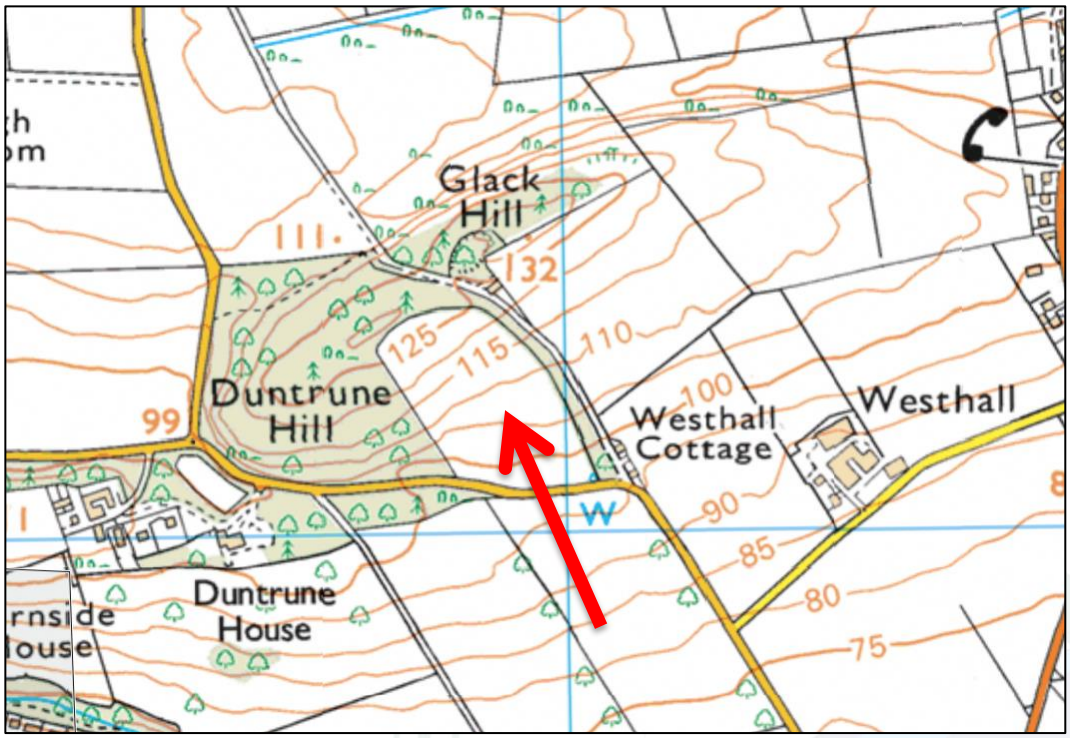

Figure 2. Site Location

Introduction

1.1 Licensed bat worker and ecologist Dr Garry Mortimer was commissioned in April 2021 by to carry out an ecology and protected species assessment on a small plot of land at Burnside of Duntrune, Dundee DD4 OPJ (Figures 1 & 2). This survey is as required by Council in regards to a potential planning application.

1.2 This report has been undertaken in accordance with the 'Guidelines for Ecological Impact Assessment in the UK' (Chartered Institute of Ecology and Environmental Management (CIEEM), 2018).

1.3 This report identifies approaches likely to be required, subject to formal consultation with Scottish Natural Heritage, Local Planning Authorities and other relevant parties.

1.4 Legislative context

A number of sites, habitats and species are protected under European and UK legislation, and may present constraints to site development.

Principal legislation and guidance which will be considered are:

- Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the Habitats Directive) 1992;
- Conservation (Natural Habitat &c.) Regulations 1994 (as amended);
- The Wildlife and Countryside Act 1981 (as amended);
- The Nature Conservation (Scotland) Act 2004;
- Protection of Badgers Act 1992;

1.5 Species that are protected include bats, badgers, otters, water voles, red squirrels and great crested newts. Protected sites and habitats include Sites of Special Scientific Interest (SSSI), Special Protection Areas (SPA) and Special Areas of Conservation (SAC).

1.6 Badgers

Both badgers and their setts are protected by law. The Protection of Badgers Act 1992 (Scottish Version) brings together all of the previous legislation specific to badgers (except their inclusion on Schedule 6 of the 1981 Wildlife and Countryside Act as amended Nature Conservation (Scotland) Act 2004). As a result it is an offence to:

- Willfully kill, injure, possess or cruelly ill-treat a badger, or attempt to do so;
- To intentionally or recklessly interfere with a sett;
- To disturb a badger when it is occupying a sett;
- Damage or destroy a sett;
- To obstruct access to, or any entrance of a badger sett.

A badger sett is defined in the legislation as '*any structure or place, which displays signs indicating current use by a badger*'. *'Current use*' does not simply mean 'current occupation' and for licensing purposes it is defined as *'any sett within an occupied badger territory regardless of when it may have last been used'.* A sett therefore, in an occupied territory, is classified as in current use even if it is only used seasonally or occasionally by badgers, and is afforded the same protection in law.

Site Description

1.7 The site at Burnside of Duntrune comprises a small field set in a rural area north of Dundee (Figures 1 & 2). Adjacent, to the west of site is Duntrune Hill, a mature deciduous/mixed woodland and to the south is a minor road. The field is rough grassland, no trees, buildings or water are present within the field (Figures 3-4).

Figure 3. Grass field looking north.

Figure 4. Grass land with woodland around western edge.

METHODOLOGY

1.8 Data Study

A data search was done with SNH Site Link to identify any designated ecological sites along the route.

1.9 Field Survey

Field surveys were carried out in April 2021 in good weather conditions.

RESULTS

1.10 Ecological Sites within 2km of Site

Ecological feature	Zone of impact from site boundary	Sites
Internationally designated sites (SPA, Ramsar)	Within 2km	None
Nationally designated sites (SSSI, NNR)	Within 1km	None
Locally designated sites (LNR, WS)	Within 1km	None

PROTECTED SPECIES

1.11 Birds

Generally, ornithological surveys or desktop surveys are required to assess potential impacts of birds throughout the year, which could arise due to:

- Potential loss, fragmentation and degradation of bird habitats arising from the construction of the water mains route.

1.12 Given the homogenous habitat of a rough grass fields and lack of suitable breeding habitat it is considered that the proposed construction would have a negligible significance of impact on any breeding species likely to be present.

1.13 Species present in nearby woodland and hedgerows would include common passerines that are recorded locally as common residents or summer visitors whose populations are not threatened and are in favourable conservation status in Scotland. None would be specially protected.

1.14 Mitigation

No mitigation needed.

1.15 Protected Mammals

No suitable habitat exists on site in the footprint for otter, bats, great crested newt or any other European Protected Species.

1.16 Results

No signs of any EPS were recorded.

1.17 Mitigation

No mitigation needed.

1.18 Badgers

No signs of badger were recorded, however they are known to be widespread in the general area. It would be expected that they traverse across site occasionally.

1.19 Mitigation

If a badger sett is found within a 30m corridor of the construction footprint when work commences then suspend work in the immediate area and contact an Ecological Consultant to assess the situation.

DISCUSSION

1.20 The purpose of this survey was to gain an understanding of the potential ecological issues that may arise during any development at the site. The survey comprised a walkover of the site to evaluate the likely presence of protected species and or habitats. Specific searching was carried out for these protected species and an evaluation of the potential habitat.

1.21 The construction footprint area is a grazing field with no trees, buildings or water present.

1.22 The site was surveyed for signs of protected mammals, European Protected Species and bats following recognised methodology. No signs were recorded of any protected species.

1.23 No nationally or internationally protected habitats were identified in the assessment.

CONCLUSION

1.24 The site at Burnside of Duntrune is considered poor from an ecology viewpoint.

1.25 It is considered that no protected species or habitats are present on site.

1.26 Badgers are widespread in the general area and if new setts are found within a 30m zone of the construction footprint when work commences then workforce will need to contact GLM Ecology or an Ecological Consultant to assess the situation.

1.27 In my professional opinion the proposed construction work would have no adverse impact on any protected species or habitats and that no further survey work is required.

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DISCLAIMER

This report has been prepared by Dr Garry Mortimer of GLM Ecology, with all reasonable skill and care within the terms of the agreement with the client. Dr Mortimer disclaims any responsibility to any parties in respect of matters outside this scope.

Best efforts were made to meet the objectives of this study through desktop study and field survey.

Information supplied by the client or any other parties and used in this report is assumed to be correct and GLM Ecology accepts no responsibility for inaccuracies in the data supplied.

It should be noted, that whilst every endeavour is made to meet the client's brief, no site investigation can guarantee absolute assessment or prediction of the natural environment. Numerous species are extremely mobile or only evident at certain times of year and habitats are subject to seasonal and temporal change.

GLM Ecology accepts no responsibility to third parties who duplicate, use, or disclose this report in whole or in part. Such third parties rely upon this report at their own risk.

Document Prepared By
Dr Garry Mortimer
GLM Ecology

PROPOSED CREMATORIUM

BURNSIDE OF DUNTRUNE, BY DUNDEE, ANGUS

Rev B SEPTEMBER 2021

PLANNING DESIGN & ACCESS STATEMENT

@rchitects
Chartered Architects

2353

LOCATION

The site is located to the south of Angus, north of Dundee and to the east of the A90. It is provided with good transport links to the surrounding area and beyond via both the A90, to the west and the B978 (Kellas Road) to the south and east. The A90 provides trunk road links to the north through Angus and beyond. To the south it connects to Dundee, Perth and the M90. The site also readily connected to the A92 providing link up the east coast of Angus and beyond. The site is discreetly located and is well suited to the nature of this type of use.

This type of development is not suitably located within existing settlements or development boundaries for two main reasons. Firstly the requirements of the Crematorium Act which I have covered. This requires a site of around 2 acres (preferably with space for possible future expansions of the landscape / memorial use). The site also needs to allow the crematorium not to be built closer than 200 yard from a dwelling house and no closer than 50 yards from a public highway (considerable distances). Both of which criteria the current proposals just meet. It also says a suitable site should preferably already benefits from existing landscaping such as mature trees, hedgerows and advantageous to benefit from pleasant views. A crematoria needs an appropriate and sensitive setting in relation to its use. Due to these requirements this use is not suited to available sites (brownfield or greenfield) within the existing development boundaries of the existing settlements, as such and in accordance with Policy DS1 there are no suitable and available brownfield sites capable of accommodating the proposed development. This type of land use was historically located on the rural edges of settlements and the only other crematoria in Angus is located in a likewise rural location. Secondly the proposed crematorium is strategically located in south Angus in relation to the surrounding settlements The surrounding area has a population of approximately 265,529 people with about 20% of these aged 65 or over. The dispersed settlement characteristics of this area of Angus and good access makes this site a logical choice.

SITE

Site History

Currently the site is covered with rough grassland but is not being farmed regularly due to its relative low quality and difficult terrain for modern farming practices. Through checking of the Macaulay Land Capability for Agriculture (LCA) classification it has been demonstrated that any development of the site would not constitute a loss of prime agricultural land.

The site measures 1.98 hectares (Red Line) and the total area of ground owned by the applicants (Blue Line) measures 4.51 hectares.

The ground slopes from north west to south east and the site is bounded to the south by the public road. The north west and east of the site is walled with a dry-stone wall with an established woodland beyond. The remaining area of ground in the client's ownership will be brought into appropriate management as part of these proposals.

Access to the site is to be gained from the adjacent road running along the south side of the site.

DESCRIPTION OF PROPOSALS

The crematorium building is designed to face directly towards the entrance with the ground rising gently towards the access. The floor area of the crematorium is 496 sq. m. and in terms of the building, its size and general arrangement are dictated by its function. The entrance and reception hall are to the front (east) with the main hall directly behind. The cremator and servicing are then to the rear (west) of the building. To the north are the offices with the public exit point to the south where there are the most views from the site.

The position of the building nestles within the general fall of the site. This combined with the surrounding landscape, trees etc. screen the proposals completely from the west round to the east. Viewing from the adjacent road is screened by a new dry-stone wall and hedge / tree planning. The site is further screened by the mature trees to the south of the road. Additional native tree planting is incorporated into the proposals particularly to the east, screening the proposals further from this angle and further enhancing the sense of enclosure.

The position of the crematorium building within the site has been carefully chosen, so that it nestles within a natural landscape. Its location within the site will mean that it is not visible from the west, north or east and is barely visible from the south. Views from the south will be from distant vantage points and will be mostly obscured by trees along public roads.

The principal view into the site will be when passing on the adjacent road along the south side of the site, which will be glimpse views through the proposed planting and screened by a new drystone wall and hedging.

There are only three dwellings within 300m of the crematorium building. With the nearest dwelling some 183 metres away and the intervening mature woodland means that the site will not be directly visible from any dwelling houses or the surrounding areas. The site entrance itself includes a feature stone entrance wall, and gates, which will be locked when the crematorium is closed.

The crematorium building is rectangular in shape with a predominantly natural slate roof and clad elevations. The size, shape and layout of the crematorium building is largely dictated by its function with the reception area to the front of the building, the main hall within the middle part of the building and cremator area to the rear of the building. The administrative areas are to the north giving control over and access to the public areas as well as the service access and cremator area. The stack is on the rear roof section and projects above the roof level minimally.

The site will incorporate an internal one-way road, parts of which can be used as overspill parking when there is a large service. There will be 127 car parking spaces, 7 of which will be for disabled drivers, and there will be space coaches to pull up and wait. A planted garden and memorial garden will be located to the front and south of the crematorium building incorporating grassed areas, memorials and flower/shrub beds. Staff car parking including electric vehicle charging will be located to the rear of the crematorium building as will the service area and accessed along with the service area to the north of the building. A simple agricultural stob and wire fence will define the northerly perimeter of the crematorium site and the applicants intend to undertake some additional native tree planting out with the site, but still within land in their ownership.

Services will take place primarily during the week (between 9am to 5pm), however there may be some services on a Saturday. From figures obtained from the intended operator It is unlikely that there will be any more than 4 services per day, however it is likely that the average will be 3 services per day. By the purpose of its use the crematorium can be considered a community facility that will satisfy an established demand in the area.

The proposed crematorium is strategically located in relation to the surrounding settlements. The surrounding area has a population of approximately 265,529 people with about 20% of these aged 65 or over. This type of land use was historically located on the rural edges of major settlements. Due to the nature of its use it is obviously not suited to residential, commercial or employment areas and this combined with the dispersed settlement characteristics of this area of Angus and good access makes this site a logical choice. These proposals are well served by the existing road infrastructure and a proposed crematorium in this location will reduce journey times compared to the existing alternatives.

The proposals make best use of the existing landforms, walls, trees and woodland. Maintaining the privacy of both the users and the nearby neighbours. The high-quality design and scale of the proposals fit well with the landscape and will not have any significant impact on surrounding properties or existing land uses. The development of the crematorium will not affect the viability or vitality of the existing villages or town centres and to the contrary has the potential to benefit some of the established businesses in the area.

DESIGN PROPOSALS

Site Context

Rural and Agricultural Context

Buildings and structures in the area of Burnside of Duntrune and the wider context of Angus have historically used a mixture of natural stone and timber materials sourced locally from quarries and locally grown timber. The roofs are generally finished using either stone and slate tiles, with some old corrugated roof materials. Modern agricultural developments however utilise a mixture of quick build products mainly of steel structures with corrugated metal and timber panels. This area, like most of rural Angus shows this palette of materials along with simple traditional building forms. The local boundaries to the fields and properties are traditionally made of local field stone and sandstones, either mortared or more commonly as dry-stone walling, more recently stob and wire fencing has been used. Trees planting to edges with pockets of woods are also common providing shelter for both crops and wildlife against the prevailing winds.

Site Strategy

- Shelter from prevailing winds by the existing wood: building siting to utilise natural defence and nestle into the landscape.
- Use existing strong boundary enclosure: use woodland and wall enclosure to reduce impact of building.
- Main views to south: building position to take advantage of these while keeping its visual impact low.
- Sloping site: use logical floor level to maintain views and minimise site impact/parking impact and allow for a natural run of drainage. Use the site to help with the processional arrival. Visually separation from the public areas of the service access.
- Desire lines and geometry: maximise approach aspect to the building by approach leading to main elevation when turning into the site. Use aspect towards views to generate circulation routes.

Concept and Precedence

The main concept is to create a modern crematorium which reflects the traditional simple agricultural forms that are typical of this area of Angus. The form will be softened in the landscape through the use of form, large overhanging roof and the use of traditionally referenced materials expressed with an appropriate high-quality to the public areas. Cladding, Slate roof and glulam timber frame.

Design

The design of the internal roads and in particular the route to the entrance canopy has been developed to satisfy the ceremonial needs of the congregation. The landscaping design is a very important part of the crematorium and it will serve three essential functions:

- it will provide a calm, contemplative, beautiful environment as a setting for the crematorium building.
- it will provide a focus on the natural environment within and beyond the site.
- it will provide a context for the crematorium building.

Public toilets are provided close to the entrance and disabled visitors have easy access. The main hall is light and airy and affords views from the site. The administration space and cremator equipment is housed to the rear of the building together with the filtration plant.

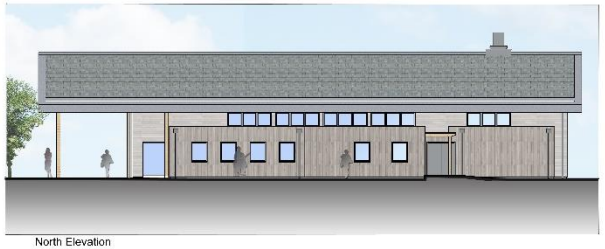
The stack is discretely located towards the rear of the crematorium building and protrudes only 1.25 metres above the ridge of the roof. Technical information on emissions and the cremator itself have been submitted as separate documents in support of the proposal.

Foul and surface water drainage will be dealt with by way of treatment plant and soakaway. A separate Drainage Proposal Report has been submitted in support of the proposal.

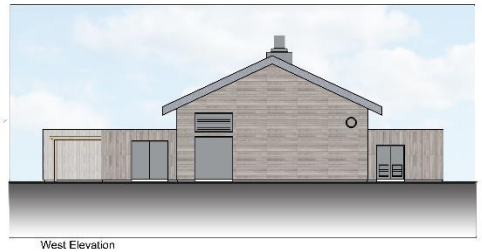
Heating for the crematorium building will be provided predominantly by waste heat recovery, with any shortfall made up by a boiler running on gas.

Ground Floor Plan

East Elevation


North Elevation


South Elevation


West Elevation

Access and Transport:

These proposals are very well served by the existing road infrastructure and a proposed crematorium in this location will reduce journey times compared to the existing alternatives. The roads department has no objection to the proposals.

Due to the nature and type of the proposed crematorium journeys are made by private car or occasionally by private hire bus. A cremation is attended by family and friends and this combined with the emotional nature of such an activity public transport is not used. Car sharing is however very high and tends to be arranged by the family and friends directly. As such this type of proposals do not demand or justify the need for public transport links, in accordance with Policy DS2. This is also influenced by the location requirements discussed previously. The transport assessment previously agreed also reflects this and adequate parking provision has been included accordingly.

While each council obviously has differing local plans, these are generally in line with the relevant national policies and where relevant TAYplan. Within the last few years similar crematoria have been approved in both Fife and Aberdeenshire in rural locations out with the development boundaries for the exact same reasons as referred to above.

The methodology applied for the TA was agreed with Angus roads department prior to the survey work and the TA carried out. The figures in TA are based on a worst case. Local industry experience suggests an average of approx. 50 attendees per funeral (3 per car). Therefore, based on an average of 3 cremations a day, 6 days a week, this would result in just 300 car journeys per week. These figures also tally with The Federation of Burial and Cremation Authorities figures which estimates that no more than 30 mourners will attend in 50% of cremation services, and only on exceptional occasions does the number exceed eighty. The above figures also do not account for the substantial proportion of unattended cremations.

Unattended cremation figures (Pharos Statistics) 2019 -

Dundee 200 No

Crathes 288 No

Friokheim 8No (This exceptionally low figure would appear to reflect a business model rather than demand).

Using the Dundee figures of 200 No unattended funerals would further reduce anticipated car journeys per week to 236.

The TA provided gives a robust assessment of the surrounding road network and an extensive area of the local road network has been reviewed within the TA given the fact that funerals occur out with what is the peak periods for the surrounding road network. Mitigation has been put in place to counter the additional traffic movements on the surrounding road network by provision of 5No new passing places and by enhancing existing junction visibility by tree/shrub clearing at the unclassified Road/B978 Kellas Road junction. The road will be widened over the site frontage to the width agreed with the Angus Council Traffic Team, improving the road for all users over that which is currently in place.

Public Transport

People travelling to cremations, due to the upsetting nature of the event, do not generally travel by public transport. Due to this people tend to pre-arrange car sharing or private hire. Provision has however already been made on site for buses.

It is usual for those travelling to a funeral without access to a private car of their own to arrange a lift from a friend or family member or by pre-arranged taxi or a private coach. Funerals by their nature tend to lend themselves to car sharing for attendees and for the same reasons this is preferable to public transport. As discussed previously the nature of a crematorium is that it is required to be situated away from residential developments.

After checking there are currently two existing bus services that run directly past the proposed crematorium site (A17 & A38) which run once in each direction each working day. Bus services in this area run on a hail and ride basis and as such would stop outside the site, even if no fixed stop was installed should someone require.

Two additional local bus services run past both ends of the road servicing the proposals (22 & 139). Whilst the distance to walk to a bus route to the west is slightly above the desired 400m any funeral attended would likely be making this journey infrequently. The routes to the east are also still within 1km of the proposals.

With regard to the only current crematorium in Angus this is located much further from a regular bus stop and has a passing bus service no more frequently than the existing services at the location of these proposals.

Additional Transport Enhancement Options

While we have explained above why we consider that public transport relating to the nature of the proposals is not relevant; and that facilities for buses have already been included within the site which could be accessed as part of the existing bus routes. If considered essential an appropriate bus stop or bus pull in area could be incorporated as part of the access to be formed for the site. We have already received correspondence from Xplore Dundee who run buses in the area and would be happy with anything that would improve access and have previously contacted the relevant parties at Angus Council.

Alternatively, and bearing in mind the anticipated infrequency it is anticipated that people will want to access the facilities by public transport; it would probably be more suitable to incorporate into the transport plan for the site the provision of a call up service for those who wanted to be collected from the

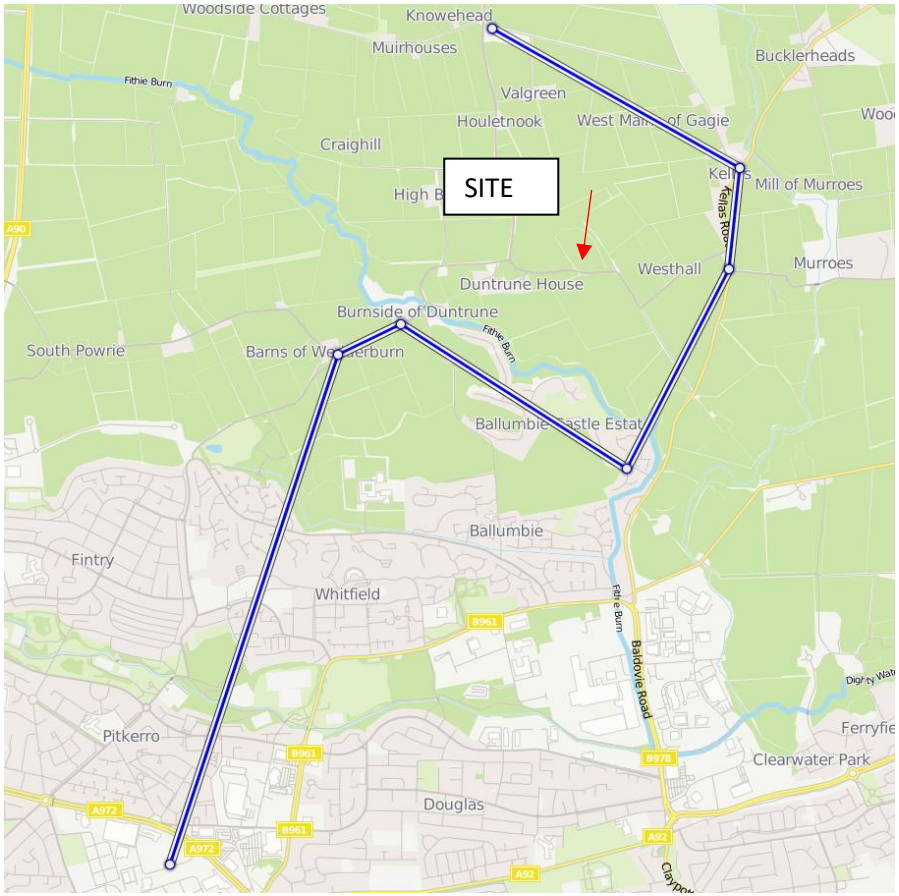
existing nearest bus stop. As we have already incorporated provision for electric vehicles on site this could also be by electric vehicle to keep emissions to an absolute minimum.

Paragraph 276 of Scottish Planning Policy (SPP) states:

"In rural areas the plan should be realistic about the likely viability of public transport services and innovative solutions such as demand-responsive public transport and small-scale park and ride facilities at nodes on rural bus corridors should be considered."

This flexibility in terms of access to public transport is an approach that has previously been adopted by Angus Council on many occasions**.**

A17 – Fishers Tours – Murroes School – Ballumbie Castle



Monday to Friday, not QE0 : BUS.CIF days

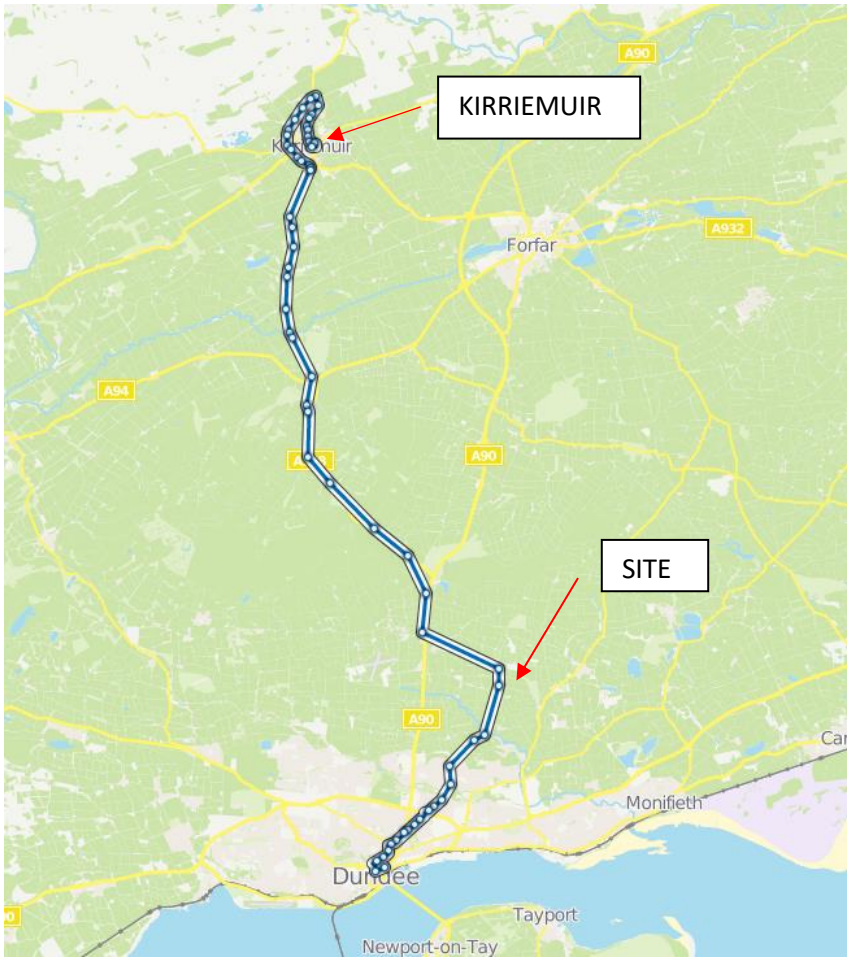
Ballumbie Castle and Fishers Depot - Murroes School

Pitkerro, opp Keyline	08:28
Barns of Wedderburn, at Farmhouse Road End	08:37
Burnside of Duntrune, at Braeside Cottages	08:38
Ballumbie Castle, opp Hawthorn Grove	08:44
Kellas, opp South Kingennie Road End	08:46
Kellas, at Smiddy	08:47
Westhall Terrace, at Murroes School	08:50
	Operates on Angus schooldays only

Murroes School - Ballumbie Castle and Fishers Depot

Westhall Terrace, at Murroes School	15:30
Burnside of Duntrune, opp Braeside Cottages	15:34
Barns of Wedderburn, opp Farmhouse Road End	15:35
Burnside of Duntrune, at Braeside Cottages	15:36
Ballumbie Castle, opp Hawthorn Grove	15:40
Pitkerro, at Keyline	15:49
	Operates on Angus schooldays only

22 – Stagecoach East Route and Timetables Shown Below



Days of Operation	Monday to Friday
Service Number	S022_F
Service Description	Dundee - Kirriemuir
Service No.	**22**	**22**
Dundee bus station 3	1600	1745
Dundee Commercial Street 1	1604	1749
Westhall Terrace oppMurroesSchl	1619	1804
Tealing road end	1624	1809
Charleston opp bus shelter	1634	1819
Glamis Dundee Road	1638	1823
Southmuir Newton Hotel	1646	1831
Northmuir golf course	1653	1838
Kirriemuir Bank Street	1658	1843

Days of Operation	Saturday
Service Number	S022_F
Service Description	Dundee - Kirriemuir
Service No.	**22**
Dundee bus station 3	1745
Dundee Commercial Street 1	1749
Westhall Terrace oppMurroesSchl	1804
Tealing road end	1809
Charleston opp bus shelter	1819
Glamis Dundee Road	1823
Southmuir Newton Hotel	1831
Northmuir golf course	1838
Kirriemuir Bank Street	1843

Days of Operation	Monday to Friday
Service Number	S022_F
Service Description	Dundee - Kirriemuir
Service No.	**22D**	**22**
Kirriemuir High Street	0733	0943
Northmuir opp golf course	0738	0948
Southmuir opp Newton Hotel	0745	0955
Glamis opp Primary School	0753	1003
Charleston bus shelter	0757	1007
Tealing road end	0809	1018
Westhall Terrace	-	1023
Dundee Commercial Street	0829	1038
Dundee bus station	-	1041
Dundee Whitehall St W3	0834	-

Days of Operation	Saturday
Service Number	S022_F
Service Description	Dundee - Kirriemuir
Service No.	**22**
Kirriemuir High Street	0734
Northmuir opp golf course	0739
Southmuir opp Newton Hotel	0746
Glamis opp Primary School	0754
Charleston bus shelter	0758
Tealing road end	0809
Westhall Terrace	0814
Dundee Commercial Street	0829
Dundee bus station	0832

139 – Explore Dundee route and Timetables Shown Below

139 Tealing | Inveraldie | Westhall Terrace | Dundee

Monday to Friday

from 9th August 2020

	139	139
Inveraldie Hall Place	0902	-
Tealing School	0910	1300
Tealing Village	0913	1303
Westhall Terrace	0919	1309
Burnside of Duntrune	0922	1312
South Powrie	0924	1314
City Centre High Street [H1]	0937	1327

139: Service terminates at High Street (H1). Use Union Street instead of Whitehall and wait at H1 for any layover. H4 is pick-up point only.

139 Tealing | Inveraldie | Westhall Terrace |Dundee

Saturday

from 9th August 2020

Inveraldie Hall Place	0902	-
Tealing School	0910	1300
Tealing Village	0913	1303
Westhall Terrace	0919	1309
Burnside of Duntrune	0922	1312
South Powrie	0924	1314
City Centre Whitehall Street [W1]	0937	1327

139 Dundee | Westhall Terrace | Inveraldie |Tealing

Monday to Friday

from 9th August 2020

		$
City Centre High Street [H4]	0840	1225
City Centre Commercial Street [1]	0842	1227
South Powrie	-	1238
Burnside of Duntrune	-	1240
Westhall Terrace	-	1243
Inveraldie Hall Place	0859	1250
Tealing Village	-	1257
Tealing School	-	1300

$: Inveraldie Hall Place is served on request to the driver.

139 Dundee | Westhall Terrace | Inveraldie | Tealing

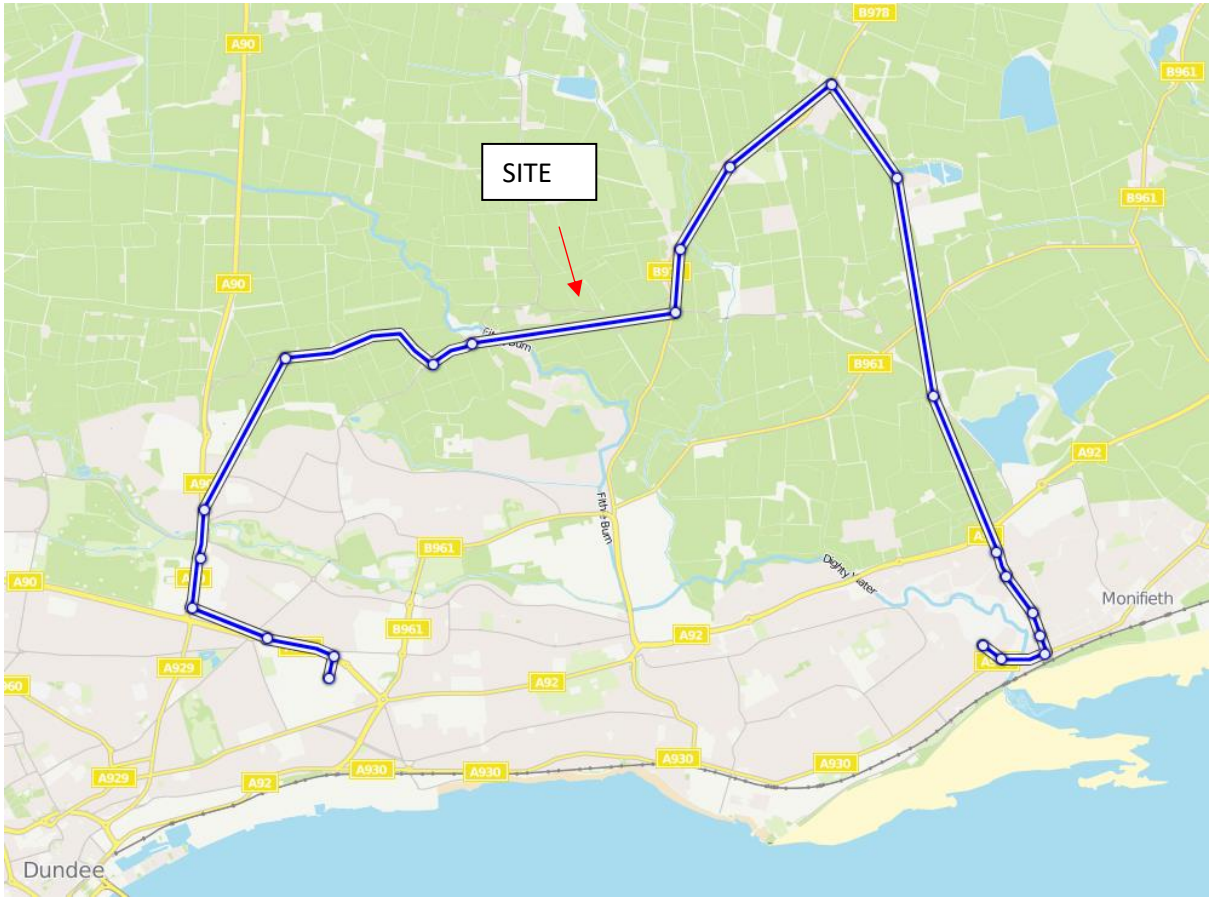
Saturday

from 9th August 2020

		$
City Centre High Street [H4]	0840	1225
City Centre Commercial Street [1]	0842	1227
South Powrie	-	1238
Burnside of Duntrune	-	1240
Westhall Terrace	-	1243
Inveraldie Hall Place	0859	1250
Tealing Village	-	1257
Tealing School	-	1300

$: Timing Points, South Powrie, Burnside of Duntrune, Westhall Terrace, are served on request to the driver, otherwise proceed to Inveraldie Hall Place

A38 – Fishers Tours bus route and timetable shown below:



Pitkerro, opp Keyline	08:00
Burnside of Duntrune, at Braeside Cottages	08:16
Kellas, at Smiddy	08:22
Kellas, at Keillorcroft	08:23
Wellbank Forge (at)	08:27
Wellbank, at Forbes of Kingennie	08:29
Monifieth, at High School	08:40
	Operates on Angus schooldays only

Monifieth, at High School	16:00
Wellbank, opp Forbes of Kingennie	16:11
Wellbank Forge (opp)	16:14
Kellas, opp Keillorcroft	16:15
Kellas, opp Smiddy	16:16
Burnside of Duntrune, opp Braeside Cottages	16:21
Pitkerro, at Keyline	16:37
	Operates on Angus schooldays only

National records of Scotland (Angus)

Current Population

On 30 June 2019, the population of Angus was 116,200. 27,790 were aged over 65. Between 1998 and 2019, the population of Angus increased by 5.8% with the 65 to 74 age group seeing the largest percentage increase (+47.5%).

Dundee has a population of nearly 30,000 larger than Angus. However, Angus has a considerably larger proportion of its population aged 65 and over giving it an older age profile.

Population Projections

The average age of the population of Angus is projected to increase as the baby boomer generation ages and the 75 and over age group is projected to see the largest percentage increase (+30.3%).

Deaths

In 2019, there were 1,410 deaths in Angus. This is a 3.1% increase from 1,367 deaths in 2018.

In Angus, the standardised death rate increased from 9.6 per 1,000 population in 2018 to 9.9 in 2019. In comparison, the rate in Scotland overall decreased from 10.8 to 10.6

Cremation Statistics

Year	2016	2017	2018	2019
Dundee	1,708	1,876	1,783	1,765
Friockheim	832	878	864	877
Total	2,540	2,754	2,647	2,642

Nationally in 2019, 26% of crematoria declined a large coffin due to inherent limitations and 60.8 % were holding over bodies for cremation.

Funeral Poverty - Local Demand

Costs and appropriate local competition – The Pharos Statistics 2020 Cremation Fee League Table As at 1st January 2020 show Dundee and Friockhiem as the most expensive crematoria in Scotland at £1050 and the joint highest in the UK out of 291 locations. Crathes, as the next nearest crematorium to the north charges only £795.00 and Perth only £788.00. We also understand that recently Parkgrove has further increased its prices. Cost offering at this new facility are anticipated to be more in line with the national average rather than the high costs offered in the area currently.

The Competition and Markets Authority (CMA) raised concerns over aspects of the industry including low numbers of crematoria providers in local areas, and difficulty for new companies to enter the market due to the planning regime and high fixed costs. This led to an investigation in 2019.

This in summary confirmed that while the prices of private sector crematoria are often significantly higher than those of crematoria operated by local authorities, the profitability analysis indicates that customers of both private and local authority facilities have been paying too much, with the former overpaying by at least £115 per cremation and potentially as much as £210 on average, while the latter are overpaying by at least £80 per cremation and potentially as much as £170 per cremation on average we consider that the upper end of these ranges is more probable than the lower end.

The issue is so pressing locally that In July 2019 the report 'Funeral Poverty in Dundee' concluded that with regard to crematorium facilities in the area:

Additional crematorium facility: To improve choice for the consumer, Dundee City Council could actively consider the addition of another cremation facility.

The CMA (2019: 89) found the average drive time to the closest crematoria was 34 minutes for the nine most expensive crematoria – almost double the time for the nine least expensive crematoria. In addition, two thirds of these more expensive crematoria had no other crematoria within a 30 minute drive time, compared to just one in nine of the least expensive. This crudely suggests prices can be kept artificially higher where competition is lower.

The CMA report suggests that there are low numbers of crematoria in any given area because only a small number may profitably operate given the fixed demand in a local market. It suggests 800 - 1,000 cremations per year are required to be viable. Given there are approximately 1,800 deaths in Dundee per annum, if the surrounding areas were included, there could be potential for an additional crematorium capacity. This would require Dundee City Council to consider more fully the 'need', liaise within Departments such as the Planning Dept. to assess potential applications, and potentially consider involving itself actively within a development.

The Cremation Act (1902) & The Cremation (Scotland) Regulations 2019

The Cremation (Scotland) Regulations 2019 only deal with how crematoria should be operated and how a cremation should be carried out. While the relevant 1902 act has recently been repealed in Scotland.

The 'Federation of Burial and Cremation Authorities', which is the principal representative of burial and cremation authorities however refers to the 1902 Act in its relevant requirements and goes on to state the following in its guidance:

A minimum of two hectares (approximately five acres) per estimated 1,000 cremations per annum is recommended to provide sufficient space for the crematorium, gardens of remembrance, traffic circulation, parking, and a modest amount of space around the building.

Ideal sites are rarely to be located in urban areas and it is emphasised that suitability of setting is of greater importance than its location in close proximity to population centres.

Site selection should be aimed at achieving quietness and seclusion. A woodland or parkland setting, or an area of undulating ground with good natural features and mature trees, would enable the establishment of a good natural setting with a minimum of horticultural treatment.

Ideal sites are rarely to be located in urban areas and it is emphasised that suitability of setting is of greater importance than its location in close proximity to population centres.

Previously developed land can often prove unsuitable, due to land contamination, which is unacceptable for the interment of ashes, or due to the presence of residential property within 200 yards. There is a growing recognition that new crematoria will be built in a countryside location close to the urban fringe.

The recommendations also separately refer to the 1902 Act directly in terms of its recommendations for proximity to dwellings and public highways.

Section 5 of the Cremation Act 1902 states that: "No crematorium shall be constructed nearer to any dwelling house than two hundred yards, except with the consent, in writing, of the owner, lessee, and occupier of such house, nor within fifty yards of any public highway, nor in the consecrated part of the burial ground of any burial authority.

The Cremation Act (1902)

The Cremation Act (1902) states that a crematorium cannot be built closer than 200 yards from a dwelling house, without the written consent of the owner and occupier. The Act also states that no new crematorium can be built closer than 50 yards from a public highway. A minimum of 2 hectares is normally required for a crematorium and the site needs to be close to a main road. A site which already benefits from existing landscaping such as mature trees, hedgerows is considered most suitable, and ideally the site should be flat or slightly sloping and pleasant views are considered advantageous.

Emissions

All UK crematoria must operate under the Secretary of State's Process Guidance for Crematoria which gives guidance on the 'Best Available Techniques' aimed at providing a strong framework for consistent regulation under the statutory Local Air Pollution Prevention and Control (LAPPC) regime in England and Wales, Scotland and Northern Ireland. In Scotland this requires an application to SEPA under Pollution Prevention and Control (Scotland) Regulations 2000; for a permit to operate, which only if satisfactory will be issued. As such it is this legislation that will ultimately asses and regulate the appropriateness of these proposals in terms of Emissions.

This process will ensure the facility operates to the highest possible standards to avoid polluting the atmosphere. SEPA carry out a twice-yearly inspection to ensure that it is operating under the terms of the permit. The crematoria will also operate under the auspices of the Federation of Burial and Cremation Authorities (FBCA) and will also be subject to six monthly inspections by Robert Swanson QPM, the Inspector of Crematoria for Scotland who operates on behalf of the Scottish Government.

With the state-of-the-art equipment used and the additional regulatory requirements placed on crematoria ensure emissions are not an issue. Cremations take place at very high temperatures, above 850 degrees centigrade and as a result there are very low levels of emissions. A tall stack is not required, and the vent is to expel primarily air only. Emissions data has been provided and emissions are regulated and controlled by SEPA under the Pollution Prevention and Control (Scotland) Regulations (2000) (As Amended).

Relevant legislation relating to emissions for this proposal - the Pollution Prevention Control Regulations 2012
The new crematorium will require authorisation from SEPA under 5.1, Part B, (c) of the Pollution Prevention Control Regulations 2012 (PPC) "cremation of human remains". The regulations require the new installation to meet 'Best Available Techniques'. Including the following:

- The aim should be to prevent any visible airborne and odorous emissions from any part of the process. Emissions from cremations should in normal operation be free from visible smoke.
- All other releases to air, other than condensed water vapour, should be free from persistent visible emissions. All emissions to air should be free from droplets
- All new crematoria to be fitted with mercury abatement.

Neither SEPA and Angus Council Environmental Health department have objected to these proposlas.

Planning Position

The site is sustainably located in relation to the relevant population centres, which in turn will significantly reduce journey times for crematorium services, compared to journey times to Friockheim, Dundee or even Perth & Kirkcaldy.

There is only one other crematoria in Angus, one in Dundee one in Perth and approval has been granted for one south of St. Andrews in Fife. It is contended that the location proposed for the crematorium will draw mainly from people located in the south of Angus and the North and East of Dundee is strategically located to serve the settlements and communities. Likewise, its location within the road network means that travelling times / distances are minimal particularly during peak traffic periods and if the weather is poor. A crematorium is not able or suited to be located within an existing settlement, because of the requirements laid down in the Crematoria Act (1902) and also the travelling distances required and difficulties with access. In any event the dispersed settlement characteristic of this part of Angus makes the site a logical choice. The crematorium is considered to be a community facility that will help satisfy the demand in the area to the benefit of the local communities.

A crematorium at Burnside of Duntrune will not on its own, or cumulatively, affect the vitality and viability of town and local centres. It is likely that the crematorium will benefit established businesses in the vicinity, such as hotels, guest houses, food establishments, taxi firms etc. The scale, design and fit of the crematorium within the landscape, will mean that it will have negligible direct or indirect impact on surrounding properties or land uses and due to the topography of the site and existing tree cover, there will either be no views of the crematorium or only very limited views. In any event, the design of the crematorium and the use of materials and landscaping, will mean that it will fit comfortably within the rural environment.

The proposed crematorium will make a positive contribution to the quality of its immediate environment. It will create a community facility with an established sense of place using high quality of built design and landscaping. It will promote, enhance and add to biodiversity, it will include water and energy conservation measures such as waste heat recovery and passive solar gain, it will incorporate appropriate waste recycling, segregation and collection facilities and the applicant will seek to minimise waste by design and during construction.

The crematorium and its setting demonstrate a high standard of architectural design which fits well with the local environment. It makes best use of the prevailing landform, trees, hedgerow s and woodland. The proposal provides both a formal and informal landscape context for the crematorium. Access and parking arrangements are safe, and the design incorporates facilities for coaches and those with disabilities and impaired mobility. The personal privacy and amenity of nearby householders will be maintained.

The accompanying Transport Assessment acknowledges that due to the nature of the crematorium, most journeys will be by private car. However, the local road network has sufficient capacity to accommodate increased car journeys, particularly as they will mostly be made out with peak periods. Sufficient car parking spaces have been made available and any rare unusually large services can be accommodated using overspill parking along the internal road.

It is contended that there is a need for a crematorium to serve this area as demonstrated by demographics and population projections The proposed countryside location is strategically situated to serve all of the surrounding communities equally, and it is considered that the location is both sustainable and of community benefit.

It is considered that local services will benefit from such a land use and the crematorium is very much seen as a community facility which will benefit the local community and provide a local service.

Pre-Application Consultation

Pre-submission enquiries were undertaken with Angus Council to determine whether the principle of a Crematorium on the subject land would be complaint with Planning Plan policy and other material considerations.

From those pre-application enquiries the following has been prior agreed with Angus Council Planning and Roads Services.

- The submitted Transport Assessment is acceptable.
- The application site is not on prime quality agricultural land.

In terms of compatibility with development plan policy, pre-application liaison also recognised that there are matters relating to public transport accessibility and sequential testing of the proposals, both of which required to be addressed through an appropriate application for planning permission.

Planning Policy

Applications for planning permission require to be determined in accordance with national planning policy and the development plan unless material considerations indicate otherwise.

Scottish Planning Policy 2010

Scottish Planning Policy (February 2010) states that the planning system has a significant role in supporting sustainable economic growth in rural areas.

The aim of the planning system should be to enable development in all rural areas, which supports prosperous and sustainable communities whilst protecting and enhancing environmental quality. The strategy for rural development should respond to the specific circumstances in an area whilst reflecting the overarching aim of supporting diversification and growth of the rural economy. Development plans should therefore promote economic activity and diversification in all rural areas and developments that provide employment or community benefits should be encouraged.

All new development should respond to the specific local character of the location, fit in the landscape and seek to achieve high design and environmental standards. Planning authorities should also be realistic about the availability or likely availability of alternatives to access by car as not all locations can be served by public transport (SPP paragraphs 92 to 96 & 276).

The Development Plan

The development plan comprises of TAYplan, approved in October 2017, and the Angus Local Development Plan, adopted in September 2016.

TAYplan 2017

Policy 1 of the Approved TAYplan Strategic Development Plan advises that, in adherence with the sequential approach, development should, in the first instance, take place within settlements. However, TAYplan also states that Local Development Plans may also provide for some development in rural areas if it genuinely contributes to the objectives of TAYplan and meets specific local needs or supports regeneration of the local economy.

Angus Local Development Plan 2016

The site is not covered by any specific policies and it is not affected by any local, national or international landscape, environmental, ecological or geological designations. The proposed crematorium therefore requires to be considered against more general, but relevant, policies contained within the Local Plan.

Policy DS1 Development Boundaries and Priorities states that all proposals will be expected to support the delivery of the Development Strategy, which put very simply promotes the re-use of brownfield sites within settlement boundaries over greenfield sites out with settlement boundaries.

Whilst it has been suitably demonstrated that the site is not on prime quality agricultural land, it is also however recognised that it is a greenfield site within a rural location. However, there are various layers to Policy DS1 that have to be recognised and assessed as not all scenarios can be anticipated through the Development Plan.

Specifically out with development boundaries, proposals will be supported where they are of a scale and nature appropriate to their location and where they are in accordance with other relevant policies. Development on unallocated greenfield sites, such as the subject land, can therefore be supported where there are no suitable and available brownfield sites capable of accommodating the proposed use within a settlement boundary.

In terms of carrying out an exercise to identify any possible alternative brownfield locations within settlements that are capable of accommodating the proposed use, it is material to note that there are no new crematorium sites identified / allocated within the Angus Local Development Plan. Most notably, Policy TC9 safeguards land for cemetery use at various locations throughout Angus, but no sites are identified for additional crematorium uses.

In terms of other possible sites, i.e. that are identified within the ALDP, Policy DS1 is very clear that sites allocated for specific uses, i.e. housing, employment, open space, etc will be safeguarded for the uses as set out within the plan. The reason for this policy is to ensure the maintenance of effective housing and employment land supply and for these sites not to be taken for other uses.

To therefore satisfy the exercise of proving that there are no alternative sites for crematorium uses within settlement boundaries, a survey therefore requires to identify a possible site within a South Angus settlement boundary, i.e. Carnoustie & Barry, Monifieth and other small settlements as follows:

- Is not allocated for any other uses.
- Is technically deliverable, i.e. access, infrastructure, etc.
- Has a willing landowner.
- Has a minimum area of 2 hectares.
- Is not closer than 50 yards to a public highway yet close to a main road.
- And is not closer than 200 yards to an existing dwelling house.

Additionally, it is preferable that the site benefits from existing landscape features such as mature trees, hedgerows, and is flat or slightly sloping, i.e. not only has the site to be appropriate in all other aspects of deliverability and availability, it is also appropriate in planning terms.

In terms of accessibility, it is acknowledged that a crematorium bears similarities with non-residential institution uses, which, among other things, include community and cultural facilities that attract significant numbers of people. The development plan applies a town centre first policy for proposals for this type of use and, for a building of the proposed size, the applicant may be required to submit relevant assessments (including retail / town centre impact, transport and sequential assessments) where it is considered that the proposal may have a significant impact on the vibrancy, vitality and viability of any of the town centres in Angus.

In the case of this application, clearly retail and town centre impact assessments are not applicable / required; however Transport and Sequential Assessments are acknowledged requirements.

The Transport Assessment was prior submitted and agreed with the Councils Roads Service. It is submitted again as part of the application pack.

Regarding the requirement for a sequential test, as set out above, key information required includes details on any alternative sites considered and the reasons for discounting these sites. The reasons can include operational and amenity considerations, but the link between these reasons and the site selection must be clearly demonstrated.

The most relevant information base for such a sequential test lies within the housing and employment land audits, both prepared by Angus Council; and from any further surveys carried out by the applicant.

Sequential Test

The following therefore seeks to demonstrate that the site is the most sequentially preferable location for the proposed development; with no other brownfield opportunities within any of the South Angus settlements available, suitable and viable to accommodate the proposals.

Angus Employment Land Audit 2019

Monifieth: No suitable sites, either greenfield or brownfield are identified.

Carnoustie & Barry: The audit identifies land at 3 locations.

- **Carlogie:** 15.00 ha of identified employment land with infrastructure constraints identified. This is a greenfield site, therefore it is not a reasonable alternative location to the application site.
- **Pitskelly:** 10.00 ha of identified employment land with infrastructure constraints identified. This is a greenfield site, therefore it is not a reasonable alternative location to the application site.
- **Panmure Industrial Estate:** 3 small and physically separate brownfield sites of 0.08; 0.09; and 0.22 ha are identified and classed as brownfield. All are listed as constrained as not currently being marketed. Notably, the Panmure Industrial Estate, including the above 3 sites, is all within 200 yards of existing dwelling houses.

Angus Housing Land Audit 2020

Monifieth: The audit identifies 5 sites / locations, all of which are either too small, within proximity of residential properties or greenfield sites.

- **Milton Mill:** 1.20 ha brownfield site currently under construction.
- **Former Seaview PS:** 0.88 ha brownfield site currently under construction.
- **Victoria Street West:** 16.30 ha greenfield site currently under construction.
- **Former Panmure Hotel:** 0.38 ha brownfield site currently under construction.
- **Panmure Church:** 0.12 ha brownfield site currently under construction.

Carnoustie & Barry: The audit identifies 5 sites / locations, 4 of which are noted as constrained; all of which are either too small, within proximity of residential properties or greenfield.

- **Land at Pitskelly**: 9.76 ha greenfield site.
- **Former Social Club, Barry Road**: 1.00 ha constrained brownfield site.
- **Greenlaw Hill:** 1.70 ha constrained brownfield site.
- **Woodside / Pitskelly:** 2.50 ha constrained brownfield site within 200 yards of existing residential properties.
- **Panmure Industrial Estate:** 3.70 ha constrained brownfield site within 200 yards of existing residential properties.

South Angus HMA Landward: There are no suitable sites within the remainder of the South Angus Housing Market Area identified within the Audit due to matters of size, location, deliverability, status and proximity to existing residential properties.

Other Potential Brownfield Opportunities identified by the applicant, i.e. not identified within either the Employment or Housing Land Audits

The South Angus HMA consists of the main settlements of Carnoustie & Barry and Monifieth. Within the Landward area, Newtyle is identified as a rural service centre and there are various other small settlements that have village boundaries such as Newbigging, Monikie, Wellbank, etc.

The ALDP recognises, in relation to brownfield opportunities in Carnoustie, that whilst the plan supports the development of vacant, underused and brownfield sites within the defined settlement boundary, the availability of brownfield land and property is extremely limited and sizeable opportunities are more or less restricted to those identified in the above audits. This is primarily due to past developments at the former driving range, the former Maltings and the site of the former Kinloch Primary School. Our own survey of potential brownfield sites has therefore failed to identify any brownfield opportunity sites of at least 2 ha and at least 200 yards from existing residential properties.

At **Monifieth**, the ALDP also supports the development of vacant, underused and brownfield sites within the defined settlement boundary, however the supply has again been extremely limited to the sites identified in the above audits. Recent re-development opportunities including Ashludie Hospital and Milton Mill have taken up any potentially significant supply and again our own survey of potential brownfield sites has therefore failed to identify any brownfield opportunity sites of at least 2 ha and at least 200 yards from existing residential properties.

Similar to the conclusions from the above audits, from our survey, there are also no suitable sites within any of the small settlements boundaries identified within the **Landward** South Angus Housing Market Area which could deliver a brownfield opportunity site of at least 2 ha and is at least 200 yards from existing residential properties.

In accordance with the requirements of ALDP Policy DS1, it has therefore been suitably demonstrated that potential brownfield sites within South Angus settlement boundaries have been researched and there are no sites available or suitable within a development boundary that would re-use or make better use of vacant, derelict or under-used brownfield land or buildings.

In summary, there are therefore no sites of sufficient size within any of the South Angus Housing market Area settlement boundaries of sufficient size to meet the requirements of the proposal, or have the necessary profile required in terms of relationship to existing residential properties, residential amenity, etc.

Notwithstanding the clearly demonstrated lack of brownfield opportunity sites within identified settlement boundaries, it remains the applicants view that a land use such as a crematorium is not well suited to an urban area and the dispersed settlement / rural characteristics of this part of South Angus makes the site a logical choice.

Accessibility

The site is centrally located within the South Angus Area, directly accessible to its target catchment area and therefore sustainably located. When compared to current Crematorium locations, the location of the site will therefore provide important savings on journey times and journey miles.

Policy DS2 Accessible Development of the ALDP requires development proposals to demonstrate, according to scale, type and location, that they are or can be made accessible to existing or proposed public transport networks.

As also noted above, SPP states that planning authorities should be realistic about the availability or likely availability of alternatives to access by car as not all locations can be served by public transport. While it is respectfully suggested that this is the case with this proposal due to a lack of demand by the nature of the use. We have drawn the similarities in this area to the only other crematorium facility located in Angus and have outlined above two possible options which adequately provide access to the development without the need to travel by car.

Finally, it is contended that the South Angus location proposed for the crematorium is strategically located to serve the principal settlements and communities. Likewise, its location within the strategic and local road network means that travelling distances are minimal. A crematorium on the subject land is therefore preferable to a site within an existing South Angus settlement location.

Conclusion

The provision of a crematorium at Burnside of Duntrune will provide a significant benefit to the local community and it has been demonstrated that, there is a need for a countryside location and there is no loss of prime agricultural ground. The site is accessible and sustainably located and has been carefully chosen in relation to the surrounding local population centres. The location of the site does not offend the development plan policy or Scottish Government policy. In fact, it provides an appropriate land use which will be of direct and indirect benefit to the local community. There are no technical impediments to the proposal, and it will have no detrimental impact on the closest residential properties, of which there are few. The crematorium building and associated landscaping will enhance the landscape character and biodiversity of the area. The crematorium building includes sustainable construction methods, use of materials and high standards of energy conservation and efficiency.

ethosenvironmental e²

Document:	P8346.04 Air Quality/Odour Assessment: Response to SEPA comments (28 May 2021)
Project:	Erection of Crematorium Building and associated Parking, Access, Turning Space, Landscaping and Boundary Enclosures, Land North East Of Duntrune House, Duntrune
Ref No:	20/00830/FULL
Client:	Paul Fretwell @rchitects-scotland Ltd
Prepared by:	Dr B Gardner, Senior Consultant
Date:	5th July 2021

1.0 Background

Senior Planning Officer for SEPA has made a number of comments (28 May) in response to the air quality assessment report for the above project. These comments are detaile din section 2 with our responses.

A revised (Ver3) version of the report is attached incorporating changes at sections 5.2 and a new section 5.4.

T: 0131-453-5111 E: brian@ethosenvironmental.co.uk
Units 15-19 Dumbryden Industrial Estate, Dumbryden Road, Edinburgh EH14 2AB

2.0 Consultant Response

Our responses to these comments are made as follows:

SEPA Comment	Consultant Response
Based on the information available to us, we lodge a **holding objection** to this application because there is insufficient information to demonstrate that the proposed stack height has been suitably assessed to ensure it accords with the principle of Best Available Techniques (BAT). The proposed stack is assumed by us to be 10m based on building design plans, but a stack height assessment should form part of the Air Quality Impact Assessment (AQIA) for BAT purposes	An initial scoping exercise identified that a screening model would be appropriate for the modelling scenario. If this delivered results of any significance other than negligible impact, then a fuller modelling assessment could be undertaken if required. The AQ assessment methodology was previously agreed with the client and confirmed with the regulator by them. The screening assessment method uses a number of significantly worst-case modelling parameters as proposed in the original methodology proposal; results from this are still able to comfortably confirm that the 10m stack height scenario results in negligible impact, even under these worst-case modelling conditions. Arguably, from the scoping exercise the emission-receptor scenario would not have even warranted a formal modelling exercise and could have been addressed by means of simpler modelling to still robustly demonstrate negligible impact. For avoidance of doubt, the worst-case modelling parameters used are as follows: **1. Emission concentrations** The assessment assumes that emission concentrations are equal to the emission concentration limit of PG 5/12 Process Guidance Note (Crematoria), (rather than 10-50% of the limit as can often be the real-world conditions with the proposed abatement) **2. Pollutant Form** The assessment assumes that all of the total suspended particulate emission is present as PM10;

	modelling for NO_2 assumes that all NO and NO_2 is expressed as NO_2. **3. Emission Pattern** The process has capacity for 6 cycles per day and each cycle operates for a total of approximately 80 minutes. The client has advised however that typical daily average throughput is anticipated to be 3 cycles per day. For the purposes of the modelling we have assumed that emission concentrations (equivalent to the emissions concentration limits) will be being emitted constantly, with no correction for percentage of the reference period (eg 24 hour day, 365 day year) in which the process is operating. For those modelled air quality concentrations referenced over periods in excess of a typical cycle (eg 80 minutes), such as 24-hour averages or annual averages, the modelled assumptions therefore represent a significant simplification – and very significant exaggeration - of actual long-term mass emissions in the model, compared to real conditions, ie at least 6-times higher than real. **4. Meteorology** For the screening model, instantaneous worst-case wind direction conditions are used, with meteorological dataset R91A-G representing a highly-localised westerly wind distribution (see Wind Rose image at Appendix 1). It must be stressed that the ground-level concentrations obtained directly downwind of source using this model are then applied to receptors in any compass direction from the source. In this assessment we only explicitly apply it to the three nearest receptors which are by some margin closer than the next set of receptors (typically at distance >500m) as discussed at section 3.1 to the report. Careful reading of the report would confirm therefore that the model does allow evaluation of impact on all receptors, but the scoping exercise indicated that specific modelling for each receptor site was not warranted, and the results obtained are considered to be consistent with that.

	5. Distance The model outputs (see Table 4) ground-level concentrations downwind of the source under worst-case conditions of uni-directional wind direction across a range of distances (0-250m) including those typical of the direct line-of-sight distance to the nearest three residential receptors (~180-200m). The maximum modelled ground-level air concentration was found to occur at a distance of approximately 100m. This value was then used for the evaluation of impact at receptors, rather than the value for the distance from source to specific receptor. Ignoring all the other worst-case assumptions made (1-4), it is highly unlikely that this worst-case value will be found at any of the receptors for any significant period of time compared to the duration of any relevant reference period. **6. Evaluation** The modelled results are interpreted against the relevant air quality objectives in terms of Table 6.3 to the EPS/LAQM Guidance (see Table 6 in report). Evaluation using all of the above the worst-case parameters (1-5 above) allows ready conclusion that there will be negligible air quality impact for PM10, CO and mercury. For NO_2, the simplified worst-case air quality concentration used to date is 10% of the AQAL. If we introduce a more representative modelled concentration by assuming active cremation for only 8 hours per day (6 cycles at 80 minutes each) for 6 days per week (rather than 365 days x 24 hours), the worst-case ground-level concentration (100m distance) drops proportionately (28.5%) and the revised worst-case air quality concentration will therefore be 2.8% of the AQAL. As such the relevant impact descriptor for this parameter – even with all other simplified worst-case conditions – can be considered *negligible*. **7. Summary** In summary, the conclusions from the scoping exercise – that a "screening" modelling strategy was

	appropriate and that more sophisticated modelling exercise would not be warranted – are borne out by the modelled outputs. The overall air quality impact associated with the development – even conservatively assuming various worst-case conditions - can be assumed to be *negligible* and no further modelling evaluation of impact significance is considered to be merited. Consideration as to potential specific mitigation measures for air quality, is also not deemed to be warranted. As such the assessment is considered to include a stack height assessment for the proposed stack height and there is considered to be no merit under BAT in exploring additional height options as these will deliver negligible improvements in ground-level air quality impact. The report has been revised to include a new section (5.4) clarifying this.
We would request clarification over the receptors. The approach taken to assessment differs from the norm as the applicant has not assessed compliance with air quality standards (AQS) at receptors, rather they have assessed it at the location of highest impact.	The assessment differs from the norm as this is a screening assessment. It does however specifically assess compliance with AQS at the closest receptors, and does so for worst-case conditions, and assuming the receptors are constantly downwind of the source. As such the modelled results can be applied directly to any receptor and will therefore be even more worst-case for those at greater distance from source than either those with the maximum concentration (100m) or those receptors specifically discussed. The negligible nature of the modelled impact – despite a number of worst-case modelling inputs – strongly suggests that the scoping assumptions and screening assessment strategy is appropriate and that explicit application of the assessment to other receptors (at greater distance and in any compass direction from source) is not warranted.
1. How many receptors are within the scope of the study? Please provide a table of receptors	Receptors within 1000m are discussed at section 3.1.

	showing distance from proposed site and type (residential or other). The applicant states that there are dwellings within 800 - 1000m from the site – have these been included in the assessment? If not please provide a justification for exclusion.	In this screening model, compass direction of receptor from source is ignored using the worst-case assumption that each receptor is downwind of the source at all times. Specific assessment is made for the three significantly closest receptors. This simplification (and gross exaggeration of impact) still allows the screening to demonstrate negligible impact, such that more resolved assessment for other receptors at greater distance Is not considered to be merited (as was assumed at the scoping stage). If this screening model had indicated moderate or even slight impact (as defined in Table 6.3 to *Land-Use Planning & Development Control: Planning For Air Quality*) then we would have explicitly extended the model to other receptors and considered use of site-specific met data and other parameters, rather than worst-case simplifications.
2.	Table 5 needs to be amended to show PC, PEC and % of the AQS at each receptor within the scope of the study	The worst-case modelled contributions (PC) are provided at Table 4, with the maximum obtained at any downwind distance (at 100m) used for the interpretation at Table 5 The predicted environmental concentration (PEC) is discussed at Table 5 as a percentage of the AQS. I have amended the table to make this more explicit
3.	A stack height assessment should be carried out and included in the AQIA for BAT purposes	The assessment relates to the proposed 10m stack height and indicates negligible AQ impact but for avoidance of doubt I have clarified this in a separate section 5.4 titled “Stack Height Assessment”
4.	Please confirm which site the meteorological data is from. We recommend 5 years met data is used for AQIA with the ‘worst case’ concentrations reported. It appears only 1 year’s data has been used in this case and the year isn’t specified.	The initial scoping exercise identified remote likelihood of air quality impact necessitating resolution for specific sources, or site -specific met data. Instead a simpler screening model was proposed but using a number of significantly conservative model inputs. The screening modelling method proposed was passed to the regulator for approval prior to commencement of the work.

	The model does not use site-specific met data. Instead synthetic data representing constant uni-directional wind was used to model the instantaneous downwind concentrations applicable for use with receptors at any compass point. The simplified screening model approach was validated by the negligible air quality impacts modelled, despite the important worst-case assumptions used.

Cameron + Ross

A/190889

PROPOSED CREMATORIUM
BURNSIDE OF DUNTRUNE
ANGUS

TRANSPORTATION ASSESSMENT
REV – 03
(Amendments in Red Text)

SEPTEMBER 2021

FM & G BATCHELOR
KINNELLS MILL
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ANGUS
DD11 4UL

CAMERON + ROSS
CONSULTING ENGINEERS
15 VICTORIA STREET
ABERDEEN
AB10 1XB

CONTENTS

- Appendix A: Traffic Count and Speed Survey Data
- Appendix B: Road Layout Drawings
- Appendix C: Population Distribution Model

REVISION SCHEDULE

Rev No.	Description of Amendment	Prepared By	Approved By	Date
-	Draft Issue	B. Clark	R. Gibb	Jan 2020
01	Issue to Angus Council for Comment	B.Clark	R.Gibb	Feb 2020
02	Response to Angus Council Traffic Team Comments	B.Clark	R.Gibb	March 2020
03	Public Transport Info Updated	B.Clark	R.Gibb	Sep 2021

A/190889 – PROPOSED CREMATORIUM, BURNSIDE OF DUNTRUNE

1.0 INTRODUCTION

1.1 Cameron + Ross have been appointed by FM & G Batchelor to prepare a Transportation Assessment (TA) to support a planning application for a proposed crematorium development at Burnside of Duntrune.

1.2 A Scoping meeting was held with Angus Council Traffic Team in November 2019.

1.3 The purpose of this Transportation Assessment is to assess the suitability of the site transport infrastructure proposals, the local road network and local transport infrastructure for the development and to respond to the Scoping Meeting items raised by the Angus Council Traffic Team.

2.0 DEVELOPMENT PROPOSALS

2.0 The site is 4.5 hectares and is proposed to be developed for a 120-seating capacity crematorium.

2.1 The site is located on the north side of the C4 and is set in a rural location around 7km to the northeast of Dundee City Centre and around 0.5km to the east of the village of Burnside of Duntrune. The Site Location Plan is contained below:

Figure 1 – Site Location Plan.

2.2 The site is surrounded by wooded areas to the north, east and west beyond which is generally agricultural land. Agricultural land also bounds the site to the to the south of the C4.

Development Layout and Access Overview

2.3 The Architects Proposed Site Layout Plan is contained below and shows that a single simple priority T-junction is proposed for the site access taken from the C4.

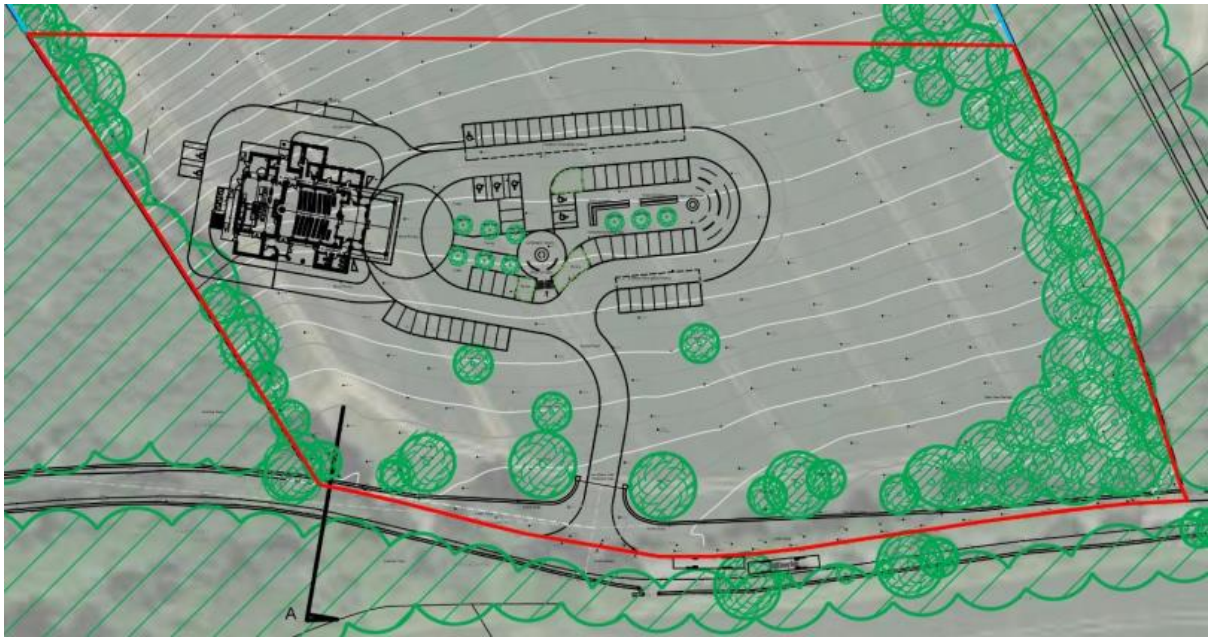


Figure 2 – Proposed Site Layout Plan

2.4 The site frontage is currently a national speed limit 60mph. The C4 along the site frontage is typically 4.75m to 5.2m in width. It is proposed to widen the existing road to 5.5m along the full length of the site frontage.

2.5 At the scoping meeting it was agreed that the new access priority T-junction will require 4.5m x 120m visibility splays in both directions. This was agreed as a result of the weekly average of the 85%tile speed survey results taken along the site frontage being 40mph eastbound and 42mph westbound. Using a 40mph design speed which corresponds to a 70A kph design speed in accordance with the DMRB. The speed survey results are contained within **Appendix A**.

2.6 Similarly it was agreed that the desired visibility in both directions at the Unclassified Road junction with Kellas Road is 4.5m x 160m as a result of the weekly average 85%tile surveyed speeds being 48mph eastbound and 49mph westbound. This corresponds to a 50mph or 85A kph design speed.

2.7 The desired 4.5m x160m visibility is achieved on the Unclassified Road looking southbound although this requires shrubs/grass etc to be cut down to ground level to achieve this. Looking northbound around 2.4mx160m is achieved once tress/shrubs/grass are cut back and down to ground level within the visibility splay which is within the adopted road envelope.

2.8 It should be noted that the local authority is currently not adequately maintaining the stated desired visibility splays at the Unclassified Road/ Kellas Road junction as only a narrow strip of verge is being cut. The existing visibility splays for the junctions considered within this assessment are contained within **Appendix B**.

2.9 A review of the existing road widths has been undertaken. The existing road widths, signage, passing place provision and proposed improvements are shown within the drawings provided within **Appendix B**. This shows that the existing C4 along the site frontage is typically between 4.8m and 5.18m in width. Continuing southbound to the C4/unclassified road junction the C4 is typically between 5.1 and 5.7m in width. The road then continues southbound from this junction as an unclassified road where the width remains between 4.65m and 5.5m in width.

2.10 The stretch of C4 between the unclassified Road and the B978 Kellas Road is narrower with a typical width of 3.8m to 4.2m. As a result, it is anticipated that this route will see a lesser traffic generation than the unclassified road coming off Kellas Road. It is therefore suggested that the signed route is via the unclassified Road. This also takes traffic through the junction off Kellas Road with the better visibility splay provision

2.11 Also the C4 junction with the unclassified Road and the B978 Kellas Road has substandard visibility splay provision.

Parking Provision

2.12 At the scoping meeting it was agreed that for a 120 seating capacity crematorium Angus Council would be looking for 40 spaces to be provided. Based on subsequent information it is proposed that a total of 90 spaces will be provided with a significant proportion of this being overflow with a soft appearance so as not to have the majority of funerals that have a lower attendance have to deal with a large empty, baron and unattractive parking areas.

2.13 The National Parking Standard indicates that there should be a minimum of 4 No disabled spaces or 4% of the total capacity. 4% of 90 spaces provided is 4 spaces.

2.14 A separate staff car parking area will be provided. There is expected to be 4 full time staff and therefore 4 staff spaces are considered to be adequate corresponding to 1 space per permanent staff member. 1 disabled user staff space will be provided. 1 of the staff spaces will also be an electrical charge point.

Review of agreed Parking Provision for Existing Crematorium

Brewsterswells, 100 Acre Wood, (Fife) – 120 Seats

2.15 The spaces provided are 90 total, including 50 standard, 4 disabled, 32 over flow and 4 staff.

Parkgrove, 164 Seats

2.16 In 2011 conducted 750 cremations averaging 3 per week as proposed for this smaller crematorium. Parkgrove has only 24 formal spaces for cars with large overspill on loop road, totalling 100 car capacity. Parkgrove sees an average occupancy of 3 people / car.

3.0 SUSTAINABLE TRAVEL OPPORTUNITIES

Walking

3.1 Due to the rural nature of the development there are no footpath links to the crematorium site. Adequate footpath provision to link the various car park areas to the crematorium building will be provided within the Architects development layout.

Cycle Infrastructure

3.2 It is very unlikely that anyone will travel to a funeral by cycle given the rural location of the development. As a result, no public cycling facilities is proposed to be provided. Those who wish to cycle to the crematorium by cycle to visit the memorial gardens would be able to keep their cycle with them within the memorial gardens and therefore there is no requirement for a public cycle storage facility.

3.3 There is anticipated to be 4 full time staff and therefore the provision of a single Sheffield stand would suffice to comply with the National Parking Standard which requires 1 space per 4 permanent staff members. There will be locker and shower facilities available for staff to use.

3.4 There is no designated cycle routes within the vicinity of the site and cyclists would require to the carriageway.

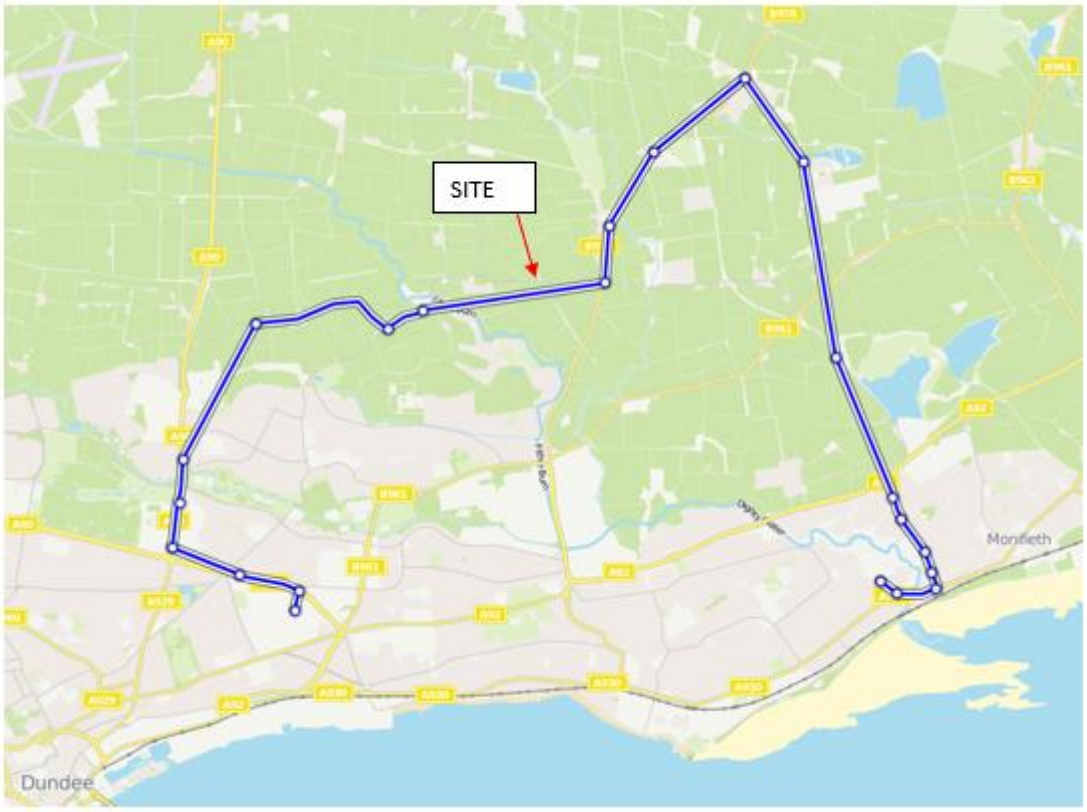
3.5 Given the anticipated low public demand for cycling to the development and the proposed staff cycle parking, locker and shower facilities it is considered that there is adequate provision for cyclists should they wish to travel to the crematorium.

Public Transport

Existing Provision

3.6 There is currently two existing bus services that run directly past the proposed crematorium site. The A17 & A38 which run one in each direction each working day. Bus services in this area run on a hail and ride basis and as such would stop outside the site, even if no fixed stop was installed should someone require. The bus routes and timetable are shown below:

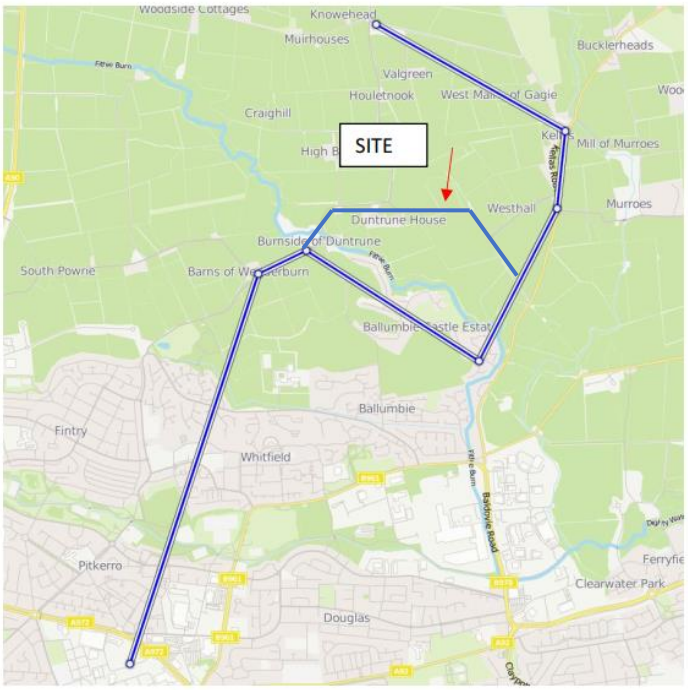
A38 – Fishers Tours bus route and timetable shown below:



Pitkerro, opp Keyline	08:00
Burnside of Duntrune, at Braeside Cottages	08:16
Kellas, at Smiddy	08:22
Kellas, at Keillorcroft	08:23
Wellbank Forge (at)	08:27
Wellbank, at Forbes of Kingennie	08:29
Monifieth, at High School	08:40
	Operates on Angus schooldays only

Monifieth, at High School	16:00
Wellbank, opp Forbes of Kingennie	16:11
Wellbank Forge (opp)	16:14
Kellas, opp Keillorcroft	16:15
Kellas, opp Smiddy	16:16
Burnside of Duntrune, opp Braeside Cottages	16:21
Pitkerro, at Keyline	16:37
	Operates on Angus schooldays only

A17 – Fishers Tours – Murroes School – Ballumbie Castle



Monday to Friday, not QE0 : BUS.CIF days

Ballumbie Castle and Fishers Depot - Murroes School

Pitkerro, opp Keyline	08:28
Barns of Wedderburn, at Farmhouse Road End	08:37
Burnside of Duntrune, at Braeside Cottages	08:38
Ballumbie Castle, opp Hawthorn Grove	08:44
Kellas, opp South Kingennie Road End	08:46
Kellas, at Smiddy	08:47
Westhall Terrace, at Murroes School	08:50
	Operates on Angus schooldays only

Murroes School - Ballumbie Castle and Fishers Depot

Westhall Terrace, at Murroes School	15:30
Burnside of Duntrune, opp Braeside Cottages	15:34
Barns of Wedderburn, opp Farmhouse Road End	15:35
Burnside of Duntrune, at Braeside Cottages	15:36
Ballumbie Castle, opp Hawthorn Grove	15:40
Pitkerro, at Keyline	15:49
	Operates on Angus schooldays only

3.7 Two additional local bus services (Nos 22 & 139) run past the site some 450m west of the proposed site access. Whilst the distance to walk to a bus route to the west is slightly above the desired 400m any funeral attendee would likely be making this journey infrequently. Service 22 operates two services per day in each direction Mondays to Fridays. One service in each direction operates on a Saturday. Service 139 operates 2 services per day Monday to Friday each day. The bus routes and timetables are shown below:

139 – Explore Dundee route AND Timetables Shown Below

139 Tealing | Inveraldie | Westhall Terrace | Dundee

Monday to Friday — from 9th August 2020

	139	139
Inveraldie Hall Place	0902	-
Tealing School	0910	1300
Tealing Village	0913	1303
Westhall Terrace	0919	1309
Burnside of Duntrune	0922	1312
South Powrie	0924	1314
City Centre High Street [H1]	0937	1327

139: Service terminates at High Street (H1). Use Union Street instead of Whitehall and wait at H1 for any layover. H4 is pick-up point only.

139 Tealing | Inveraldie | Westhall Terrace | Dundee

Saturday — from 9th August 2020

Inveraldie Hall Place	0902	-
Tealing School	0910	1300
Tealing Village	0913	1303
Westhall Terrace	0919	1309
Burnside of Duntrune	0922	1312
South Powrie	0924	1314
City Centre Whitehall Street [W1]	0937	1327

139 Dundee | Westhall Terrace | Inveraldie | Tealing

Monday to Friday — from 9th August 2020

		$
City Centre High Street [H4]	0840	1225
City Centre Commercial Street [1]	0842	1227
South Powrie	-	1238
Burnside of Duntrune	-	1240
Westhall Terrace	-	1243
Inveraldie Hall Place	0859	1250
Tealing Village	-	1257
Tealing School	-	1300

$: Inveraldie Hall Place is served on request to the driver.

139 Dundee | Westhall Terrace | Inveraldie | Tealing

Saturday — from 9th August 2020

		$
City Centre High Street [H4]	0840	1225
City Centre Commercial Street [1]	0842	1227
South Powrie	-	1238
Burnside of Duntrune	-	1240
Westhall Terrace	-	1243
Inveraldie Hall Place	0859	1250
Tealing Village	-	1257
Tealing School	-	1300

$: Timing Points, South Powrie, Burnside of Duntrune, Westhall Terrace, are served on request to the driver, otherwise proceed to Inveraldie Hall Place

3.8 Further buses can be accessed on Hawick Drive off the Drumgeith Road approximately 2.4km from the site. There is no footpath provision from the site until the Kellas Road junction with Poplar Drive approximately 1.4km from the proposed crematorium site.

3.9 The Table below gives a summary of the buses that can be accessed from the Hawick Drive bus stops.

Service Operator	Service Type	Service No.	Journey	Typical Time Interval Between Services	
				Peak Hours	Outwith Normal Hours
Moffat & Williamson	Bus	78C	Dundee to Monikie via Kellas Rd		There is a total of 3 services per day
Moffat & Williamson	Bus	78A/79 A	Monikie to Dundee via Kellas Rd		There is a total of 4 services per day

Service Operator	Service Type	Service No.	Journey	Typical Time Interval Between Services	
				Peak Hours	Outwith Normal Hours
Moffat & Williamson	Bus	88 at Hawick Drive	Whitfiled – Broughty Ferry Circular via Hawick Drive	hourly	hourly

Table 1 – Summary of Existing Public Transport Provision.

3.10 Given the rural nature of the site and the fact that there are several bus routes identified that either pass the site or are within the surrounding area of the site there is the opportunity for staff or funeral attendees to travel to the site via existing public transport.

3.11 There will be potential for people to travel to the site by private bus and the site layout is designed to have adequate space for buses although no designated space will be provided. Buses would be expected to utilise the overspill parking area.

Additional Transport Enhancement Options

3.12 If considered essential an appropriate bus stop or pull in area could be incorporated as part of the access to be formed for the site. Correspondence from Xplore Dundee who run buses in the area indicates they *"would be happy with anything that would improve accessibility and make a service more useful for people" and they* have previously contacted the relevant parties at Angus Council.

3.12 Alternatively bearing in mind the anticipated infrequency it is anticipated that people will want to access facilities by public transport: it would probably be more suitable to incorporate into the transport plan for the site the provision of a call up service for those who wanted to be collected from the existing nearest bus stops. As we have already incorporated provision for electric vehicles on site this could also be by electric vehicle to keep emissions to an absolute minimum.

3.13 Paragraph 276 of Scottish Planning Policy (SPP) States:

"In rural areas the plan should be realistic about the likely viability of public transport services and innovative solutions such as demand-responsive public transport and small-scale park and ride facilities at nodes on rural bus corridors should be considered."

This flexibility in terms of access to public transport is an approach that has previously been adopted by Angus Council on many occasions.

4.0 NETWORK ANALYSIS

Road Network Extent Considered

4.1 The initial extent of the existing road network to be included in the study was agreed with Angus Council Traffic Team at the scoping meeting and includes the following junctions:

- New Site Access junction
- C4/C6 simple priority T-junction
- Unclassified Rd/ C4 simple priority T-Junction
- C4/ Kellas Road simple priority T-Junction
- Unclassified Road/ Kellas Road simple priority T-Junction

4.2 The following junction with the Dundee City Council area is also within the extent of road network considered. The B978 Baldovie Road is dual-carriageway and changes to single carriageway at Drumgeith Road. Kellas Road is also designated as the B978.

- Kellas Road/Baldovie Road/Drumgeith Road ghost island right turn junction.

Traffic Surveys

4.3 A turning count traffic survey was undertaken by Transurveys Ltd on Tuesday the 8th of October 2019 at the B961 Drumgeith Road/B978 Kellas Road and Baldovie Road ghost island junction. A week long speed survey was also undertaken at the same period on the B978 Kellas Road approximately 30m south of the unclassified road. A speed survey was also undertaken on the C4 along the site frontage. Straight ahead flows are also provided at the speed survey locations for the peak periods. The traffic flow survey data is contained within **Appendix A**.

4.4 The AM and PM peak flows were established from the traffic counts and are displayed in the road network diagrams below:

Assessment Years/Periods

4.5 We confirm a we will assess the development for a proposed opening year of 2021 and the NRTF central growth rate has been applied to the 2019 base flows. The NRTF central growth factor is = a growth rate of 1.19% over 2 years which = 1.019*1.019= 1.038. The 2021 AM and Pm Base Flows are contained in the figures below.

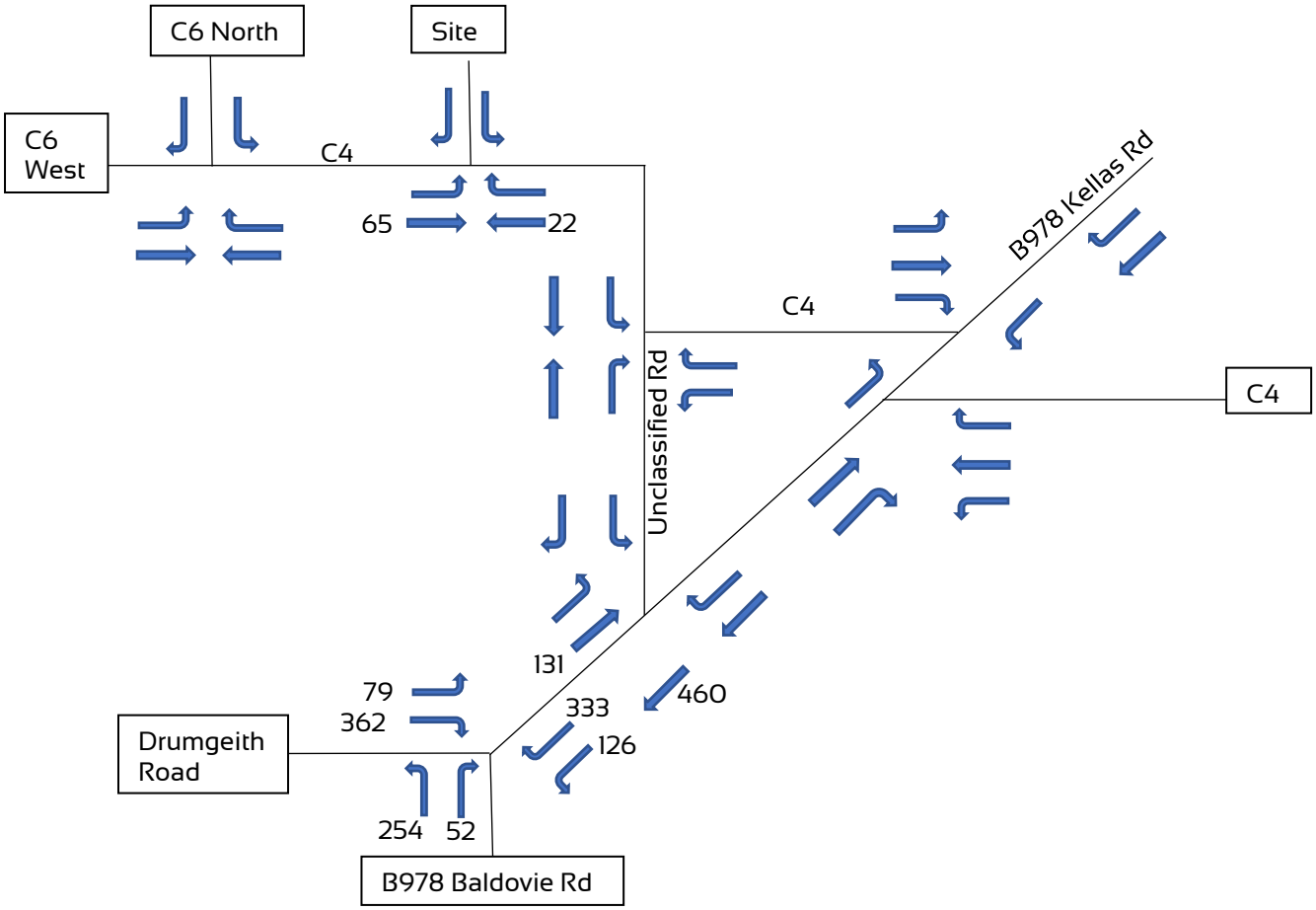


Figure 3 – 2019 Weekday AM Surveyed Base Flows 07:30 – 08:30 (PCUs)

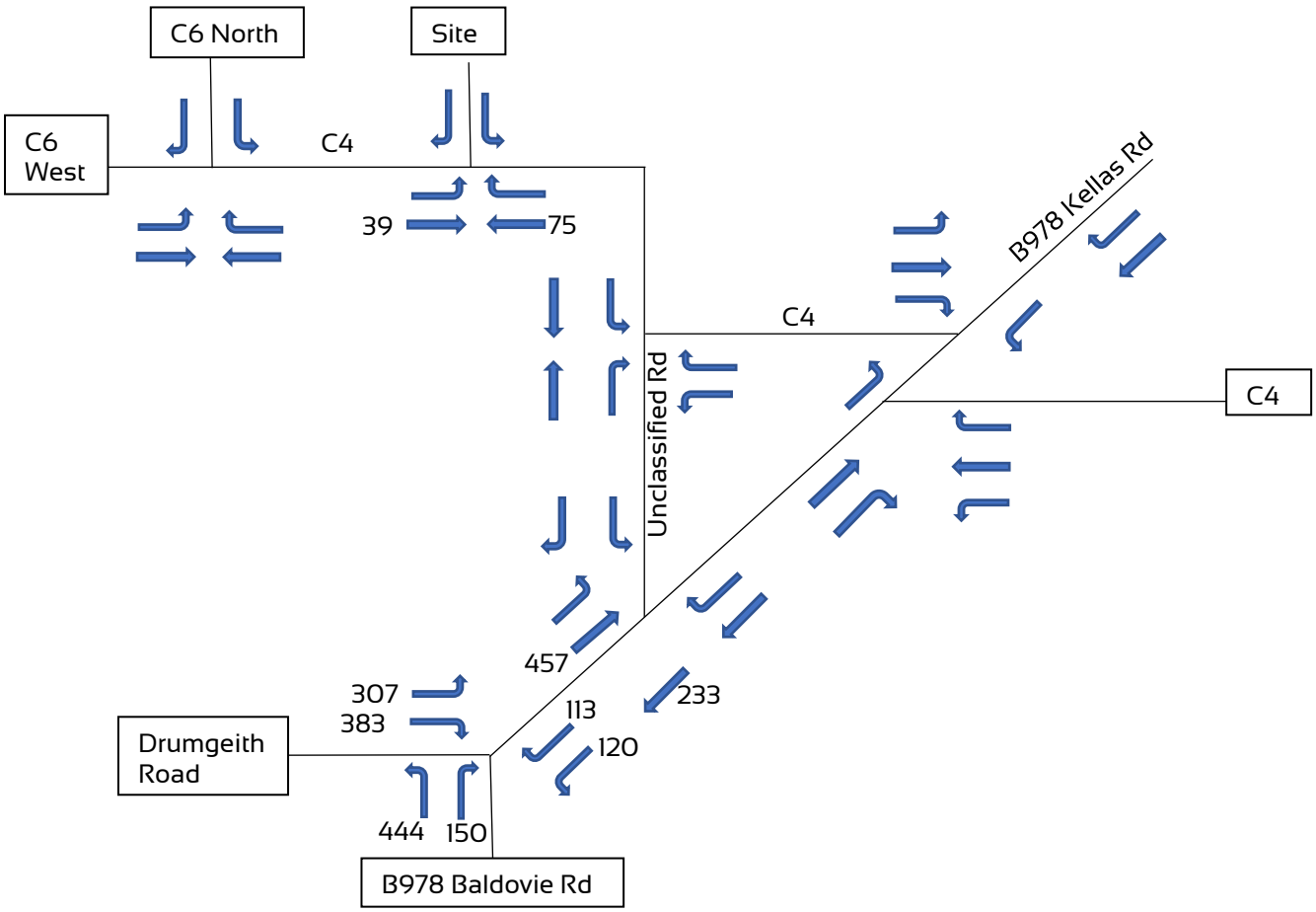


Figure 4 – 2019 Weekday PM Surveyed Base Flows 16:15 – 17:15 (PCUs)

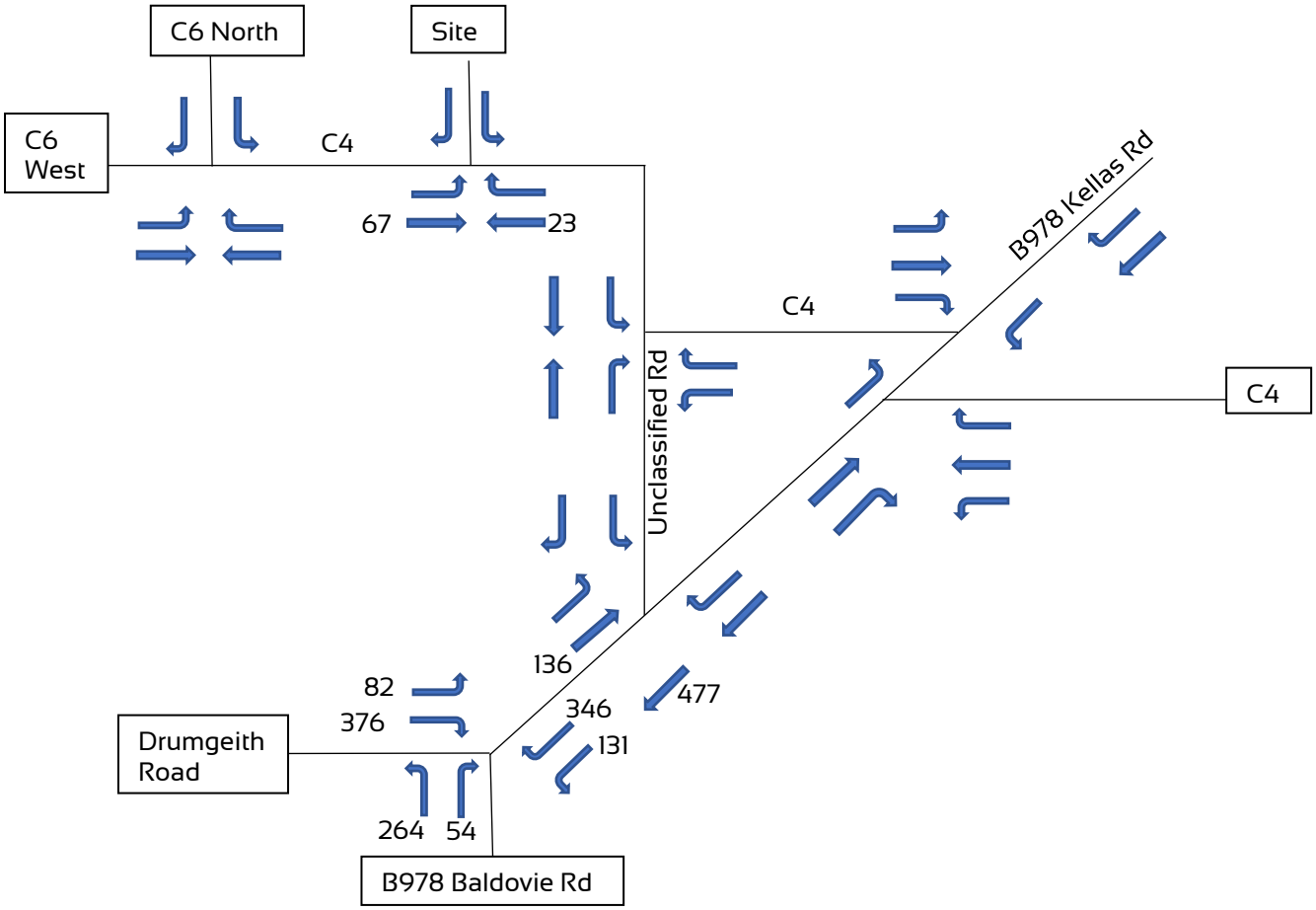


Figure 5 – 2021 Weekday AM Base Flows 07:30 – 08:30 (Vehicles)

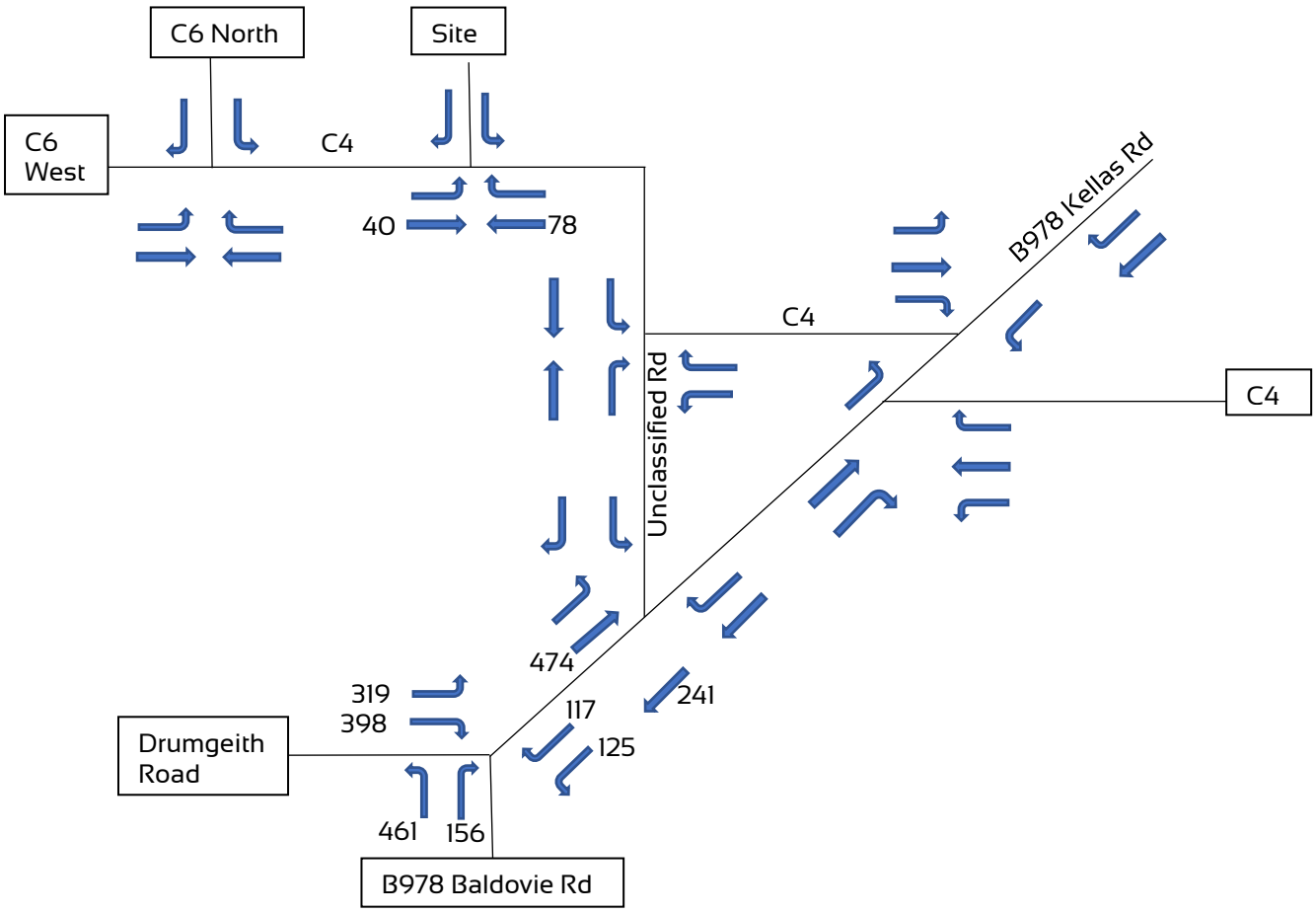


Figure 6 – 2021 Weekday PM Base Flows 16:15 – 17:15 (Vehicles)

TRIP GENERATION

4.6 As there are no sites from Crematoriums within the TRICS database the generated trips will be based on the expected usage of the Crematorium. The following information has been provided by the developer. Some of the information has been based on a previous TA undertaken for a Crematorium at 100Acre Wood in Fife which used information obtained from Parkgrove Crematorium near Friockheim.

- The Crematorium will have a seating capacity of 120.
- There is expected to be an average of 3 cremations per day.
- There will be no weekend cremations.
- A maximum of 5 cremations per day will take place.
- Cremations will be at a minimum of 1-hour intervals (i.e. There is a minimum of 1-hour gap between a service ending and the next one starting).
- Cremations start times will be between 09:00 and 16:00.
- 4 full time staff.
- Cremations will be attended by an average of 70 people arriving in 24 cars, with a very infrequent extreme maximum of 200 people arriving in 67 cars. This is based on the average occupancy of 3 people per car as experienced at Parkgrove (See section 2.16)
- There will be a memorial garden which is expected to not have a high peak demand with peak usage expected at weekends when there are no cremations planned.
- Coaches will be expected at approximately 3% of funerals.
- Visitors to the memorial gardens will generate an average of 10 vehicles per day although this will only reach this figure once the garden is fully established.

4.7 It is unlikely that two maximum capacity funerals would take place back to back and these are not expected to occur with any great frequency. Therefore, the worst case frequently experienced scenario to be considered is for an average size funeral leaving and an average size funeral arriving within the same hourly period. Therefore, it is considered that 24 cars arriving and leaving within the same hour should be assessed for impact on the local road network.

Trip Distribution

4.8 It was agreed at the scoping meeting that a population gravity/distribution model should be used to determine the percentage distribution of the generated trips. A population gravity model was considered however this would likely lead to a much disproportionately high proportion of trips from Dundee given the high population and short distance to the site. The crematorium is to primarily serve the Angus Council District.

4.9 The distribution is therefore based on a population distribution model which has been determined using the populations of electoral ward areas provided within the Scotland Census 2011 data. This has considered the catchment area of the crematorium to be the Angus Council electoral wards and the Dundee City Council wards. The extent of the electoral wards selected is shown below:

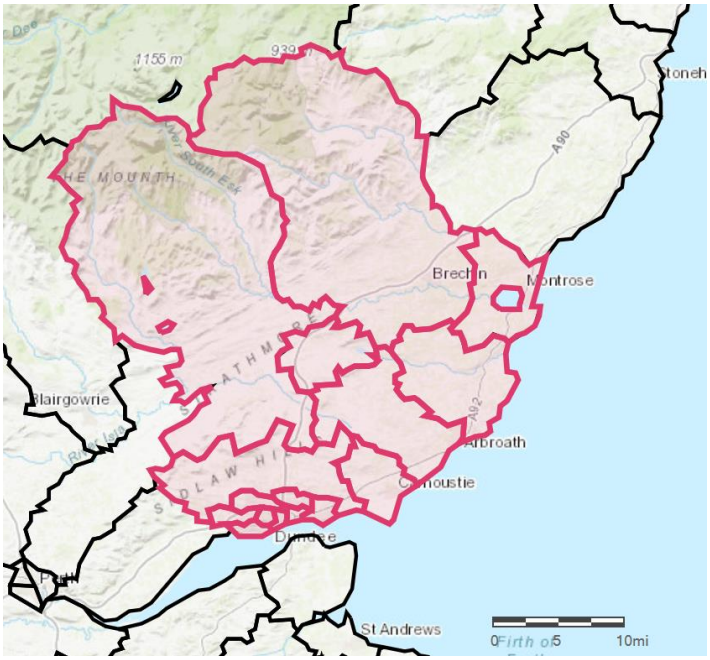


Figure 7 – Scottish Census Electoral Ward Areas – Proposed Crematorium Catchment Area

4.10 A percentage of the traffic from each electoral ward area has been apportioned to the most likely routes used from these electoral wards to access the crematorium and enter the assessed road network area.

4.11 The population distribution model is contained in **Appendix C**. The % distribution through the assessed road network is in figure 8 below:

4.12 The proposed traffic generated by the development with 24 inbound and 24 outbound trips is shown in the figure 9 below:

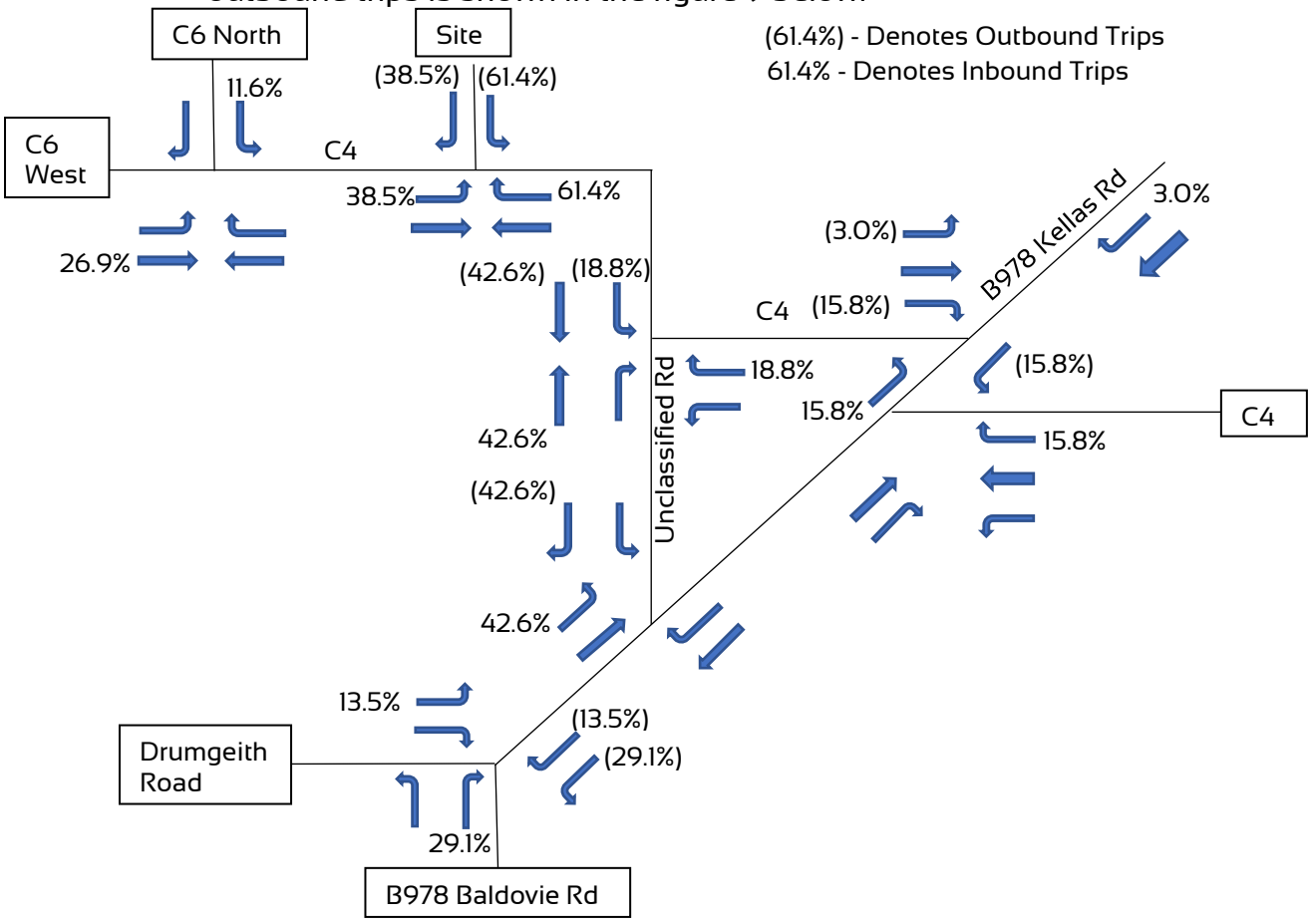


Figure 8 – Generated Trip Distribution

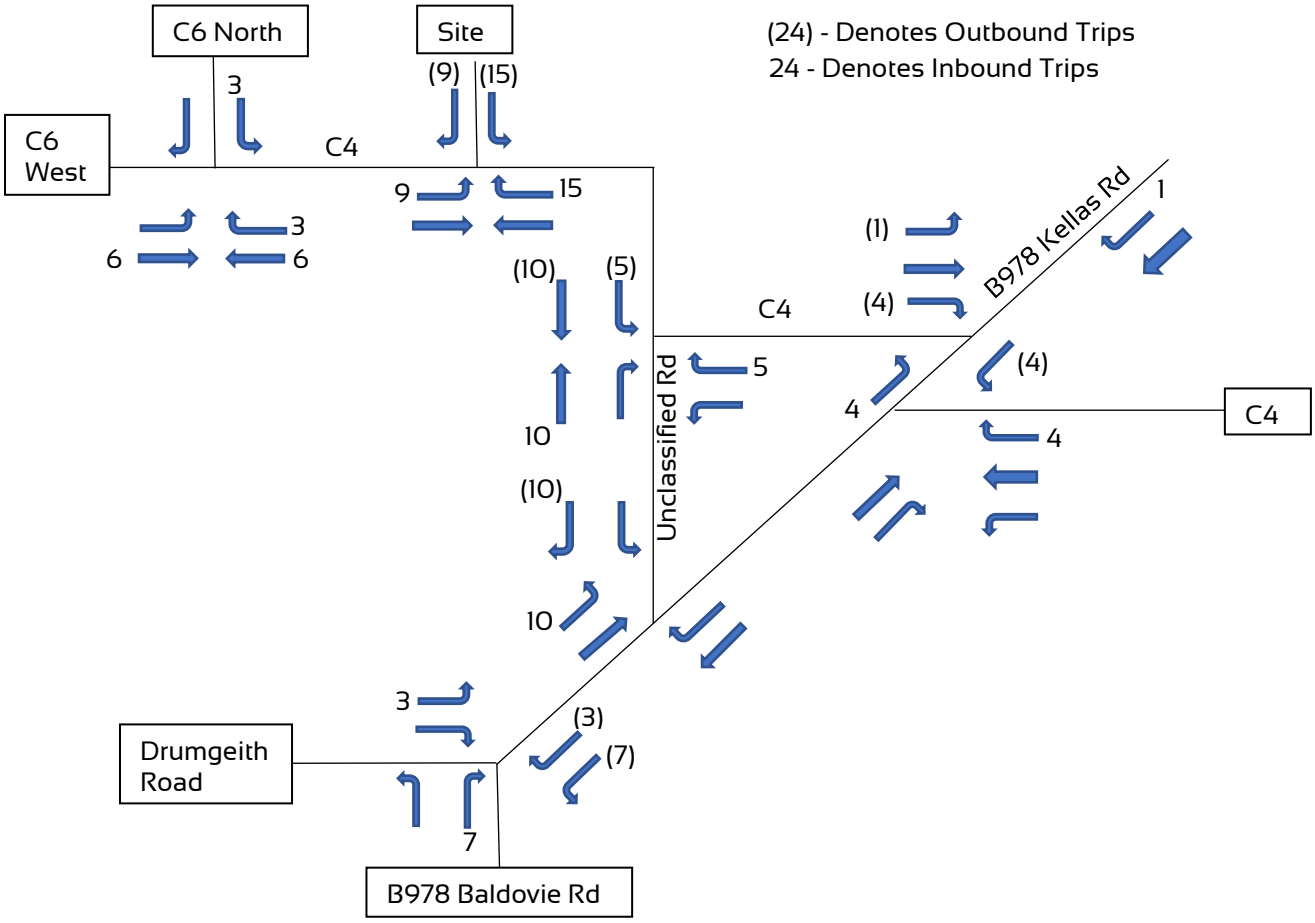


Figure 9 – Generated Trips Based on Average Funerals

Committed Developments

4.13 There are no known committed developments to consider.

Threshold Assessment

4.14 The above proposed traffic generation figures are applied to the 2021 AM and PM Base Flows to determine the 2-way flow thresholds assessment which is shown in the figures below. Where the generated traffic results in an increase of greater than 5% a junction capacity analysis is normally considered to be required to be undertaken. Although where existing plus proposed development traffic is clearly shown to be well below that expected to cause capacity and queuing issues then it is accepted that modelling is not required in these circumstances.

4.15 Based on the figures below it is shown that due to the relatively small existing traffic flows on the existing minor roads there is a large percentage increase in traffic resulting from the development with a 27% increase during the AM peak on the C4 at the site frontage. Due to the existing traffic flows and expected traffic generation it was accepted at the scoping meeting that there would be no requirement to model the proposed site access junction provided a simple priority T-junction with adequate visibility lines is provided.

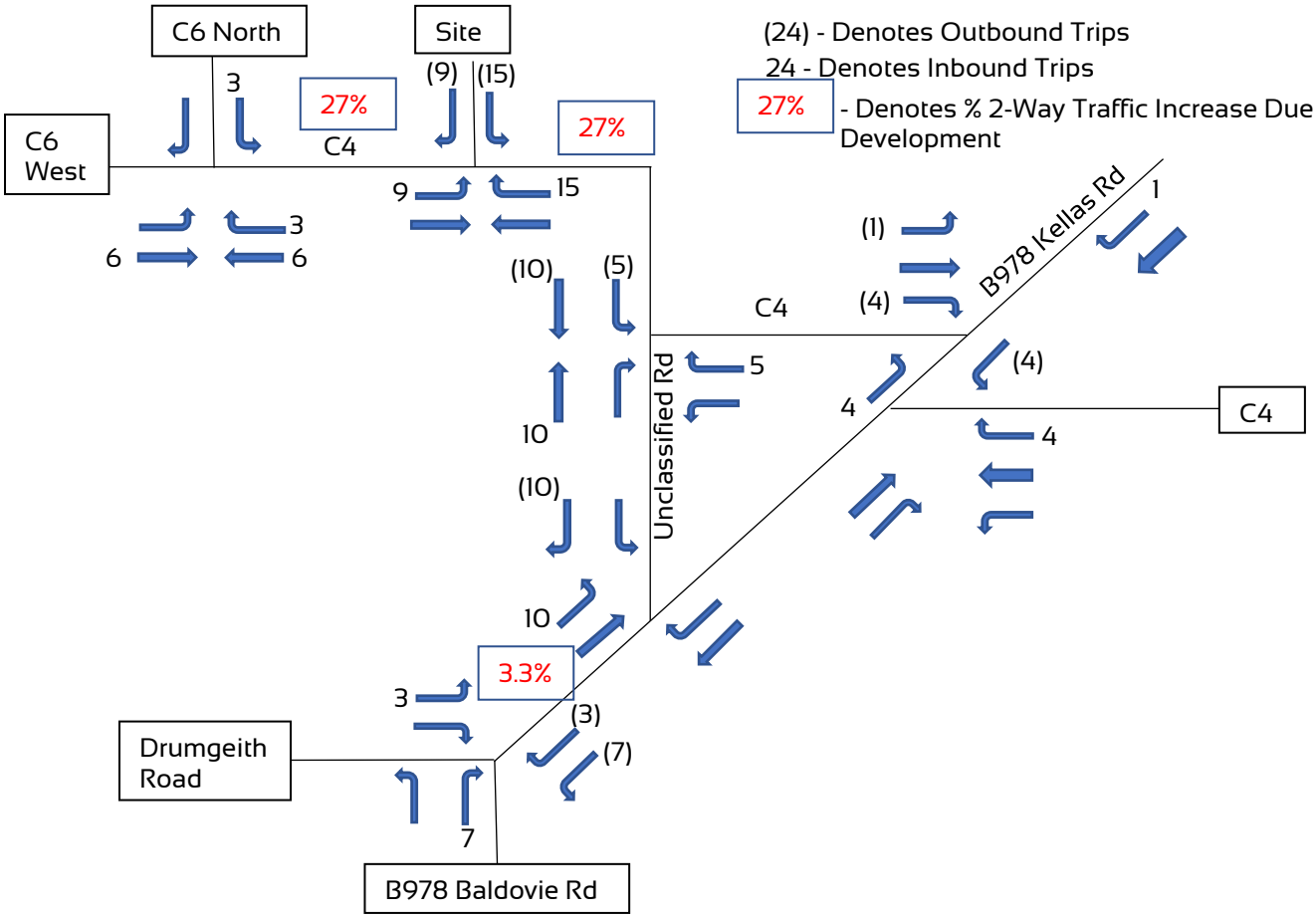


Figure 10 – 2-Way Traffic Threshold Assessment Generated Trips Based on Average Funerals Compared with 2021 AM Base Flow

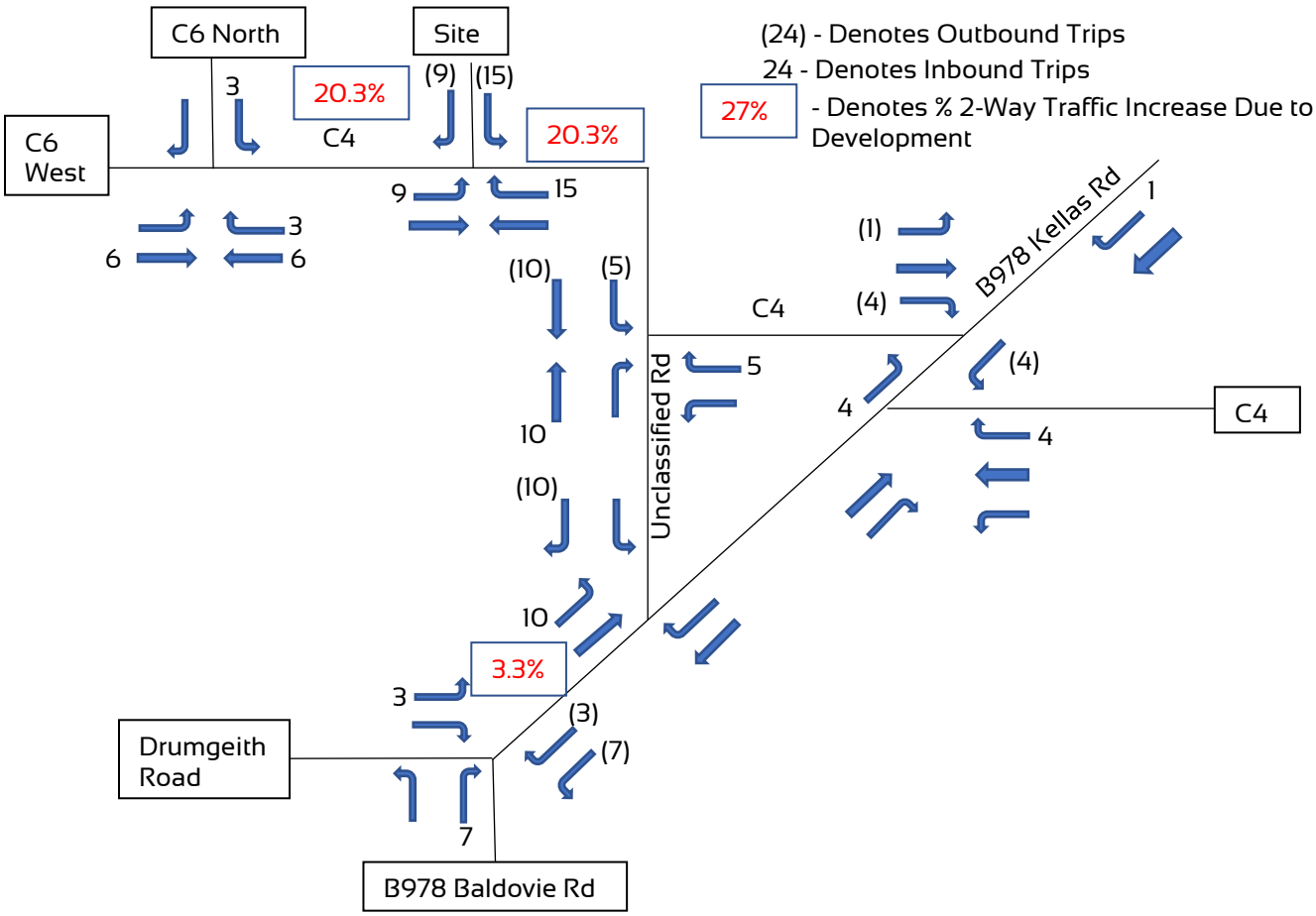


Figure 11 – 2-Way Traffic Threshold Assessment Generated Trips Based on Average Funerals Compared with 2021 PM Base Flow

5.15 The increases in traffic are only 3.3% for both AM and PM peak periods on Kellas Road itself and therefore there is no requirement for a capacity analysis of the Kellas Road junction with Baldovie Road. Even if it was considered that one maximum seating capacity funeral was followed by an average funeral the percentage increase on Kellas Road would then only increase to 4.4%.

5.0 CONCLUSIONS

5.1 The proposed 120 seating capacity crematorium is anticipated to serve primarily the Angus Council area.

5.2 Given its location close to Dundee a reasonable percentage of trips would be generated from Dundee which is the largest population within the nearby area.

5.3 The proposed site access will be in the form of a simple priority T-junction taken off the C4 with 4.5m x 120m visibility splays provided each side to suit the design speed of 40mph established through speed surveys.

5.4 Junction modelling for the proposed simple priority T-junction site access junction is not required as a result of the existing low traffic flows and the scale of the development would clearly not result in the proposed access junction having any capacity issues. It is also considered that there is no requirement to undertake junction capacity modelling on any of the existing road network junctions.

5.5 It is proposed to provide signage so that those accessing the site from the C4 West and from Baldovie Road are directed to use the unclassified Road rather than the C4 section between the unclassified Road and Kellas Road due to this section of the C4 having a lesser road width than the unclassified road. Also the C4 junction with B878 Kellas Road has substandard visibility.

5.6 A number of additional passing places will be provided along the C4 and unclassified road as identified on the drawings in **Appendix B**.

5.7 The existing road along the full length of the site frontage will be widened to 5.5m.

5.8 The unclassified junction with the B978 Kellas Road desired visibility is 4.5mx160m to suit a 50mph design speed which has been determined by speed survey data presented within this report. Bushes/shrubs within the adopted road envelope requires to be cleared in order for this to be achieved when looking to the South.

5.9 At the same junction the visibility achieved to the North is 2.2mx160m and again this will require shrubs and grass to be cut back within the road envelope in order to provide this visibility. Once this is undertaken this will improve the existing visibility at the junction and therefore it is considered that the visibility provided is acceptable.

5.10 A total of 90 spaces are proposed including 50 standard, 4 disabled, 32 overflow and 4 staff.

5.11 Bus services are available including two services which pass the site frontage and can be accessed on a hail and ride basis. Additional bus services are provided to the surrounding area which gives the opportunity for staff and funeral attendees to access the site via existing public transport.

5.11 If considered essential an appropriate bus stop or pull in area could be incorporated as part of the access to be formed for the site. Correspondence from Xplore Dundee who run buses in the area indicates they *"would be happy with anything that would improve accessibility and make a service more useful for people" and they* have previously contacted the relevant parties at Angus Council.

5.12 Alternatively bearing in mind the anticipated infrequency it is anticipated that people will want to access facilities by public transport: it would probably be more suitable to incorporate into the transport plan for the site the provision of a call up service for those who wanted to be collected from the existing nearest bus stops. As we have already incorporated provision for electric vehicles on site this could also be by electric vehicle to keep emissions to an absolute minimum.

5.13 Although it has been shown that there is reasonable public transport infrastructure already provided when considering the sites rural location, the potential to extend surrounding bus services to include the site should demand require it and the potential for a call up service to/from the site to the nearby bus stops there is ample opportunity to ensure funeral attendees and staff can access the site via public transport. It is not expected that there would be any significant demand for public transport provision given the nature of the development. The above information in our view gives adequate provision and opportunity to travel to site via public transport.

5.14 There are currently no footpath or cycle links to the site and given the nature of the development there is no proposal to provide a footpath link.

5.14 As a result, of the low traffic impact on the surrounding road network and the proposed access provision and improvements to existing visibility splays there is no foreseeable reason for refusal of the proposed planning application, in terms of traffic impact or transport provision.

BAC
28.09.2021

APPENDIX A – TRAFFIC SURVEY AND SPEED SURVEY DATA

TRAFFIC SURVEY REPORT

KELLAS ROAD, DUNDEE

TRANSURVEYS LIMITED

BLUE SQUARE OFFICES, 272 BATH STRET, GLASGOW, G2 4JR

2407

TRAFFIC SURVEY REPORT

QUALITY MANAGEMENT

CLIENT	Cameron + Ross
PROJECT	Kellas Road, Dundee
REFERENCE	TS-19-058
REVISION	001

Revision	Date	Prepared by	Signed	Checked by	Signed
001	22/10/2018	Neil Dempsey	[redacted]	Neil Dempsey	[redacted]

SURVEYED NETWORK

Junction Turning Counts & Queue Surveys:-

1. B961 (Drumgeith Road) / Kellas Road Priority Junction

Automatic Traffic Counts:-

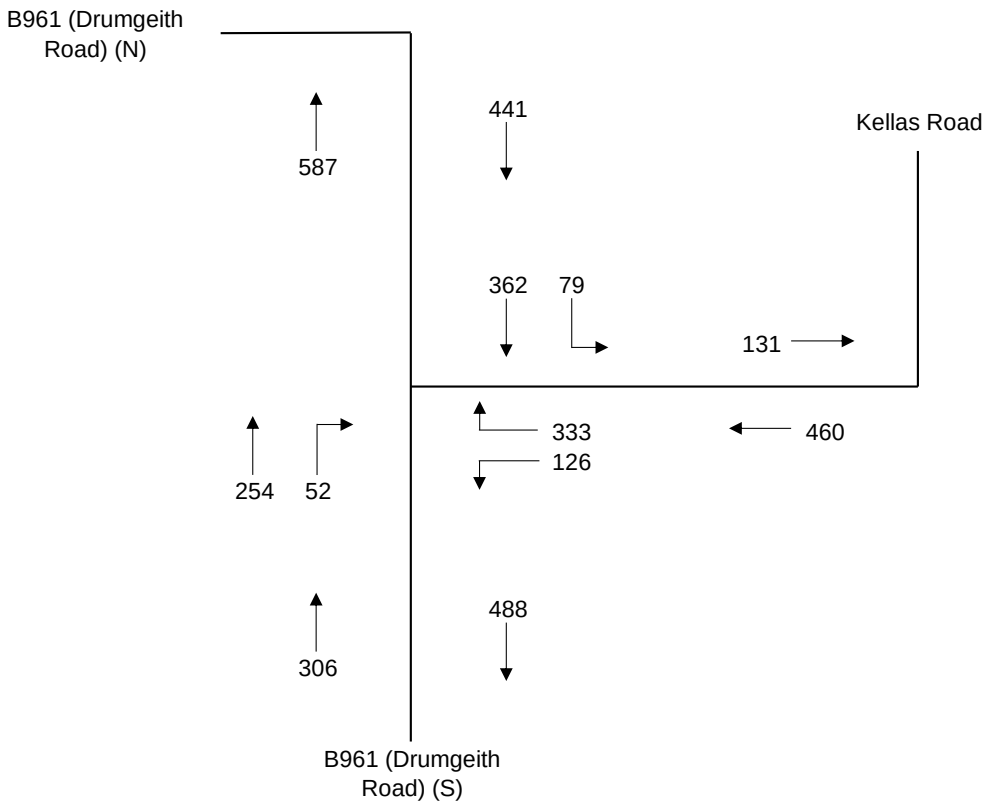
2. Unnamed Road, east of Duntrune House; and
3. Kellas Road - approximately 30m south of Unnamed Road.

CLASSIFIED VEHICLE JUNCTION TURNING COUNTS

TRAFFIC SURVEY REPORT

2410

SURVEY NETWORK TRAFFIC FLOW DIAGRAMS

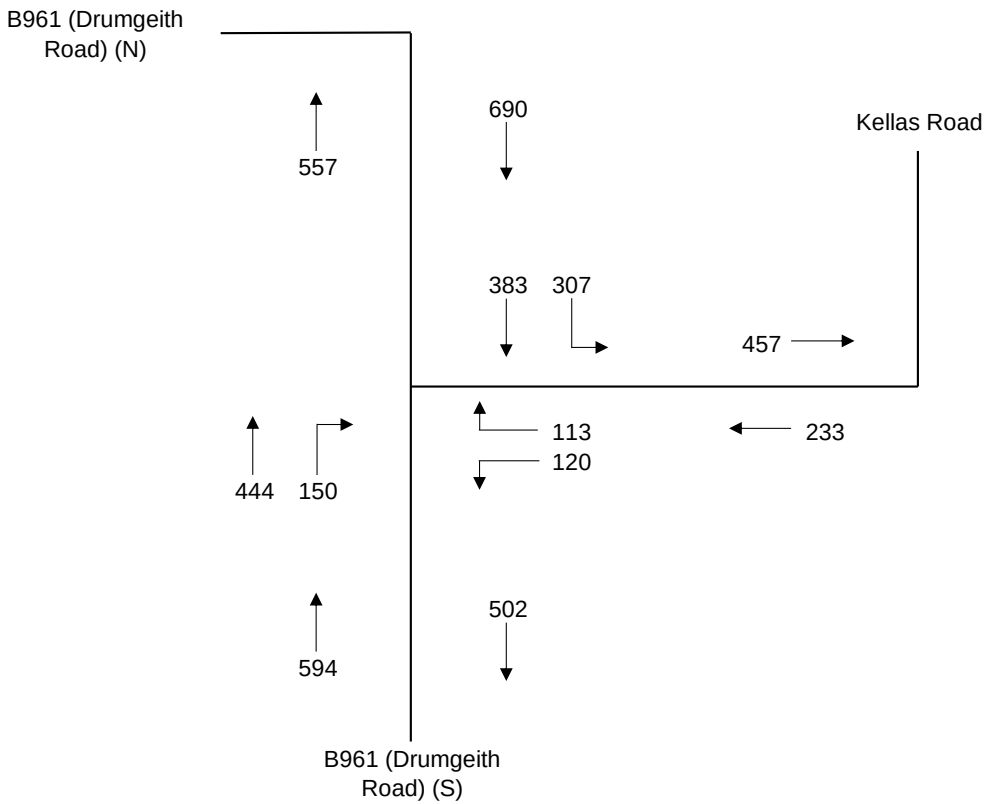


	Peak Hour
Weekday AM Hour	07:30-08:30
Veh.Classification	TOTAL PCUs

Date: 8th October 2019

For illustrative purposes only, please refer to data sheets for individual traffic movements

SURVEY NETWORK TRAFFIC FLOW DIAGRAMS



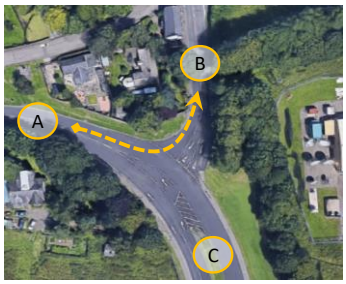
	Peak Hour
Weekday PM Hour	16:15-17:15
Veh.Classification	TOTAL PCUs

Date: 8th October 2019

For illustrative purposes only, please refer to data sheets for individual traffic movements

CLASSIFIED VEHICLE JUNCTION TURNING COUNT

Project: Kellas Road, Dundee
Client: Cameron + Ross
Project Ref: TS-19-058
Date: Tuesday 8th October 2019
Weather: AM: Dry / Sunny; PM: Wet / Overcast
Junction 1: B961 (Drumgeith Road) / Kellas Road Priority Junction
Movement 1.1: B961 (Drumgeith Road) (North) to Kellas Road Left Turn (A-B)



TIME		VEHICLE CLASSIFICATION							TOTAL		
		B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
07:00	07:15	0	0	7	0	0	0	0	7	0	7.00
07:15	07:30	0	0	9	2	1	0	0	12	1	12.50
07:30	07:45	0	0	10	3	0	0	1	14	1	15.00
07:45	08:00	0	0	12	6	2	0	0	20	2	21.00
08:00	08:15	0	0	13	3	2	0	0	18	2	19.00
08:15	08:30	0	0	18	6	0	0	0	24	0	24.00
08:30	08:45	0	0	11	3	1	1	0	16	2	17.80
08:45	09:00	0	1	18	3	0	0	0	22	0	21.40
09:00	09:15	0	0	16	7	1	2	0	26	3	29.10
09:15	09:30	0	0	12	3	2	0	0	17	2	18.00
09:30	09:45	0	0	7	6	0	0	0	13	0	13.00
09:45	10:00	0	0	21	7	2	0	0	30	2	31.00
TOTAL		0	1	154	49	11	3	1	219	15	228.80

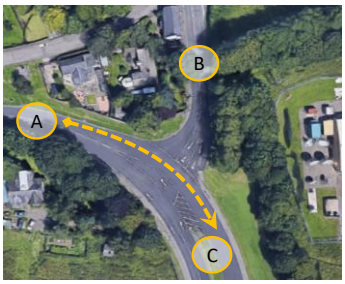
PEAK	VEHICLE CLASSIFICATION							TOTAL		
JUNCTION	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
07:30 - 08:30	0	0	53	18	4	0	1	76	5	79.00
NETWORK	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
07:30 - 08:30	0	0	53	18	4	0	1	76	5	79.00

TIME		VEHICLE CLASSIFICATION							TOTAL		
		B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
15:30	15:45	0	0	39	6	1	1	0	47	2	48.80
15:45	16:00	0	0	55	6	4	1	0	66	5	69.30
16:00	16:15	0	1	53	5	1	0	0	60	1	59.90
16:15	16:30	1	0	53	15	4	0	0	73	4	74.20
16:30	16:45	0	0	55	10	1	0	1	67	2	68.50
16:45	17:00	1	0	61	7	1	0	0	70	1	69.70
17:00	17:15	0	0	84	9	1	0	0	94	1	94.50
17:15	17:30	0	1	68	4	1	0	0	74	1	73.90
17:30	17:45	0	0	49	6	1	0	0	56	1	56.50
17:45	18:00	0	0	56	9	0	1	0	66	1	67.30
18:00	18:15	0	0	56	3	0	1	0	60	1	61.30
18:15	18:30	0	0	43	2	0	0	0	45	0	45.00
TOTAL		2	2	672	82	15	4	1	778	20	788.90

PEAK	VEHICLE CLASSIFICATION							TOTAL		
JUNCTION	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
16:15 - 17:15	2	0	253	41	7	0	1	304	8	306.90
NETWORK	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
16:15 - 17:15	2	0	253	41	7	0	1	304	8	306.90

CLASSIFIED VEHICLE JUNCTION TURNING COUNT

Project: Kellas Road, Dundee
Client: Cameron + Ross
Project Ref: TS-19-058
Date: Tuesday 8th October 2019
Weather: AM: Dry / Sunny; PM: Wet / Overcast
Junction 1: B961 (Drumgeith Road) / Kellas Road Priority Junction
Movement 1.2: B961 (Drumgeith Road) (North) to B961 (Drumgeith Road) (South) Ahead (A-C)



TIME	VEHICLE CLASSIFICATION							TOTAL		
	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
07:00 07:15	0	0	37	2	1	1	0	41	2	42.80
07:15 07:30	1	0	61	12	4	1	0	79	5	81.50
07:30 07:45	0	1	60	13	4	0	0	78	4	79.40
07:45 08:00	1	0	82	20	5	4	0	112	9	118.90
08:00 08:15	0	0	44	15	6	3	0	68	9	74.90
08:15 08:30	2	1	62	13	4	3	0	85	7	88.70
08:30 08:45	0	0	51	11	3	2	0	67	5	71.10
08:45 09:00	0	0	58	11	0	0	0	69	0	69.00
09:00 09:15	0	0	39	10	4	0	0	53	4	55.00
09:15 09:30	0	0	32	7	2	3	0	44	5	48.90
09:30 09:45	0	0	44	8	8	3	0	63	11	70.90
09:45 10:00	0	0	48	10	3	0	0	61	3	62.50
TOTAL	4	2	618	132	44	20	0	820	64	863.60

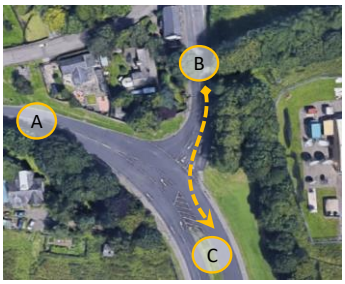
PEAK	VEHICLE CLASSIFICATION							TOTAL		
JUNCTION	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
07:30 - 08:30	3	2	248	61	19	10	0	343	29	361.90
NETWORK	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
07:30 - 08:30	3	2	248	61	19	10	0	343	29	361.90

TIME	VEHICLE CLASSIFICATION							TOTAL		
	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
15:30 15:45	0	1	55	8	4	1	0	69	5	71.70
15:45 16:00	0	0	60	8	3	5	0	76	8	84.00
16:00 16:15	0	0	70	6	2	0	0	78	2	79.00
16:15 16:30	0	0	69	12	5	2	0	88	7	93.10
16:30 16:45	0	0	81	16	2	2	0	101	4	104.60
16:45 17:00	0	0	69	11	1	2	0	83	3	86.10
17:00 17:15	0	0	76	11	2	3	1	93	6	98.90
17:15 17:30	0	0	83	10	3	1	0	97	4	99.80
17:30 17:45	0	0	62	7	2	1	0	72	3	74.30
17:45 18:00	0	1	68	7	1	2	0	79	3	81.50
18:00 18:15	0	0	48	8	0	0	0	56	0	56.00
18:15 18:30	0	0	68	5	0	2	0	75	2	77.60
TOTAL	0	2	809	109	25	21	1	967	47	1006.60

PEAK	VEHICLE CLASSIFICATION							TOTAL		
JUNCTION	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
16:15 - 17:15	0	0	295	50	10	9	1	365	20	382.70
NETWORK	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
16:15 - 17:15	0	0	295	50	10	9	1	365	20	382.70

CLASSIFIED VEHICLE JUNCTION TURNING COUNT

Project: Kellas Road, Dundee
Client: Cameron + Ross
Project Ref: TS-19-058
Date: Tuesday 8th October 2019
Weather: AM: Dry / Sunny; PM: Wet / Overcast
Junction 1: B961 (Drumgeith Road) / Kellas Road Priority Junction
Movement 1.3: Kellas Road to B961 (Drumgeith Road) (South) Left Turn (B-C)



TIME	VEHICLE CLASSIFICATION							TOTAL		
	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
07:00 07:15	0	0	13	1	0	1	0	15	1	16.30
07:15 07:30	1	1	18	4	0	0	0	24	0	22.60
07:30 07:45	0	1	15	3	2	0	0	21	2	21.40
07:45 08:00	0	0	27	9	0	2	0	38	2	40.60
08:00 08:15	0	0	20	2	2	0	1	25	3	27.00
08:15 08:30	1	0	25	12	0	0	0	38	0	37.20
08:30 08:45	0	0	26	2	0	1	0	29	1	30.30
08:45 09:00	0	0	31	5	1	1	0	38	2	39.80
09:00 09:15	1	0	18	5	0	0	0	24	0	23.20
09:15 09:30	1	0	21	6	0	0	0	28	0	27.20
09:30 09:45	0	0	21	4	2	1	0	28	3	30.30
09:45 10:00	0	0	21	5	0	0	0	26	0	26.00
TOTAL	4	2	256	58	7	6	1	334	14	341.90

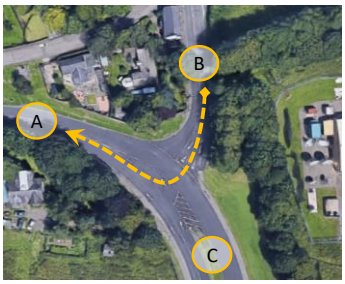
PEAK	VEHICLE CLASSIFICATION							TOTAL		
JUNCTION	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
07:30 - 08:30	1	1	87	26	4	2	1	122	7	126.20
NETWORK	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
07:30 - 08:30	1	1	87	26	4	2	1	122	7	126.20

TIME	VEHICLE CLASSIFICATION							TOTAL		
	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
15:30 15:45	1	0	17	2	0	0	0	20	0	19.20
15:45 16:00	0	0	28	2	2	0	0	32	2	33.00
16:00 16:15	0	0	21	6	0	0	0	27	0	27.00
16:15 16:30	0	0	33	7	0	0	0	40	0	40.00
16:30 16:45	0	0	18	2	0	1	0	21	1	22.30
16:45 17:00	1	0	28	2	0	0	0	31	0	30.20
17:00 17:15	0	0	23	1	2	0	0	26	2	27.00
17:15 17:30	0	0	17	5	0	0	0	22	0	22.00
17:30 17:45	0	0	32	4	1	0	0	37	1	37.50
17:45 18:00	0	0	25	1	1	1	0	28	2	29.80
18:00 18:15	0	0	31	2	1	0	0	34	1	34.50
18:15 18:30	0	0	18	2	1	0	0	21	1	21.50
TOTAL	2	0	291	36	8	2	0	339	10	344.00

PEAK	VEHICLE CLASSIFICATION							TOTAL		
JUNCTION	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
16:15 - 17:15	1	0	102	12	2	1	0	118	3	119.50
NETWORK	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
16:15 - 17:15	1	0	102	12	2	1	0	118	3	119.50

CLASSIFIED VEHICLE JUNCTION TURNING COUNT

Project: Kellas Road, Dundee
Client: Cameron + Ross
Project Ref: TS-19-058
Date: Tuesday 8th October 2019
Weather: AM: Dry / Sunny; PM: Wet / Overcast
Junction 1: B961 (Drumgeith Road) / Kellas Road Priority Junction
Movement 1.3: Kellas Road to B961 (Drumgeith Road) (North) Right Turn (B-A)



TIME	VEHICLE CLASSIFICATION							TOTAL		
	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
07:00 07:15	0	0	32	8	0	0	0	40	0	40.00
07:15 07:30	0	0	40	7	0	2	0	49	2	51.60
07:30 07:45	1	0	63	13	4	0	0	81	4	82.20
07:45 08:00	1	0	63	6	1	3	0	74	4	77.60
08:00 08:15	0	0	70	9	0	0	0	79	0	79.00
08:15 08:30	0	0	87	6	1	0	0	94	1	94.50
08:30 08:45	0	0	62	13	4	0	0	79	4	81.00
08:45 09:00	0	1	36	8	0	2	1	48	3	51.00
09:00 09:15	0	0	33	4	3	1	0	41	4	43.80
09:15 09:30	0	0	36	4	4	1	0	45	5	48.30
09:30 09:45	0	0	23	2	2	1	0	28	3	30.30
09:45 10:00	0	0	47	2	0	0	0	49	0	49.00
TOTAL	2	1	592	82	19	10	1	707	30	728.30

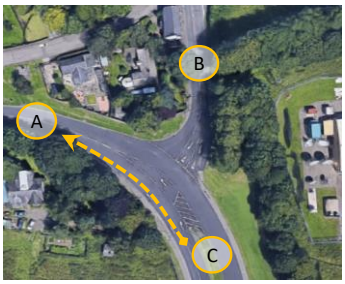
PEAK	VEHICLE CLASSIFICATION							TOTAL		
JUNCTION	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
07:30 - 08:30	2	0	283	34	6	3	0	328	9	333.30
NETWORK	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
07:30 - 08:30	2	0	283	34	6	3	0	328	9	333.30

TIME	VEHICLE CLASSIFICATION							TOTAL		
	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
15:30 15:45	0	0	27	6	1	1	0	35	2	36.80
15:45 16:00	0	0	21	7	1	0	0	29	1	29.50
16:00 16:15	1	0	17	5	0	0	0	23	0	22.20
16:15 16:30	0	1	15	8	0	0	0	24	0	23.40
16:30 16:45	0	0	27	5	0	0	1	33	1	34.00
16:45 17:00	0	0	21	4	1	1	0	27	2	28.80
17:00 17:15	0	0	23	4	0	0	0	27	0	27.00
17:15 17:30	0	0	32	2	0	0	0	34	0	34.00
17:30 17:45	0	0	24	1	0	0	0	25	0	25.00
17:45 18:00	0	0	21	3	0	0	0	24	0	24.00
18:00 18:15	0	0	27	4	0	0	0	31	0	31.00
18:15 18:30	0	0	24	3	0	0	0	27	0	27.00
TOTAL	1	1	279	52	3	2	1	339	6	342.70

PEAK	VEHICLE CLASSIFICATION							TOTAL		
JUNCTION	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
16:15 - 17:15	0	1	86	21	1	1	1	111	3	113.20
NETWORK	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
16:15 - 17:15	0	1	86	21	1	1	1	111	3	113.20

CLASSIFIED VEHICLE JUNCTION TURNING COUNT

Project: Kellas Road, Dundee
Client: Cameron + Ross
Project Ref: TS-19-058
Date: Tuesday 8th October 2019
Weather: AM: Dry / Sunny; PM: Wet / Overcast
Junction 1: B961 (Drumgeith Road) / Kellas Road Priority Junction
Movement 1.4: B961 (Drumgeith Road) (South) to B961 (Drumgeith Road) (North) Ahead (C-A)



TIME	VEHICLE CLASSIFICATION							TOTAL		
	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
07:00 07:15	0	0	39	9	1	0	0	49	1	49.50
07:15 07:30	0	0	31	7	1	0	0	39	1	39.50
07:30 07:45	0	0	49	6	1	6	1	63	8	72.30
07:45 08:00	0	0	41	13	1	3	0	58	4	62.40
08:00 08:15	0	0	48	8	2	0	0	58	2	59.00
08:15 08:30	0	0	40	8	8	0	0	56	8	60.00
08:30 08:45	0	0	31	13	4	1	0	49	5	52.30
08:45 09:00	0	0	37	9	2	1	0	49	3	51.30
09:00 09:15	0	0	40	12	4	5	0	61	9	69.50
09:15 09:30	0	0	31	16	3	0	0	50	3	51.50
09:30 09:45	0	0	37	13	4	0	0	54	4	56.00
09:45 10:00	0	0	49	12	3	0	0	64	3	65.50
TOTAL	0	0	473	126	34	16	1	650	51	688.80

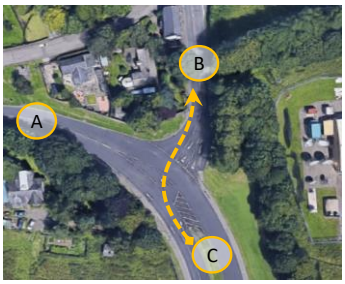
PEAK	VEHICLE CLASSIFICATION							TOTAL		
JUNCTION	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
07:30 - 08:30	0	0	178	35	12	9	1	235	22	253.70
NETWORK	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
07:30 - 08:30	0	0	178	35	12	9	1	235	22	253.70

TIME	VEHICLE CLASSIFICATION							TOTAL		
	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
15:30 15:45	1	0	123	6	0	4	0	134	4	138.40
15:45 16:00	0	0	56	10	0	2	0	68	2	70.60
16:00 16:15	1	0	63	11	4	1	0	80	5	82.50
16:15 16:30	0	0	78	19	6	2	0	105	8	110.60
16:30 16:45	0	0	97	16	2	3	0	118	5	122.90
16:45 17:00	0	0	74	9	2	2	0	87	4	90.60
17:00 17:15	1	0	105	8	3	1	0	118	4	120.00
17:15 17:30	0	0	83	10	0	0	1	94	1	95.00
17:30 17:45	0	0	77	7	0	1	0	85	1	86.30
17:45 18:00	0	0	41	3	0	0	0	44	0	44.00
18:00 18:15	0	0	47	6	0	0	0	53	0	53.00
18:15 18:30	0	0	53	6	0	0	0	59	0	59.00
TOTAL	3	0	897	111	17	16	1	1045	34	1072.90

PEAK	VEHICLE CLASSIFICATION							TOTAL		
JUNCTION	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
16:15 - 17:15	1	0	354	52	13	8	0	428	21	444.10
NETWORK	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
16:15 - 17:15	1	0	354	52	13	8	0	428	21	444.10

CLASSIFIED VEHICLE JUNCTION TURNING COUNT

Project: Kellas Road, Dundee
Client: Cameron + Ross
Project Ref: TS-19-058
Date: Tuesday 8th October 2019
Weather: AM: Dry / Sunny; PM: Wet / Overcast
Junction 1: B961 (Drumgeith Road) / Kellas Road Priority Junction
Movement 1.5: B961 (Drumgeith Road) (South) to Kellas Road Right Turn (C-B)



TIME		VEHICLE CLASSIFICATION							TOTAL		
		B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
07:00	07:15	0	0	7	1	0	1	0	9	1	10.30
07:15	07:30	0	0	7	2	1	0	0	10	1	10.50
07:30	07:45	0	0	7	2	1	0	0	10	1	10.50
07:45	08:00	0	0	7	1	0	0	0	8	0	8.00
08:00	08:15	0	0	10	2	0	1	0	13	1	14.30
08:15	08:30	0	0	14	4	1	0	0	19	1	19.50
08:30	08:45	0	0	12	2	0	0	0	14	0	14.00
08:45	09:00	0	0	10	2	1	0	0	13	1	13.50
09:00	09:15	0	0	15	6	0	0	0	21	0	21.00
09:15	09:30	0	0	13	3	0	0	1	17	1	18.00
09:30	09:45	0	0	13	5	0	0	0	18	0	18.00
09:45	10:00	0	0	18	4	3	0	0	25	3	26.50
TOTAL		0	0	133	34	7	2	1	177	10	184.10

PEAK	VEHICLE CLASSIFICATION							TOTAL		
JUNCTION	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
07:30 - 08:30	0	0	38	9	2	1	0	50	3	52.30
NETWORK	**B/CYCLE**	**M/CYCLE**	**CAR/TAXI**	**LGV**	**OGV1**	**OGV2**	**BUS/COACH**	**VEHICLES**	**HGVs**	**PCUs**
07:30 - 08:30	0	0	38	9	2	1	0	50	3	52.30

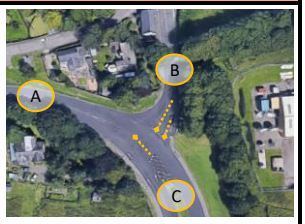
TIME		VEHICLE CLASSIFICATION							TOTAL		
		B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
15:30	15:45	0	1	33	5	0	1	0	40	1	40.70
15:45	16:00	1	0	32	4	1	0	0	38	1	37.70
16:00	16:15	0	0	35	2	0	1	0	38	1	39.30
16:15	16:30	0	0	36	2	0	1	1	40	2	42.30
16:30	16:45	0	0	35	4	0	0	0	39	0	39.00
16:45	17:00	0	0	23	4	0	0	0	27	0	27.00
17:00	17:15	0	0	34	5	0	1	0	40	1	41.30
17:15	17:30	1	0	31	2	0	0	0	34	0	33.20
17:30	17:45	0	0	31	1	0	2	0	34	2	36.60
17:45	18:00	0	0	24	1	0	0	0	25	0	25.00
18:00	18:15	0	0	35	2	1	0	1	39	2	40.50
18:15	18:30	0	0	19	1	1	0	0	21	1	21.50
TOTAL		2	1	368	33	3	6	2	415	11	424.10

PEAK	VEHICLE CLASSIFICATION							TOTAL		
JUNCTION	B/CYCLE	M/CYCLE	CAR/TAXI	LGV	OGV1	OGV2	BUS/COACH	VEHICLES	HGVs	PCUs
16:15 - 17:15	0	0	128	15	0	2	1	146	3	149.60
NETWORK	**B/CYCLE**	**M/CYCLE**	**CAR/TAXI**	**LGV**	**OGV1**	**OGV2**	**BUS/COACH**	**VEHICLES**	**HGVs**	**PCUs**
16:15 - 17:15	0	0	128	15	0	2	1	146	3	149.60

VEHICLE QUEUE SURVEYS

STUDY NETWORK MAXIMUM QUEUE COUNT

Project: Kellas Road, Dundee
Client: Cameron + Ross
Project Ref: TS-19-058
Date: Tuesday 8th October 2019
Weather: AM: Dry / Sunny; PM: Wet / Overcast
Junction 1: B961 (Drumgeith Road) / Kellas Road Priority Junction



TIME		VEHICLE MOVEMENT(S) / QUEUE - PCUs / LANE			
		B961 (Drumgeith Road) (North) (A-BC)	Kellas Road		B961 (Drumgeith Road) (South) (C-B)
			Near. (B-C)	Off. (B-A)	
07:15	07:20	-	0	1	0
07:20	07:25	-	0	4	0
07:25	07:30	-	0	4	1
07:30	07:35	-	0	3	0
07:35	07:40	-	0	11	0
07:40	07:45	-	0	3	1
07:45	07:50	-	1	7	1
07:50	07:55	-	1	16	0
07:55	08:00	-	1	9	1
08:00	08:05	-	1	2	0
08:05	08:10	-	1	4	0
08:10	08:15	-	1	2	1
08:15	08:20	-	1	5	2
08:20	08:25	-	1	4	1
08:25	08:30	-	2	11	2
08:30	08:35	-	2	2	0
08:35	08:40	-	1	4	1
08:40	08:45	-	2	10	1

QUEUE	NETWORK PEAK (07:30-08:30)			
MINIMUM	-	0	2	0
MAXIMUM	-	2	16	2
AVERAGE	-	1	6	1
85th%ILE	-	1	11	1

TIME		VEHICLE MOVEMENT(S) / QUEUE - PCUs / LANE			
		B961 (Drumgeith Road) (North) (A-BC)	Kellas Road		B961 (Drumgeith Road) (South) (C-B)
			Near. (B-C)	Off. (B-A)	
16:00	16:05	-	1	2	2
16:05	16:10	-	2	2	3
16:10	16:15	-	1	2	1
16:15	16:20	-	2	6	1
16:20	16:25	-	3	2	3
16:25	16:30	-	1	1	2
16:30	16:35	-	1	4	2
16:35	16:40	-	0	4	3
16:40	16:45	-	2	2	1
16:45	16:50	-	1	3	1
16:50	16:55	-	1	3	2
16:55	17:00	-	1	2	1
17:00	17:05	-	1	2	2
17:05	17:10	-	2	2	1
17:10	17:15	-	1	5	5
17:15	17:20	-	2	5	2
17:20	17:25	-	1	4	4
17:25	17:30	-	2	2	2

QUEUE	NETWORK PEAK (16:15-17:15)			
MINIMUM	-	0	1	1
MAXIMUM	-	3	6	5
AVERAGE	-	1	3	2
85th%ILE	-	2	4	3

CLASSIFIED AUTOMATIC TRAFFIC COUNTS
(LINK FLOW & SPEED SURVEYS)

TRAFFIC SURVEY REPORT

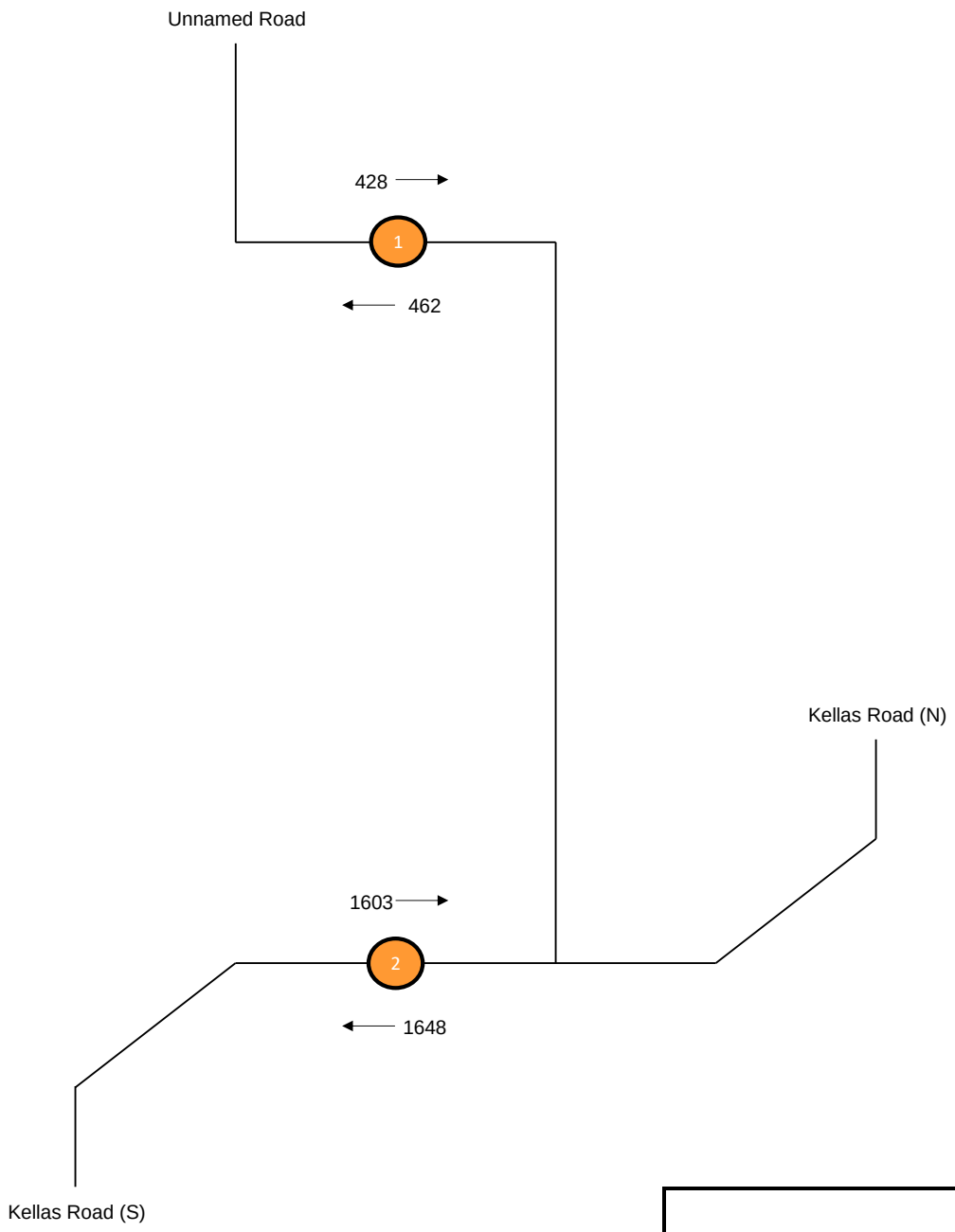
2421

SITE LOCATION

Project: Kellas Road, Dundee
Client: Cameron + Ross
Project.Ref. TS-19-058

Location 1: Unamed Road, east of Duntrune House
Location 2: Kellas Road - Approx. 30m south of Unnamed Road

SURVEY NETWORK TRAFFIC FLOW DIAGRAM



Time	**24hr (00:00-00:00)**
Date	**7 day (Weekly) Average**

CLASS	AXLES	AXLE GROUPS	DESCRIPTION	DOMINATE VEHICLE	AGGREGATE
1	2	1 or 2	Very Short - Bicycle or Motorcycle		**LIGHT**
2	2	1 or 2	Short - Car, 4WD or Light Van		
3	3 / 4 / 5	3	Short Towing - Trailer, Caravan etc.		
4	2	2	2-Axle Truck or Bus		**MEDIUM**
5	3	2	3-Axle Truck or Bus		
6	>3	2	4-Axle Truck		
7	3	3	3-Axle Articulated Vehicle or Rigid Vehicle & Trailer		**HEAVY**
8	4	>2	4-Axle Articulated Vehicle or Rigid Vehicle & Trailer		
9	5	>2	5-Axle Articulated Vehicle or Rigid Vehicle & Trailer		
10	>=6	>2	6 (or more) Axle Articulated Vehicle or Rigid Vehicle & Trailer		
11	>6	4	B-Double or Heavy Truck & Trailer		
12	>6	>=5	Double or Triple Heavy Truck & 2 (or more) Trailers		

ATC CLASSIFIED LINK & SPEED SURVEY

Project: Kellas Road, Dundee
Client: Cameron + Ross
Project.Ref. TS-19-058

Location 1: Unnamed Road, east of Duntrune House
Movement: Eastbound

TIME		TOTAL	ARX VEHICLE CLASSIFICATIONS												SPEED BIN TOTALS																				SPEED STATISTICS			
			LIGHT			MEDIUM			HEAVY						0-5 mph	5-10mph	10-15mph	15-20mph	20-25mph	25-30mph	30-35mph	35-40mph	40-45mph	45-50mph	50-55mph	55-60mph	60-65mph	65-70mph	70-75mph	75-80mph	80-85mph	85-90mph	90-95mph	95-100mph	AVERAGE	MINIMUM	MAXIMUM	85th%ile
			1	2	3	4	5	6	7	8	9	10	11	12																								
Date:	**10 October 2019**																																					
00:00	01:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	36.8	36.8	36.8	-
01:00	02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
02:00	03:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26.4	26.4	26.4	-
03:00	04:00	5	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	1	0	0	0	0	0	0	0	0	0	0	0	36.6	31.3	42.1	-
04:00	05:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	37.0	37.0	37.0	-
05:00	06:00	4	0	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	0	0	0	0	0	0	0	0	0	0	0	36.7	30.9	40.8	-
06:00	07:00	14	0	13	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	8	4	0	0	0	0	0	0	0	0	0	0	0	37.9	31.4	44.4	42.1
07:00	08:00	60	0	56	0	3	0	1	0	0	0	0	0	0	0	0	0	0	0	2	14	26	16	2	0	0	0	0	0	0	0	0	0	0	37.5	26.2	47.7	42.2
08:00	09:00	71	0	63	0	6	0	1	0	0	1	0	0	0	0	0	0	1	2	3	22	34	8	1	0	0	0	0	0	0	0	0	0	0	35.6	18.7	49.6	39.9
09:00	10:00	30	0	27	0	3	0	0	0	0	0	0	0	0	0	0	0	0	1	6	8	13	2	0	0	0	0	0	0	0	0	0	0	0	33.8	21.5	41.8	38.8
10:00	11:00	25	1	15	0	8	1	0	0	0	0	0	0	0	0	0	1	0	0	1	13	7	3	0	0	0	0	0	0	0	0	0	0	0	33.5	10.1	43.3	38.7
11:00	12:00	32	0	29	0	3	0	0	0	0	0	0	0	0	0	0	2	0	0	4	11	9	5	1	0	0	0	0	0	0	0	0	0	0	34.0	12.0	47.5	40.5
12:00	13:00	32	0	28	0	4	0	0	0	0	0	0	0	0	0	0	0	0	1	5	13	12	1	0	0	0	0	0	0	0	0	0	0	0	33.6	23.3	41.4	37.9
13:00	14:00	19	0	18	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	11	6	0	1	0	0	0	0	0	0	0	0	0	0	34.2	29.2	45.8	39.4
14:00	15:00	17	0	14	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	7	3	1	0	0	0	0	0	0	0	0	0	0	36.7	28.3	46.2	41.5
15:00	16:00	29	1	21	0	6	0	0	0	1	0	0	0	0	0	1	0	1	1	9	6	9	2	0	0	0	0	0	0	0	0	0	0	0	31.5	8.2	41.5	39.1
16:00	17:00	30	0	29	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	5	12	9	3	0	0	0	0	0	1	0	0	0	0	0	35.3	26.3	74.0	39.6
17:00	18:00	30	0	26	1	2	0	0	0	0	1	0	0	0	0	0	0	0	0	1	14	12	2	1	0	0	0	0	0	0	0	0	0	0	35.5	25.1	45.4	39.3
18:00	19:00	22	0	19	0	2	0	0	0	1	0	0	0	0	0	0	0	0	1	2	11	7	1	0	0	0	0	0	0	0	0	0	0	0	33.3	23.8	40.7	36.7
19:00	20:00	12	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	6	2	2	0	1	0	0	0	0	0	0	0	0	0	0	31.5	22.6	45.8	39.5
20:00	21:00	13	0	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	8	2	0	0	0	0	0	0	0	0	0	0	0	0	32.5	27.0	39.4	37.2
21:00	22:00	7	0	7	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	3	1	0	0	0	0	0	0	0	0	0	0	0	31.6	9.4	40.2	-
22:00	23:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	33.8	30.9	35.3	-
23:00	00:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	32.7	28.8	38.9	-
07:00-19:00		**397**	**2**	**345**	**1**	**42**	**1**	**2**	**0**	**2**	**2**	**0**	**0**	**0**	**0**	**1**	**3**	**2**	**6**	**40**	**140**	**151**	**46**	**7**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**34.8**	**8.2**	**74.0**	**39.9**
06:00-22:00		**443**	**2**	**390**	**1**	**43**	**1**	**2**	**0**	**2**	**2**	**0**	**0**	**0**	**0**	**2**	**3**	**2**	**7**	**49**	**154**	**166**	**51**	**8**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**34.7**	**8.2**	**74.0**	**39.8**
06:00-00:00		**451**	**2**	**398**	**1**	**43**	**1**	**2**	**0**	**2**	**2**	**0**	**0**	**0**	**0**	**2**	**3**	**2**	**7**	**51**	**157**	**169**	**51**	**8**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**34.7**	**8.2**	**74.0**	**39.7**
00:00-00:00		**463**	**2**	**404**	**1**	**49**	**1**	**2**	**0**	**2**	**2**	**0**	**0**	**0**	**0**	**2**	**3**	**2**	**7**	**52**	**159**	**176**	**53**	**8**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**34.7**	**8.2**	**74.0**	**39.7**
Date:	**11 October 2019**																																					
00:00	01:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	31.5	31.5	31.5	-
01:00	02:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29.0	29.0	29.0	-
02:00	03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
03:00	04:00	6	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	1	0	0	0	0	0	0	0	0	0	0	0	35.4	26.6	42.7	-
04:00	05:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	35.3	32.1	38.6	-
05:00	06:00	7	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	3	0	0	0	0	0	0	0	0	0	0	0	38.5	31.1	44.4	-
06:00	07:00	10	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	5	1	0	0	0	0	0	0	0	0	0	0	0	34.9	26.4	42.9	-
07:00	08:00	35	0	32	0	2	1	0	0	0	0	0	0	0	0	0	0	0	1	1	6	15	11	1	0	0	0	0	0	0	0	0	0	0	37.8	23.5	46.4	42.9
08:00	09:00	66	0	58	2	5	0	0	0	0	0	1	0	0	0	0	0	2	3	11	21	18	8	3	0	0	0	0	0	0	0	0	0	0	34.2	18.7	47.0	41.1
09:00	10:00	28	0	25	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	6	10	7	4	1	0	0	0	0	0	0	0	0	0	0	34.4	25.3	48.4	40.5
10:00	11:00	28	0	27	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	14	8	3	0	0	0	0	0	0	0	0	0	0	0	34.3	26.8	42.9	39.3
11:00	12:00	29	1	25	1	2	0	0	0	0	0	0	0	0	0	0	0	0	1	4	14	7	3	0	0	0	0	0	0	0	0	0	0	0	33.6	20.2	44.0	38.9
12:00	13:00	23	0	19	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	2	8	10	3	0	0	0	0	0	0	0	0	0	0	0	35.5	26.0	44.3	39.8
13:00	14:00	25	0	21	1	3	0	0	0	0	0	0	0	0	0	0	0	0	2	5	9	3	6	0	0	0	0	0	0	0	0	0	0	0	34.0	22.8	43.1	41.2
14:00	15:00	20	0	14	1	4	0	1	0	0	0	0	0	0	0	0	0	0	0	4	11	2	2	1	0	0	0	0	0	0	0	0	0	0	33.6	25.5	48.4	40.2
15:00	16:00	37	1	33	2	1	0	0	0	0	0	0	0	0	0	0	0	0	1	5	11	13	5	2	0	0	0	0	0	0	0	0	0	0	35.4	20.1	47.8	41.0
16:00	17:00	33	0	28	2	3	0	0	0	0	0	0	0	0	0	0	0	0	1	10	10	10	2	0	0	0	0	0	0	0	0	0	0	0	32.9	25.0	41.8	38.6
17:00	18:00	31	1	28	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	6	10	9	6	0	0	0	0	0	0	0	0	0	0	0	35.1	26.5	44.7	41.7
18:00	19:00	21	0	20	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	6	11	2	0	0	0	0	0	0	0	0	0	0	0	35.4	28.2	42.9	38.7
19:00	20:00	17	0	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	6	5	3	0	0	0	0	0	0	0	0	0	0	0	35.2	27.5	43.3	41.4
20:00	21:00	8	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	3	0	0	0	0	0	0	0	0	0	0	0	36.1	28.3	42.1	-
21:00	22:00	12	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	5	2	1	1	0	0	0	0	0	0	0	0	0	38.6	26.9	52.5	45.6
22:00	23:00	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	32.5	28.8	34.7	-
23:00	00:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	32.4	28.2	36.6	-
07:00-19:00		**376**	**3**	**330**	**11**	**29**	**1**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**2**	**9**	**59**	**130**	**113**	**55**	**8**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**34.7**	**18.7**	**48.4**	**40.7**
06:00-22:00		**423**	**3**	**377**	**11**	**29**	**1**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**2**	**9**	**67**	**141**	**130**	**64**	**9**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**34.8**	**18.7**	**52.5**	**40.8**
06:00-00:00		**428**	**3**	**382**	**11**	**29**	**1**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**2**	**9**	**69**	**143**	**131**	**64**	**9**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**34.8**	**18.7**	**52.5**	**40.8**
00:00-00:00		**445**	**3**	**393**	**11**	**35**	**1**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**2**	**9**	**71**	**149**	**136**	**68**	**9**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**34.9**	**18.7**	**52.5**	**40.8**
Date:	**12 October 2019**																																					
00:00	01:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	32.4	29.9	34.8	-
01:00	02:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	38.8	37.8	39.8	-
02:00	03:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	39.3	39.3	39.3	-
03:00	04:00	6	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	1	0	0	0	0	0	0	0	0	0	0	0	34.8	26.5	40.0	-
04:00	05:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	34.4	34.4	34.4	-
05:00	06:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
06:00	07:00	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	3	0	0	0	0	0	0	0	0	0	0	0	0	34.2	26.4	39.7	-
07:00	08:00	12	0	10	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	4	2	1	0	0	0	0	0	0	0	0	0	0	37.0	30.7	46.6	42.9
08:00	09:00	24	0	19	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	6	9	7	0	2	0	0	0	0	0	0	0	0	0	0	33.8	25.3	48.2	38.7
09:00	10:00	22	0	20	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	3	11	6	1	1	0	0	0	0	0	0	0	0	0	0	34.4	28.6	45.2	38.9
10:00	11:00	32	1	30	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	4	14	11	2	0	0	0	0	0	0	0	0	0	0	0	33.2	12.2	43.6	37.7
11:00	12:00	31	0	28	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	8	12	8	3	0	0	0	0	0	0	0	0	0	0	0	33.9	26.1	44.0	39.5
12:00	13:00	36	1	32	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	6	15	9	3	1	0	2	0	0	0	0	0	0	0	0	35.8	25.1	59.2	42.5
13:00	14:00	22	0	21	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	11	7	3	0	0	0	0	0	0	0	0	0	0	0	35.3	29.8	44.5	39.7
14:00	15:00	31	1	29	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	8	11	5	3	2	0	0	0	0	0	0	0	0	0	0	33.3	11.8	49.0	42.2
15:00	16:00	27	0	26	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	12	6	3	1	0	0	0	0	0	0	0	0	0	0	34.0	26.5	47.2	40.7
16:00	17:00	25	0	23	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	20	3	1	0	0	0	0	0	0	0	0	0	0	0	33.7	29.9	43.4	35.3
17:00	18:00	19	0	18	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	10	2	2	0	0	0	0	0	0	0	0	0	0	0	32.8	26.5	43.1	37.0
18:00	19:00	14	0	13	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	7	3	0	1	0	0	0	0	0	0	0	0	0	0	33.9	23.1	48.3	39.2
19:00	20:00	13	0	12	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	3	1	1	0	0	0	0	0	0	0	0	0	0	0	30.4	25.8	42.5	37.3
20:00	21:00	12	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	4	3	0	0	0	0	0	0	0	0	0	0	0	0	31.6	25.3	37.1	36.1
21:00	22:00	8	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	3	1	0	0	0	0	0	0	0	0	0	0	0	34.5	27.6	40.2	-
22:00	23:00	7	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	3	0	0	0	0	0	0	0	0	0	0	0	0	33.8	27.4	37.0	-
23:00	00:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	1	0	0	0	0	0	0	0	0	0	0	35.4	27.3	47.7	-
07:00-19:00		**295**	**3**	**269**	**10**	**13**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**2**	**49**	**137**	**71**	**23**	**9**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**34.2**	**11.8**	**59.2**	**38.9**
06:00-22:00		**333**	**3**	**306**	**11**	**13**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**2**	**65**	**147**	**81**	**25**	**9**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**33.9**	**11.8**	**59.2**	**38.7**
06:00-00:00		**344**	**3**	**317**	**11**	**13**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**2**	**67**	**152**	**84**	**25**	**10**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**34.0**	**11.8**	**59.2**	**38.7**
00:00-00:00		**356**	**3**	**323**	**11**	**19**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**2**	**69**	**156**	**89**	**26**	**10**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**34.0**	**11.8**	**59.2**	**38.9**
Date:	**13 October 2019**																																					
00:00	01:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	32.9	31.1	36.0	-
01:00	02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
02:00	03:00	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	36.0	36.0	36.0	-
03:00	04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
04:00	05:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
05:00	06:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	39.1	39.1	39.1	-
06:00	07:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29.8	29.8	29.8	-
07:00	08:00	7	0	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	1	0	1	0	0	0	0	0	0	0	0	0	0	32.9	21.8	47.2	-
08:00	09:00	12	0	10	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	5	2	3	2	0	0	0	0	0	0	0	0	0	0	0	33.3	25.4	42.0	41.8
09:00	10:00	23	1	20	0	0	0	0	0	0	2	0	0	0	0	1	0	1	2	3	10	5	1	0	0	0	0	0	0	0	0	0	0	0	30.7	9.7	41.3	38.5
10:00	11:00	11	0	10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	3	2	0	0	0	0	0	0	0	0	0	0	0	34.7	25.7	44.0	41.5
11:00	12:00	24	0	21	3	0	0	0	0	0	0	0	0	0	0	0	0	0	1	6	11	5	0	0	1	0	0	0	0	0	0	0	0	0	33.1	21.4	52.1	38.3
12:00	13:00	30	0	24	2	4	0	0	0	0	0	0	0	0	0	0	0	0	0	11	13	4	2	0	0	0	0	0	0	0	0	0	0	0	32.7	26.6	43.7	37.1
13:00	14:00	33	0	33	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	5	13	9	2	2	0	0	0	0	0	0	0	0	0	0	34.1	16.7	50.0	39.6
14:00	15:00	20	0	18	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	3	7	5	4	0	0	0	0	0	0	0	0	0	0	0	35.0	24.2	43.3	41.1
15:00	16:00	24	1	22	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2	7	7	5	0	1	0	0	0	0	0	0	0	0	0	35.2	11.2	50.9	42.3

TIME		TOTAL	ARX VEHICLE CLASSIFICATIONS: LIGHT 1	2	3	MEDIUM 4	5	6	HEAVY 7	8	9	10	11	12	SPEED BIN TOTALS: 0-5 mph	5-10mph	10-15mph	15-20mph	20-25mph	25-30mph	30-35mph	35-40mph	40-45mph	45-50mph	50-55mph	55-60mph	60-65mph	65-70mph	70-75mph	75-80mph	80-85mph	85-90mph	90-95mph	95-100mph	SPEED STATISTICS: AVERAGE	MINIMUM	MAXIMUM	85th%ile
16:00	17:00	22	0	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	10	10	1	0	0	0	0	0	0	0	0	0	0	0	35.2	29.5	40.4	38.9
17:00	18:00	25	0	24	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	5	8	7	1	0	0	0	0	0	0	0	0	0	0	36.0	25.2	46.1	41.4
18:00	19:00	17	0	16	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	8	5	3	0	0	0	0	0	0	0	0	0	0	0	35.2	29.1	44.5	40.9
19:00	20:00	9	0	8	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	2	0	1	0	0	0	0	0	0	0	0	0	0	35.1	30.1	49.1	-
20:00	21:00	13	0	13	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	7	2	1	0	0	0	0	0	0	0	0	0	0	0	31.3	13.4	43.1	37.0
21:00	22:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	33.0	30.8	34.7	-
22:00	23:00	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0	33.6	30.7	38.3	-
23:00	00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
07:00-19:00		**248**	**2**	**226**	**11**	**7**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**1**	**1**	**2**	**7**	**44**	**93**	**65**	**29**	**4**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**34.0**	**9.7**	**52.1**	**39.9**
06:00-22:00		**275**	**2**	**252**	**12**	**7**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**1**	**2**	**2**	**7**	**47**	**110**	**69**	**30**	**5**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**33.9**	**9.7**	**52.1**	**39.6**
06:00-00:00		**280**	**2**	**257**	**12**	**7**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**1**	**2**	**2**	**7**	**47**	**114**	**70**	**30**	**5**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**33.9**	**9.7**	**52.1**	**39.6**
00:00-00:00		**286**	**2**	**262**	**12**	**8**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**1**	**2**	**2**	**7**	**47**	**117**	**73**	**30**	**5**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**33.9**	**9.7**	**52.1**	**39.4**
Date: 14 October 2019																																						
00:00	01:00	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27.3	27.3	27.3	-
01:00	02:00	2	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25.7	24.0	27.3	-
02:00	03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
03:00	04:00	6	0	1	0	5	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	2	0	0	0	0	0	0	0	0	0	0	0	0	30.3	20.6	36.4	-
04:00	05:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
05:00	06:00	7	0	6	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	1	0	0	0	0	0	0	0	0	0	0	0	38.0	34.4	43.3	-
06:00	07:00	14	0	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	6	6	1	0	0	0	0	0	0	0	0	0	0	0	34.7	28.8	42.7	38.2
07:00	08:00	50	0	47	0	3	0	0	0	0	0	0	0	0	0	0	0	0	4	0	22	14	8	2	0	0	0	0	0	0	0	0	0	0	35.5	20.2	48.2	41.1
08:00	09:00	53	0	49	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	4	17	23	7	1	1	0	0	0	0	0	0	0	0	0	36.4	26.7	50.0	40.2
09:00	10:00	32	0	31	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	5	16	9	1	0	0	0	0	0	0	0	0	0	0	0	33.3	17.3	41.6	37.2
10:00	11:00	26	0	24	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	3	14	6	1	1	0	0	0	0	0	0	0	0	0	0	33.9	23.5	46.5	39.2
11:00	12:00	27	0	16	1	9	0	1	0	0	0	0	0	0	0	0	0	0	0	4	14	9	0	0	0	0	0	0	0	0	0	0	0	0	33.5	26.7	38.9	37.7
12:00	13:00	27	0	21	1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	2	10	11	2	2	0	0	0	0	0	0	0	0	0	0	35.9	27.0	47.1	41.2
13:00	14:00	27	0	24	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	4	15	5	3	0	0	0	0	0	0	0	0	0	0	0	33.8	26.9	42.2	39.8
14:00	15:00	27	0	23	0	3	0	1	0	0	0	0	0	0	0	0	0	0	0	2	14	10	1	0	0	0	0	0	0	0	0	0	0	0	34.4	25.9	42.2	37.1
15:00	16:00	16	0	12	0	2	1	0	0	1	0	0	0	0	0	0	0	0	0	2	9	5	0	0	0	0	0	0	0	0	0	0	0	0	34.0	25.1	39.9	37.7
16:00	17:00	45	0	39	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	4	19	19	3	0	0	0	0	0	0	0	0	0	0	0	34.8	26.1	44.3	38.8
17:00	18:00	41	0	38	0	3	0	0	0	0	0	0	0	0	0	0	0	3	1	2	14	15	5	1	0	0	0	0	0	0	0	0	0	0	34.2	17.5	45.5	40.6
18:00	19:00	20	1	18	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	6	9	4	0	0	0	0	0	0	0	0	0	0	0	36.8	27.4	44.9	43.8
19:00	20:00	13	0	10	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	4	2	1	0	0	0	0	0	0	0	0	0	0	36.9	30.7	49.1	42.3
20:00	21:00	6	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	1	0	0	1	0	0	0	0	0	0	0	0	0	34.9	25.9	53.5	-
21:00	22:00	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	33.5	26.4	38.2	-
22:00	23:00	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	36.1	29.7	40.3	-
23:00	00:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	34.0	31.0	37.0	-
07:00-19:00		**391**	**1**	**342**	**4**	**40**	**1**	**2**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**6**	**33**	**170**	**135**	**35**	**7**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**34.8**	**17.3**	**50.0**	**39.4**
06:00-22:00		**427**	**1**	**375**	**4**	**43**	**1**	**2**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**6**	**37**	**184**	**148**	**38**	**8**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**34.9**	**17.3**	**53.5**	**39.4**
06:00-00:00		**432**	**1**	**380**	**4**	**43**	**1**	**2**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**6**	**38**	**185**	**150**	**39**	**8**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**34.9**	**17.3**	**53.5**	**39.4**
00:00-00:00		**448**	**1**	**388**	**4**	**51**	**1**	**2**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**8**	**42**	**188**	**156**	**40**	**8**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**34.8**	**17.3**	**53.5**	**39.4**
Date: 15 October 2019																																						
00:00	01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
01:00	02:00	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25.4	25.4	25.4	-
02:00	03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
03:00	04:00	6	0	1	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	2	0	0	0	0	0	0	0	0	0	0	0	35.0	25.2	42.0	-
04:00	05:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	38.8	38.8	38.8	-
05:00	06:00	6	0	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	39.6	35.3	43.7	-
06:00	07:00	12	0	11	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	9	2	0	0	0	0	0	0	0	0	0	0	0	36.5	18.8	43.7	42.2
07:00	08:00	59	1	51	2	5	0	0	0	0	0	0	0	0	0	0	1	0	4	5	16	19	12	1	1	0	0	0	0	0	0	0	0	0	35.4	10.2	50.2	42.1
08:00	09:00	66	0	58	1	6	0	0	0	1	0	0	0	0	0	0	0	0	2	9	17	30	8	0	0	0	0	0	0	0	0	0	0	0	35.0	22.5	44.3	39.7
09:00	10:00	34	1	31	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	14	11	6	0	0	0	0	0	0	0	0	0	0	0	35.3	26.0	42.2	40.2
10:00	11:00	21	0	16	1	3	0	0	1	0	0	0	0	0	0	0	0	1	1	3	6	5	3	1	1	0	0	0	0	0	0	0	0	0	34.8	19.6	50.9	41.5
11:00	12:00	29	0	24	0	4	0	0	0	0	1	0	0	0	0	0	0	0	1	4	9	10	5	0	0	0	0	0	0	0	0	0	0	0	35.0	22.9	44.3	41.5
12:00	13:00	42	0	32	0	8	0	2	0	0	0	0	0	0	0	0	0	0	0	3	13	15	8	2	0	0	0	1	0	0	0	0	0	0	37.2	26.8	66.3	41.6
13:00	14:00	30	1	24	1	3	0	1	0	0	0	0	0	0	0	0	0	1	1	3	9	9	5	1	1	0	0	0	0	0	0	0	0	0	35.5	18.8	52.6	42.9
14:00	15:00	30	0	25	1	3	0	0	0	1	0	0	0	0	0	0	0	0	1	6	10	11	2	0	0	0	0	0	0	0	0	0	0	0	33.9	24.9	41.5	39.7
15:00	16:00	24	0	22	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	10	7	5	0	0	0	0	0	0	0	0	0	0	0	35.3	25.8	42.5	40.6
16:00	17:00	51	1	42	1	6	0	0	1	0	0	0	0	0	0	0	1	0	1	6	21	18	3	1	0	0	0	0	0	0	0	0	0	0	34.1	13.0	45.2	38.6
17:00	18:00	34	0	30	0	3	0	1	0	0	0	0	0	0	0	0	0	0	0	1	11	14	7	0	0	1	0	0	0	0	0	0	0	0	36.9	27.3	55.0	41.7
18:00	19:00	25	0	24	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3	9	10	2	0	0	0	0	0	0	0	0	0	1	0	0	36.9	27.9	85.7	39.5
19:00	20:00	18	0	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	6	5	6	0	0	0	0	0	0	0	0	0	0	0	36.5	26.9	43.5	41.6
20:00	21:00	9	0	8	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	1	1	1	0	0	0	0	0	0	0	0	0	38.7	31.8	54.5	-
21:00	22:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	31.5	25.3	37.2	-
22:00	23:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0	0	0	0	0	0	43.7	41.3	45.5	-
23:00	00:00	2	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	40.4	36.1	44.8	-
07:00-19:00		**445**	**4**	**379**	**8**	**44**	**0**	**5**	**2**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**2**	**2**	**11**	**48**	**145**	**159**	**66**	**6**	**3**	**1**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**35.4**	**10.2**	**85.7**	**40.4**
06:00-22:00		**488**	**4**	**420**	**8**	**45**	**0**	**6**	**2**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**2**	**3**	**11**	**50**	**156**	**177**	**75**	**7**	**4**	**1**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**35.5**	**10.2**	**85.7**	**40.7**
06:00-00:00		**494**	**4**	**425**	**8**	**46**	**0**	**6**	**2**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**2**	**3**	**11**	**50**	**156**	**178**	**79**	**8**	**4**	**1**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**35.6**	**10.2**	**85.7**	**40.8**
00:00-00:00		**508**	**4**	**432**	**8**	**53**	**0**	**6**	**2**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**2**	**3**	**11**	**52**	**158**	**183**	**84**	**8**	**4**	**1**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**35.6**	**10.2**	**85.7**	**41.0**
Date: 16 October 2019																																						
00:00	01:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	45.8	45.8	45.8	-
01:00	02:00	2	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	30.0	24.5	35.4	-
02:00	03:00	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	33.6	33.6	33.6	-
03:00	04:00	3	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	31.7	27.3	38.7	-
04:00	05:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	42.6	42.6	42.6	-
05:00	06:00	7	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	6	0	0	0	0	0	0	0	0	0	0	0	41.2	31.5	43.9	-
06:00	07:00	17	0	14	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	8	5	1	0	0	0	0	0	0	0	0	0	0	39.0	32.0	47.7	43.0
07:00	08:00	57	0	51	0	5	0	1	0	0	0	0	0	0	0	0	0	0	0	4	13	21	12	5	1	1	0	0	0	0	0	0	0	0	38.4	25.3	57.4	44.8
08:00	09:00	75	0	71	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	1	19	29	22	3	1	0	0	0	0	0	0	0	0	0	38.3	27.6	50.0	43.1
09:00	10:00	29	1	25	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	4	5	16	3	1	0	0	0	0	0	0	0	0	0	0	36.0	28.0	45.5	39.8
10:00	11:00	28	0	22	0	5	0	1	0	0	0	0	0	0	0	0	0	0	1	3	12	8	3	1	0	0	0	0	0	0	0	0	0	0	34.6	24.7	46.4	41.4
11:00	12:00	28	0	26	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	4	10	10	3	1	0	0	0	0	0	0	0	0	0	0	35.2	27.0	46.3	39.8
12:00	13:00	27	0	22	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	5	6	11	4	1	0	0	0	0	0	0	0	0	0	0	35.7	26.0	45.0	41.6
13:00	14:00	22	0	21	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	8	9	2	0	0	0	0	0	0	0	0	0	0	0	35.1	26.2	42.9	39.7
14:00	15:00	17	0	15	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	10	1	0	0	0	0	0	0	0	0	0	0	0	36.2	31.6	41.5	38.9
15:00	16:00	27	0	24	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	11	12	4	0	0	0	0	0	0	0	0	0	0	0	36.6	33.0	44.5	41.8
16:00	17:00	37	0	33	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	8	13	13	2	1	0	0	0	0	0	0	0	0	0	0	34.3	25.8	46.0	38.7
17:00	18:00	39	0	33	0	5	0	0	0	0	1	0	0	0	0	0	0	0	0	4	23	8	4	0	0	0	0	0	0	0	0	0	0	0	34.4	29.0	42.1	39.3
18:00	19:00	32	0	31	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	12	9	7	1	1	0	0	0	0	0	0	0	0	0	36.5	27.2	50.7	41.1
19:00	20:00	11	2	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	3	6	0	0	0	0	0	0	0	0	0	0	0	0	33.7	23.3	39.2	37.6
20:00	21:00	15	0	13	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	4	4	1	0	0	0	0	0	0	0	0	0	0	37.6	27.1	48.7	43.8
21:00	22:00	7	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	2	2	0	0	1	0	0	0	0	0	0	0	0	39.0	19.4	59.4	-
22:00	23:00	6	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	1	0	0	0	0	0	0	0	0	0	0	42.1	38.2	47.8	-
23:00	00:00	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	37.9	32.0	41.9	-
07:00-19:00		**418**	**1**	**374**	**1**	**38**	**0**	**2**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**38**	**138**	**156**	**67**	**14**	**3**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.3**	**24.7**	**57.4**	**41.0**
06:00-22:00		**468**	**3**	**417**	**1**	**43**	**0**	**2**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**40**	**150**	**176**	**78**	**16**	**3**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.4**	**19.4**	**59.4**	**41.5**
06:00-00:00		**477**	**3**	**426**	**1**	**43**	**0**	**2**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**40**	**151**	**180**	**81**	**17**	**3**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.5**	**19.4**	**59.4**	**41.8**
00:00-00:00		**492**	**3**	**437**	**1**	**47**	**0**	**2**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**3**	**42**	**153**	**182**	**88**	**18**	**3**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.5**	**19.4**	**59.4**	**41.9**
5 day (Weekday) Average																																						
07:00-19:00		**405**	**2**	**354**	**5**	**39**	**1**	**2**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**7**	**44**	**145**	**143**	**54**	**8**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**35.2**	**15.8**	**63.1**	**40.3**
06:00-22:00		**450**	**3**	**396**	**5**	**41**	**1**	**3**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**7**	**49**	**157**	**159**	**61**	**10**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**35.3**	**14.8**	**65.0**	**40.4**
06:00-00:00		**456**	**3**	**402**	**5**	**41**	**1**	**3**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**7**	**50**	**158**	**162**	**63**	**10**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**35.3**	**14.8**	**65.0**	**40.5**
00:00-00:00		**471**	**3**	**411**	**5**	**47**	**1**	**3**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**8**	**52**	**161**	**167**	**67**	**10**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**35.3**	**14.8**	**65.0**	**40.6**
7 day (Weekly) Average																																						
07:00-19:00		**367**	**2**	**324**	**7**	**30**	**0**	**2**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**6**	**44**	**136**	**121**	**46**	**8**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**34.9**	**14.4**	**61.0**	**40.0**
06:00-22:00		**408**	**3**	**362**	**7**	**32**	**0**	**2**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**6**	**51**	**149**	**135**	**52**	**9**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**34.9**	**13.6**	**62.3**	**40.1**
06:00-00:00		**415**	**3**	**369**	**7**	**32**	**0**	**2**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**6**	**52**	**151**	**137**	**53**	**9**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**34.9**	**13.6**	**62.3**	**40.1**
00:00-00:00		**428**	**3**	**377**	**7**	**37**	**0**	**2**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**7**	**54**	**154**	**142**	**56**	**9**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**34.9**	**13.6**	**62.3**	**40.2**

ATC CLASSIFIED LINK & SPEED SURVEY

Project: Kellas Road, Dundee
Client: Cameron + Ross
Project.Ref. TS-19-058

Location 1: Unnamed Road, east of Duntrune House
Movement: Westbound

TIME		TOTAL	ARX VEHICLE CLASSIFICATIONS												SPEED BIN TOTALS																				SPEED STATISTICS			
			LIGHT			MEDIUM			HEAVY						0-5 mph	5-10mph	10-15mph	15-20mph	20-25mph	25-30mph	30-35mph	35-40mph	40-45mph	45-50mph	50-55mph	55-60mph	60-65mph	65-70mph	70-75mph	75-80mph	80-85mph	85-90mph	90-95mph	95-100mph	AVERAGE	MINIMUM	MAXIMUM	85th%ile
			1	2	3	4	5	6	7	8	9	10	11	12																								
Date: 10 October 2019																																						
00:00	01:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	47.9	47.9	47.9	-
01:00	02:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	41.0	41.0	41.0	-
02:00	03:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24.9	24.9	24.9	-
03:00	04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
04:00	05:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
05:00	06:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
06:00	07:00	7	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	2	1	0	0	0	0	0	0	0	0	0	42.5	36.2	50.4	-
07:00	08:00	27	1	22	0	3	0	1	0	0	0	0	0	0	0	0	0	1	0	2	12	10	2	0	0	0	0	0	0	0	0	0	0	0	34.7	19.3	43.9	38.5
08:00	09:00	22	0	19	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	4	8	5	5	0	0	0	0	0	0	0	0	0	0	0	35.7	28.2	44.8	43.7
09:00	10:00	34	0	22	0	10	1	1	0	0	0	0	0	0	0	0	0	0	0	3	16	11	2	2	0	0	0	0	0	0	0	0	0	0	35.5	25.0	47.6	39.5
10:00	11:00	22	0	14	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	2	6	9	2	3	0	0	0	0	0	0	0	0	0	0	36.9	27.5	46.1	44.5
11:00	12:00	19	0	14	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	3	6	6	4	0	0	0	0	0	0	0	0	0	0	0	35.0	27.1	44.8	41.4
12:00	13:00	29	1	25	0	3	0	0	0	0	0	0	0	0	0	0	0	1	0	6	10	6	5	1	0	0	0	0	0	0	0	0	0	0	34.3	16.9	45.1	40.8
13:00	14:00	36	0	34	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	16	13	3	3	0	0	0	0	0	0	0	0	0	0	35.7	24.5	47.9	41.5
14:00	15:00	50	0	44	0	6	0	0	0	0	0	0	0	0	0	0	0	1	0	3	16	15	9	5	1	0	0	0	0	0	0	0	0	0	37.0	17.1	50.2	44.0
15:00	16:00	35	0	30	0	5	0	0	0	0	0	0	0	0	0	0	0	0	1	2	10	16	4	2	0	0	0	0	0	0	0	0	0	0	35.9	24.3	46.4	40.9
16:00	17:00	73	0	68	0	5	0	0	0	0	0	0	0	0	0	0	0	0	1	4	14	33	20	0	0	0	0	0	1	0	0	0	0	0	37.9	25.0	74.0	41.4
17:00	18:00	78	0	73	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	3	25	30	14	6	0	0	0	0	0	0	0	0	0	0	37.1	28.1	49.9	41.8
18:00	19:00	42	0	40	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	5	9	14	13	0	0	0	0	0	0	0	0	0	0	0	36.4	22.3	44.6	42.1
19:00	20:00	16	0	14	0	2	0	0	0	0	0	0	0	0	0	0	0	1	1	3	3	6	2	0	0	0	0	0	0	0	0	0	0	0	33.0	19.6	43.4	39.9
20:00	21:00	11	0	11	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	3	4	2	0	1	0	0	0	0	0	0	0	0	0	0	31.6	11.3	48.1	40.6
21:00	22:00	11	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	3	1	1	0	0	0	0	0	0	0	0	0	0	35.6	26.5	49.1	42.4
22:00	23:00	3	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	33.3	28.0	37.9	-
23:00	00:00	6	0	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	32.2	27.2	36.1	-
07:00-19:00		**467**	**2**	**405**	**0**	**55**	**1**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**4**	**37**	**148**	**168**	**83**	**22**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**36.4**	**16.9**	**74.0**	**41.5**
06:00-22:00		**512**	**2**	**448**	**0**	**57**	**1**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**4**	**5**	**44**	**160**	**182**	**87**	**26**	**2**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**36.2**	**11.3**	**74.0**	**41.5**
06:00-00:00		**521**	**2**	**455**	**1**	**58**	**1**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**4**	**5**	**47**	**163**	**185**	**87**	**26**	**2**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**36.2**	**11.3**	**74.0**	**41.5**
00:00-00:00		**524**	**2**	**458**	**1**	**58**	**1**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**4**	**6**	**47**	**163**	**185**	**88**	**27**	**2**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**36.2**	**11.3**	**74.0**	**41.5**
Date: 11 October 2019																																						
00:00	01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
01:00	02:00	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	31.9	28.2	35.3	-
02:00	03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
03:00	04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
04:00	05:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
05:00	06:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
06:00	07:00	10	0	9	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	2	5	1	0	0	0	0	0	0	0	0	0	0	40.6	31.5	49.1	-
07:00	08:00	19	0	15	0	3	1	0	0	0	0	0	0	0	0	0	0	1	0	4	4	7	2	1	0	0	0	0	0	0	0	0	0	0	34.2	17.6	47.7	40.0
08:00	09:00	21	0	18	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	1	6	10	2	2	0	0	0	0	0	0	0	0	0	0	36.8	29.8	46.7	44.3
09:00	10:00	33	0	29	1	2	1	0	0	0	0	0	0	0	0	0	0	0	4	4	12	8	4	1	0	0	0	0	0	0	0	0	0	0	33.6	22.2	46.1	40.3
10:00	11:00	19	0	13	0	5	0	0	0	0	1	0	0	0	0	0	0	0	0	1	6	10	0	2	0	0	0	0	0	0	0	0	0	0	36.2	29.6	48.8	38.7
11:00	12:00	22	0	19	2	1	0	0	0	0	0	0	0	0	0	0	0	0	1	4	7	6	3	0	1	0	0	0	0	0	0	0	0	0	34.4	21.0	51.1	41.6
12:00	13:00	28	0	26	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	9	11	4	2	0	0	0	0	0	0	0	0	0	0	36.3	24.3	47.7	41.0
13:00	14:00	40	1	35	1	1	0	2	0	0	0	0	0	0	0	0	0	1	1	3	8	19	8	0	0	0	0	0	0	0	0	0	0	0	36.0	19.4	44.8	41.6
14:00	15:00	32	0	26	1	4	0	0	0	0	1	0	0	0	0	0	0	0	0	1	18	11	0	2	0	0	0	0	0	0	0	0	0	0	35.0	29.7	49.4	38.7
15:00	16:00	62	0	53	1	8	0	0	0	0	0	0	0	0	0	0	0	0	1	3	18	21	17	2	0	0	0	0	0	0	0	0	0	0	36.9	24.6	47.0	42.6
16:00	17:00	68	0	63	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	4	18	22	17	7	0	0	0	0	0	0	0	0	0	0	37.8	26.8	49.2	44.0
17:00	18:00	70	0	65	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	4	13	36	14	2	1	0	0	0	0	0	0	0	0	0	37.7	25.3	54.9	43.5
18:00	19:00	43	0	39	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	2	6	18	9	7	0	1	0	0	0	0	0	0	0	0	39.4	27.9	59.0	46.2
19:00	20:00	26	0	20	1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	2	5	7	6	5	0	0	0	1	0	0	0	0	0	0	39.9	28.4	66.6	47.2
20:00	21:00	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	31.3	24.6	38.1	-
21:00	22:00	9	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	3	3	1	1	0	0	0	0	0	0	0	0	0	0	34.8	17.5	45.6	-
22:00	23:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	37.3	19.8	52.9	-
23:00	00:00	6	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	4	0	1	0	0	0	0	0	0	0	0	0	41.6	33.7	50.4	-
07:00-19:00		**457**	**1**	**401**	**10**	**39**	**2**	**2**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**8**	**32**	**125**	**179**	**80**	**28**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.6**	**17.6**	**59.0**	**42.1**
06:00-22:00		**507**	**1**	**444**	**11**	**44**	**2**	**2**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**9**	**36**	**135**	**193**	**92**	**35**	**2**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**36.8**	**17.5**	**66.6**	**42.5**
06:00-00:00		**517**	**1**	**454**	**11**	**44**	**2**	**2**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**9**	**36**	**137**	**193**	**97**	**35**	**4**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**36.8**	**17.5**	**66.6**	**42.5**
00:00-00:00		**520**	**1**	**457**	**11**	**44**	**2**	**2**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**9**	**37**	**138**	**194**	**97**	**35**	**4**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**36.8**	**17.5**	**66.6**	**42.5**
Date: 12 October 2019																																						
00:00	01:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	32.9	25.4	40.3	-
01:00	02:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	39.4	37.7	41.2	-
02:00	03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
03:00	04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
04:00	05:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
05:00	06:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
06:00	07:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0	0	38.2	32.4	41.7	-
07:00	08:00	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	34.8	30.2	37.9	-
08:00	09:00	15	0	14	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	7	3	3	1	0	0	0	0	0	0	0	0	0	0	36.4	26.9	46.9	43.3
09:00	10:00	19	0	15	0	3	0	0	0	0	0	1	0	0	0	0	0	0	1	4	5	7	2	0	0	0	0	0	0	0	0	0	0	0	33.8	24.1	45.0	38.4
10:00	11:00	32	0	28	0	2	0	0	0	0	0	2	0	0	0	0	0	0	1	4	14	8	5	0	0	0	0	0	0	0	0	0	0	0	34.2	24.5	43.1	40.6
11:00	12:00	30	1	27	0	2	0	0	0	0	0	0	0	0	0	0	3	1	0	0	13	9	4	0	0	0	0	0	0	0	0	0	0	0	32.8	13.0	44.3	39.9
12:00	13:00	44	1	39	2	2	0	0	0	0	0	0	0	0	0	0	0	0	2	3	10	15	10	3	0	1	0	0	0	0	0	0	0	0	37.2	23.0	58.6	43.7
13:00	14:00	27	0	25	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	7	12	3	3	0	0	0	0	0	0	0	0	0	0	37.6	29.1	47.8	44.3
14:00	15:00	38	3	33	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	0	12	15	5	1	0	2	0	0	0	0	0	0	0	0	36.0	11.8	57.2	41.6
15:00	16:00	34	0	30	2	1	0	0	0	0	0	0	0	1	0	0	0	1	0	3	9	11	4	3	3	0	0	0	0	0	0	0	0	0	37.6	19.9	52.7	48.4
16:00	17:00	35	0	34	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	5	15	8	4	0	0	0	0	0	0	0	0	0	0	38.3	27.0	48.1	42.8
17:00	18:00	18	0	15	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	8	4	2	0	0	0	0	0	0	0	0	0	0	38.5	29.5	48.4	44.4
18:00	19:00	30	0	29	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	6	11	6	5	2	0	0	0	0	0	0	0	0	0	0	35.2	25.2	49.1	43.7
19:00	20:00	13	0	12	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	3	6	0	0	0	0	0	0	0	0	0	0	0	0	32.9	24.8	39.4	37.5
20:00	21:00	10	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	3	2	0	0	0	0	0	0	0	0	0	0	0	0	29.6	22.3	39.2	-
21:00	22:00	7	0	6	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	0	1	0	0	0	0	0	0	0	0	0	0	0	33.6	28.7	43.3	-
22:00	23:00	7	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	29.1	22.8	36.9	-
23:00	00:00	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	0	0	0	0	0	0	0	0	0	0	0	0	35.8	31.5	39.3	-
07:00-19:00		**327**	**5**	**294**	**10**	**14**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**1**	**0**	**0**	**4**	**3**	**5**	**27**	**99**	**111**	**53**	**19**	**3**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.2**	**11.8**	**58.6**	**42.4**
06:00-22:00		**361**	**5**	**326**	**11**	**15**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**1**	**0**	**0**	**4**	**3**	**8**	**34**	**111**	**120**	**56**	**19**	**3**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**35.8**	**11.8**	**58.6**	**42.0**
06:00-00:00		**373**	**5**	**338**	**11**	**15**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**1**	**0**	**0**	**4**	**3**	**9**	**37**	**115**	**124**	**56**	**19**	**3**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**35.7**	**11.8**	**58.6**	**41.7**
00:00-00:00		**377**	**5**	**342**	**11**	**15**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**1**	**0**	**0**	**4**	**3**	**9**	**38**	**115**	**125**	**58**	**19**	**3**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**35.7**	**11.8**	**58.6**	**41.7**
Date: 13 October 2019																																						
00:00	01:00	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	35.7	35.4	36.2	-
01:00	02:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	34.0	34.0	34.0	-
02:00	03:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	40.0	40.0	40.0	-
03:00	04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
04:00	05:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
05:00	06:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
06:00	07:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	32.7	31.7	33.7	-
07:00	08:00	7	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	2	0	0	0	0	0	0	0	0	0	0	0	36.9	32.4	43.3	-
08:00	09:00	7	0	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	2	0	0	0	0	0	0	0	0	0	0	0	37.5	31.5	41.0	-
09:00	10:00	13	0	11	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2	4	5	1	1	0	0	0	0	0	0	0	0	0	0	35.7	25.3	47.7	40.3
10:00	11:00	15	0	12	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	5	4	0	0	0	0	0	0	0	0	0	0	0	36.8	29.8	43.4	43.0
11:00	12:00	33	1	31	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	6	8	12	5	0	0	0	0	0	0	0	0	0	0	0	34.7	22.2	43.2	40.1
12:00	13:00	22	0	21	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	7	7	5	0	0	0	0	0	0	0	0	0	0	0	35.0	24.6	43.9	40.6
13:00	14:00	25	0	23	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	7	2	13	3	0	0	0	0	0	0	0	0	0	0	0	34.8	26.1	43.3	39.7
14:00	15:00	35	2	32	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	5	10	10	5	2	0	0	0	0	0	0	0	0	0	0	34.8	20.4	46.9	42.3
15:00	16:00	31	0	30	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	9	16	4	0	0	0	0	0	0	0	0	0	0	0	36.0	27.0	44.4	40.1

TIME		TOTAL	ARX VEHICLE CLASSIFICATIONS												SPEED BIN TOTALS																				SPEED STATISTICS			
			LIGHT			MEDIUM			HEAVY						0-5 mph	5-10mph	10-15mph	15-20mph	20-25mph	25-30mph	30-35mph	35-40mph	40-45mph	45-50mph	50-55mph	55-60mph	60-65mph	65-70mph	70-75mph	75-80mph	80-85mph	85-90mph	90-95mph	95-100mph	AVERAGE	MINIMUM	MAXIMUM	85th%ile
			1	2	3	4	5	6	7	8	9	10	11	12																								
Date: 13 October 2019																																						
16:00	17:00	20	0	19	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	6	7	4	1	0	0	0	0	0	0	0	0	0	0	36.2	28.9	48.4	42.2
17:00	18:00	35	0	32	1	2	0	0	0	0	0	0	0	0	0	0	0	0	1	3	10	13	7	0	0	0	0	1	0	0	0	0	0	0	36.8	23.5	67.9	41.6
18:00	19:00	15	0	14	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	3	2	1	1	0	0	0	0	0	0	0	0	0	35.8	26.4	52.5	44.3
19:00	20:00	13	0	12	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	5	3	1	1	0	0	0	0	0	0	0	0	0	39.3	32.6	51.1	45.4
20:00	21:00	11	0	10	0	1	0	0	0	0	0	0	0	0	0	0	0	1	2	3	2	2	1	0	0	0	0	0	0	0	0	0	0	0	29.5	19.7	40.1	36.6
21:00	22:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	35.1	35.1	35.1	-
22:00	23:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	28.5	21.1	35.7	-
23:00	00:00	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	30.2	22.8	34.5	-
07:00-19:00		**258**	**3**	**238**	**8**	**7**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**34**	**69**	**97**	**44**	**5**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**35.7**	**20.4**	**67.9**	**40.9**
06:00-22:00		**285**	**3**	**263**	**8**	**9**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**1**	**9**	**37**	**76**	**105**	**48**	**6**	**2**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**35.6**	**19.7**	**67.9**	**40.9**
06:00-00:00		**292**	**3**	**270**	**8**	**9**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**1**	**11**	**38**	**79**	**106**	**48**	**6**	**2**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**35.4**	**19.7**	**67.9**	**40.8**
00:00-00:00		**297**	**3**	**275**	**8**	**9**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**1**	**11**	**38**	**80**	**110**	**48**	**6**	**2**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**35.4**	**19.7**	**67.9**	**40.8**
Date: 14 October 2019																																						
00:00	01:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	31.4	31.4	31.4	-
01:00	02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
02:00	03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
03:00	04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
04:00	05:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	39.2	39.2	39.2	-
05:00	06:00	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	33.2	33.2	33.2	-
06:00	07:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	30.9	15.4	38.9	-
07:00	08:00	21	0	16	0	5	0	0	0	0	0	0	0	0	0	0	0	0	1	1	11	4	2	2	0	0	0	0	0	0	0	0	0	0	34.7	23.4	45.7	42.6
08:00	09:00	21	0	18	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	11	3	1	0	0	0	0	0	0	0	0	0	0	37.4	31.9	45.4	41.3
09:00	10:00	23	0	17	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	4	9	9	1	0	0	0	0	0	0	0	0	0	0	0	34.6	27.5	41.9	39.0
10:00	11:00	19	0	17	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	4	8	6	1	0	0	0	0	0	0	0	0	0	0	0	33.4	26.1	40.3	38.3
11:00	12:00	25	0	20	0	4	0	1	0	0	0	0	0	0	0	0	0	0	0	1	12	5	5	2	0	0	0	0	0	0	0	0	0	0	36.4	26.1	49.7	42.1
12:00	13:00	27	0	24	1	2	0	0	0	0	0	0	0	0	0	0	0	0	1	5	4	8	8	1	0	0	0	0	0	0	0	0	0	0	35.8	22.3	45.3	41.9
13:00	14:00	28	0	26	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	9	13	4	0	1	0	0	0	0	0	0	0	0	0	36.8	28.9	50.3	41.4
14:00	15:00	27	0	24	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	3	6	10	7	1	0	0	0	0	0	0	0	0	0	0	36.9	25.5	49.2	42.3
15:00	16:00	34	0	27	1	6	0	0	0	0	0	0	0	0	0	0	0	0	1	2	12	8	10	1	0	0	0	0	0	0	0	0	0	0	36.4	20.3	47.6	43.0
16:00	17:00	74	0	70	1	3	0	0	0	0	0	0	0	0	0	0	0	1	0	2	20	31	17	3	0	0	0	0	0	0	0	0	0	0	37.3	16.4	48.5	42.5
17:00	18:00	94	2	79	0	12	0	0	0	0	1	0	0	0	0	0	0	2	2	11	19	30	21	8	1	0	0	0	0	0	0	0	0	0	36.7	19.6	54.1	43.0
18:00	19:00	32	0	31	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	1	8	9	7	5	0	0	0	0	0	0	0	0	0	0	37.6	22.9	48.1	45.8
19:00	20:00	19	0	18	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	5	2	8	2	2	0	0	0	0	0	0	0	0	0	0	36.3	29.0	47.8	43.3
20:00	21:00	12	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	5	3	0	0	0	0	0	0	0	0	0	0	0	36.9	27.4	43.7	41.7
21:00	22:00	9	0	8	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	1	3	3	0	0	0	0	0	0	0	0	0	0	0	0	31.5	20.3	37.2	-
22:00	23:00	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	37.0	28.9	43.7	-
23:00	00:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	35.4	32.6	39.2	-
07:00-19:00		**425**	**2**	**369**	**4**	**47**	**0**	**1**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**7**	**35**	**124**	**144**	**86**	**24**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.5**	**16.4**	**54.1**	**42.2**
06:00-22:00		**469**	**2**	**411**	**4**	**49**	**0**	**1**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**9**	**42**	**133**	**162**	**91**	**26**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.3**	**15.4**	**54.1**	**42.1**
06:00-00:00		**476**	**2**	**418**	**4**	**49**	**0**	**1**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**9**	**43**	**135**	**165**	**92**	**26**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.3**	**15.4**	**54.1**	**42.1**
00:00-00:00		**479**	**2**	**420**	**4**	**50**	**0**	**1**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**9**	**43**	**137**	**166**	**92**	**26**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.3**	**15.4**	**54.1**	**42.1**
Date: 15 October 2019																																						
00:00	01:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	39.7	38.0	41.3	-
01:00	02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
02:00	03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
03:00	04:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	34.1	34.1	34.1	-
04:00	05:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
05:00	06:00	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27.0	27.0	27.0	-
06:00	07:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0	0	38.3	34.7	40.6	-
07:00	08:00	19	0	15	1	3	0	0	0	0	0	0	0	0	0	0	0	1	0	0	8	7	2	1	0	0	0	0	0	0	0	0	0	0	35.9	19.5	46.0	40.8
08:00	09:00	22	0	18	1	3	0	0	0	0	0	0	0	0	0	0	0	0	2	0	7	11	1	1	0	0	0	0	0	0	0	0	0	0	35.2	22.4	45.7	39.7
09:00	10:00	30	0	20	0	9	0	0	0	0	1	0	0	0	0	0	0	1	0	3	11	8	6	1	0	0	0	0	0	0	0	0	0	0	35.2	18.4	45.1	42.5
10:00	11:00	27	0	20	2	5	0	0	0	0	0	0	0	0	0	0	0	0	2	2	7	11	4	1	0	0	0	0	0	0	0	0	0	0	35.6	21.2	49.3	41.9
11:00	12:00	28	0	23	1	4	0	0	0	0	0	0	0	0	0	0	0	0	2	2	11	6	5	1	1	0	0	0	0	0	0	0	0	0	35.6	20.5	50.7	43.0
12:00	13:00	29	0	25	1	3	0	0	0	0	0	0	0	0	0	0	0	0	3	2	8	10	4	2	0	0	0	0	0	0	0	0	0	0	35.5	20.8	45.7	43.3
13:00	14:00	31	0	23	1	5	0	1	0	0	1	0	0	0	0	0	0	0	1	3	9	14	3	1	0	0	0	0	0	0	0	0	0	0	35.1	23.7	45.0	39.1
14:00	15:00	34	0	28	1	4	1	0	0	0	0	0	0	0	0	0	0	0	1	3	10	15	4	1	0	0	0	0	0	0	0	0	0	0	35.8	20.8	48.5	39.9
15:00	16:00	37	0	29	1	6	0	0	0	1	0	0	0	0	0	0	0	1	0	2	6	12	11	5	0	0	0	0	0	0	0	0	0	0	38.2	18.1	49.9	44.5
16:00	17:00	86	0	80	1	5	0	0	0	0	0	0	0	0	0	0	4	0	4	7	19	29	21	2	0	0	0	0	0	0	0	0	0	0	35.0	10.5	45.5	42.6
17:00	18:00	95	1	89	0	5	0	0	0	0	0	0	0	0	0	0	0	1	0	1	13	49	22	8	1	0	0	0	0	0	0	0	0	0	38.9	18.2	52.5	43.8
18:00	19:00	42	0	39	0	2	0	0	0	1	0	0	0	0	0	0	0	0	1	2	5	18	13	2	0	1	0	0	0	0	0	0	0	0	38.2	24.6	57.9	42.9
19:00	20:00	12	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	4	4	0	0	0	0	0	0	0	0	0	0	0	37.7	27.9	44.0	43.6
20:00	21:00	8	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	1	1	2	0	0	0	0	0	0	0	0	0	0	35.6	21.0	48.5	-
21:00	22:00	12	0	9	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	4	1	0	0	0	0	0	0	0	0	0	0	39.4	35.4	45.6	44.8
22:00	23:00	4	0	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	1	0	0	0	0	0	0	0	0	0	0	0	36.3	27.9	42.8	-
23:00	00:00	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	1	0	0	0	0	0	0	0	0	0	0	41.8	37.6	48.8	-
07:00-19:00		**480**	**1**	**409**	**10**	**54**	**1**	**1**	**0**	**2**	**2**	**0**	**0**	**0**	**0**	**0**	**4**	**4**	**16**	**27**	**114**	**190**	**96**	**26**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.5**	**10.5**	**57.9**	**42.6**
06:00-22:00		**516**	**1**	**442**	**10**	**57**	**1**	**1**	**0**	**2**	**2**	**0**	**0**	**0**	**0**	**0**	**4**	**4**	**17**	**29**	**120**	**203**	**107**	**29**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.6**	**10.5**	**57.9**	**42.6**
06:00-00:00		**525**	**1**	**450**	**10**	**58**	**1**	**1**	**0**	**2**	**2**	**0**	**0**	**0**	**0**	**0**	**4**	**4**	**17**	**30**	**120**	**207**	**110**	**30**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.7**	**10.5**	**57.9**	**42.7**
00:00-00:00		**529**	**1**	**453**	**10**	**59**	**1**	**1**	**0**	**2**	**2**	**0**	**0**	**0**	**0**	**0**	**4**	**4**	**17**	**31**	**121**	**208**	**111**	**30**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.6**	**10.5**	**57.9**	**42.7**
Date: 16 October 2019																																						
00:00	01:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	33.4	33.4	33.4	-
01:00	02:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	42.5	37.4	47.7	-
02:00	03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
03:00	04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
04:00	05:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
05:00	06:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	43.1	43.1	43.1	-
06:00	07:00	5	0	3	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	3	0	0	0	0	0	0	0	0	0	0	0	38.7	33.6	41.8	-
07:00	08:00	26	0	23	1	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	5	11	8	1	0	0	0	0	0	0	0	0	0	0	37.4	16.4	47.2	42.8
08:00	09:00	27	0	24	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	1	8	13	4	1	0	0	0	0	0	0	0	0	0	0	36.6	26.9	46.5	40.8
09:00	10:00	39	0	35	1	3	0	0	0	0	0	0	0	0	0	0	0	0	2	6	11	15	4	1	0	0	0	0	0	0	0	0	0	0	34.7	24.7	45.1	39.8
10:00	11:00	24	0	18	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	2	10	8	2	2	0	0	0	0	0	0	0	0	0	0	35.7	28.7	46.0	41.6
11:00	12:00	29	0	23	0	6	0	0	0	0	0	0	0	0	0	0	0	0	1	3	9	10	4	2	0	0	0	0	0	0	0	0	0	0	36.1	23.2	48.0	40.7
12:00	13:00	15	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	5	5	1	0	0	0	0	0	0	0	0	0	0	37.9	28.7	45.1	43.2
13:00	14:00	28	0	24	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	2	6	11	7	2	0	0	0	0	0	0	0	0	0	0	37.6	28.5	46.9	43.5
14:00	15:00	26	0	22	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	2	13	7	4	0	0	0	0	0	0	0	0	0	0	0	34.9	27.6	42.7	40.0
15:00	16:00	35	1	29	0	5	0	0	0	0	0	0	0	0	0	0	1	0	0	1	12	13	3	5	0	0	0	0	0	0	0	0	0	0	36.6	14.4	45.5	44.3
16:00	17:00	70	0	65	0	5	0	0	0	0	0	0	0	0	0	0	0	0	1	5	7	29	21	7	0	0	0	0	0	0	0	0	0	0	38.8	22.7	49.2	43.6
17:00	18:00	92	1	86	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	3	16	43	22	7	1	0	0	0	0	0	0	0	0	0	38.6	28.1	52.7	43.3
18:00	19:00	42	1	37	0	4	0	0	0	0	0	0	0	0	0	0	0	1	0	1	8	16	13	3	0	0	0	0	0	0	0	0	0	0	37.9	19.8	47.9	43.1
19:00	20:00	19	2	16	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	8	6	3	0	0	0	0	0	0	0	0	0	0	0	34.9	25.7	44.5	41.5
20:00	21:00	9	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	1	4	0	0	0	0	0	0	0	0	0	0	0	36.4	28.5	42.0	-
21:00	22:00	9	0	8	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	3	1	1	1	0	0	0	0	0	0	0	0	0	39.0	29.0	51.7	-
22:00	23:00	10	0	8	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	2	3	0	1	0	0	0	0	0	0	0	0	0	37.1	20.2	52.5	-
23:00	00:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	36.5	34.9	38.0	-
07:00-19:00		**453**	**3**	**401**	**3**	**44**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**4**	**28**	**107**	**181**	**97**	**32**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**37.3**	**14.4**	**52.7**	**42.1**
06:00-22:00		**495**	**5**	**437**	**3**	**48**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**4**	**32**	**121**	**192**	**108**	**33**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**37.2**	**14.4**	**52.7**	**42.1**
06:00-00:00		**507**	**5**	**447**	**3**	**50**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**5**	**33**	**124**	**195**	**111**	**33**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**37.2**	**14.4**	**52.7**	**42.1**
00:00-00:00		**511**	**5**	**451**	**3**	**50**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**5**	**33**	**125**	**196**	**112**	**34**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**37.2**	**14.4**	**52.7**	**42.1**
5 day (Weekday) Average																																						
07:00-19:00		**456**	**2**	**397**	**5**	**48**	**1**	**2**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**3**	**8**	**32**	**124**	**172**	**88**	**26**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.7**	**15.2**	**59.5**	**42.1**
06:00-22:00		**500**	**2**	**436**	**6**	**51**	**1**	**2**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**3**	**9**	**37**	**134**	**186**	**97**	**30**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.6**	**13.8**	**61.1**	**42.2**
06:00-00:00		**509**	**2**	**445**	**6**	**52**	**1**	**2**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**4**	**9**	**38**	**136**	**189**	**99**	**30**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.6**	**13.8**	**61.1**	**42.2**
00:00-00:00		**513**	**2**	**448**	**6**	**52**	**1**	**2**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**4**	**9**	**38**	**137**	**190**	**100**	**30**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.6**	**13.8**	**61.1**	**42.2**
7 day (Weekly) Average																																						
07:00-19:00		**410**	**2**	**360**	**6**	**37**	**1**	**1**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**1**	**2**	**7**	**31**	**112**	**153**	**77**	**22**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.5**	**15.4**	**60.6**	**42.0**
06:00-22:00		**449**	**3**	**396**	**7**	**40**	**1**	**1**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**1**	**3**	**9**	**36**	**122**	**165**	**84**	**25**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.4**	**14.4**	**61.7**	**42.0**
06:00-00:00		**459**	**3**	**405**	**7**	**40**	**1**	**1**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**1**	**3**	**9**	**38**	**125**	**168**	**86**	**25**	**3**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.3**	**14.4**	**61.7**	**41.9**
00:00-00:00		**462**	**3**	**408**	**7**	**41**	**1**	**1**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**1**	**3**	**9**	**38**	**126**	**169**	**87**	**25**	**3**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36.3**	**14.4**	**61.7**	**41.9**

ATC CLASSIFIED LINK & SPEED SURVEY

Project: Kellas Road, Dundee
Client: Cameron + Ross
Project.Ref. TS-19-058

Location 2: Kellas Road - Approx. 30m south of Unnamed Road
Movement: Northbound

TIME		TOTAL	ARX VEHICLE CLASSIFICATIONS												SPEED BIN TOTALS																				SPEED STATISTICS			
			LIGHT			MEDIUM			HEAVY																													
			1	2	3	4	5	6	7	8	9	10	11	12	0-5 mph	5-10mph	10-15mph	15-20mph	20-25mph	25-30mph	30-35mph	35-40mph	40-45mph	45-50mph	50-55mph	55-60mph	60-65mph	65-70mph	70-75mph	75-80mph	80-85mph	85-90mph	90-95mph	95-100mph	AVERAGE	MINIMUM	MAXIMUM	85th%ile
Date: 10 October 2019																																						
00:00	01:00	12	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	4	1	3	0	2	0	0	0	0	0	0	0	47.1	26.7	62.5	60.8
01:00	02:00	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	0	1	0	0	0	0	0	0	0	0	44.4	38.9	55.1	-
02:00	03:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	37.2	33.4	41.1	-
03:00	04:00	6	0	2	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	28.6	25.9	37.7	-
04:00	05:00	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	32.4	24.3	41.1	-
05:00	06:00	8	0	7	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	3	0	1	1	1	1	0	0	0	0	0	0	0	0	0	35.3	21.7	51.9	-
06:00	07:00	30	0	24	0	5	1	0	0	0	0	0	0	0	0	0	0	0	1	6	4	6	3	5	3	0	1	1	0	0	0	0	0	0	40.0	25.0	67.2	50.5
07:00	08:00	51	0	42	0	8	0	1	0	0	0	0	0	0	0	0	0	1	1	9	8	5	10	9	4	4	0	0	0	0	0	0	0	0	39.9	18.6	57.8	51.6
08:00	09:00	75	0	69	0	4	2	0	0	0	0	0	0	0	0	0	0	1	5	20	8	14	16	6	3	1	1	0	0	0	0	0	0	0	36.1	18.5	64.2	45.1
09:00	10:00	75	0	66	1	7	0	0	0	1	0	0	0	0	0	0	0	0	13	8	8	14	21	8	3	0	0	0	0	0	0	0	0	0	36.5	20.4	52.2	45.0
10:00	11:00	59	0	51	0	8	0	0	0	0	0	0	0	0	0	0	0	0	3	8	5	19	13	8	1	2	0	0	0	0	0	0	0	0	38.7	23.1	58.1	46.0
11:00	12:00	111	0	106	0	4	0	0	0	1	0	0	0	0	0	0	0	1	6	16	7	29	29	18	5	0	0	0	0	0	0	0	0	0	38.4	19.4	54.4	46.3
12:00	13:00	110	0	95	3	8	1	0	0	1	1	1	0	0	0	0	0	1	8	14	18	19	31	13	4	1	0	0	1	0	0	0	0	0	37.7	15.8	73.7	46.6
13:00	14:00	101	0	87	0	13	1	0	0	0	0	0	0	0	0	0	0	0	6	6	10	22	33	18	6	0	0	0	0	0	0	0	0	0	39.7	21.7	54.4	46.9
14:00	15:00	108	2	97	0	8	0	0	0	1	0	0	0	0	0	0	0	0	3	6	14	31	28	15	8	2	1	0	0	0	0	0	0	0	40.2	22.1	60.3	47.4
15:00	16:00	135	2	116	1	12	2	1	0	1	0	0	0	0	0	0	1	2	12	9	12	29	34	21	11	3	1	0	0	0	0	0	0	0	39.2	11.3	63.4	47.9
16:00	17:00	190	1	179	1	9	0	0	0	0	0	0	0	0	0	0	0	1	12	12	29	60	51	20	5	0	0	0	0	0	0	0	0	0	37.8	19.2	51.2	44.6
17:00	18:00	181	0	169	2	9	0	1	0	0	0	0	0	0	0	0	0	2	5	14	11	64	53	23	8	1	0	0	0	0	0	0	0	0	39.1	17.2	58.7	45.6
18:00	19:00	133	0	124	0	8	0	0	0	1	0	0	0	0	0	0	0	1	3	13	14	47	30	17	7	1	0	0	0	0	0	0	0	0	38.9	19.7	56.0	46.1
19:00	20:00	88	0	84	0	4	0	0	0	0	0	0	0	0	0	0	0	3	3	6	5	25	26	18	1	1	0	0	0	0	0	0	0	0	39.2	15.9	60.0	46.0
20:00	21:00	52	0	51	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	5	5	23	11	4	2	0	0	1	0	0	0	0	0	0	38.7	23.4	67.6	43.8
21:00	22:00	50	0	49	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	4	3	16	16	7	2	0	0	0	0	0	0	0	0	0	39.4	19.7	52.7	45.9
22:00	23:00	29	0	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	5	7	6	6	0	0	1	0	0	0	0	0	0	43.3	23.6	65.0	51.1
23:00	00:00	13	0	12	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	3	4	1	0	0	0	0	0	0	0	0	0	41.6	29.7	51.4	48.6
07:00-19:00		**1329**	**5**	**1201**	**8**	**98**	**6**	**3**	**0**	**6**	**1**	**1**	**0**	**0**	**0**	**0**	**1**	**10**	**77**	**135**	**144**	**353**	**349**	**176**	**65**	**15**	**3**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**38.6**	**11.3**	**73.7**	**46.3**
06:00-22:00		**1549**	**5**	**1409**	**8**	**108**	**7**	**4**	**0**	**6**	**1**	**1**	**0**	**0**	**0**	**0**	**1**	**14**	**83**	**156**	**161**	**423**	**405**	**210**	**73**	**16**	**4**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**38.7**	**11.3**	**73.7**	**46.3**
06:00-00:00		**1591**	**5**	**1450**	**8**	**109**	**7**	**4**	**0**	**6**	**1**	**1**	**0**	**0**	**0**	**0**	**1**	**14**	**84**	**158**	**165**	**430**	**415**	**220**	**80**	**16**	**4**	**3**	**1**	**0**	**0**	**0**	**0**	**0**	**38.8**	**11.3**	**73.7**	**46.5**
00:00-00:00		**1627**	**5**	**1481**	**8**	**114**	**7**	**4**	**0**	**6**	**1**	**1**	**0**	**0**	**0**	**0**	**1**	**14**	**86**	**167**	**167**	**435**	**423**	**223**	**84**	**17**	**6**	**3**	**1**	**0**	**0**	**0**	**0**	**0**	**38.8**	**11.3**	**73.7**	**46.5**
Date: 11 October 2019																																						
00:00	01:00	9	0	8	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	3	1	1	0	0	0	0	0	0	0	0	45.2	34.7	58.0	-
01:00	02:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	35.4	22.4	48.3	-
02:00	03:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0	1	0	0	0	0	0	0	0	44.4	32.6	60.8	-
03:00	04:00	9	0	5	0	4	0	0	0	0	0	0	0	0	0	0	0	0	4	3	1	0	1	0	0	0	0	0	0	0	0	0	0	0	28.3	23.8	40.6	-
04:00	05:00	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	28.7	24.7	35.4	-
05:00	06:00	7	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	3	0	1	0	0	0	0	0	0	0	0	0	0	0	31.9	24.6	42.3	-
06:00	07:00	20	0	18	0	1	0	1	0	0	0	0	0	0	0	0	0	0	3	5	1	2	1	4	2	2	0	0	0	0	0	0	0	0	38.1	23.2	59.6	52.2
07:00	08:00	59	0	47	1	6	2	1	0	1	0	1	0	0	0	0	0	0	1	8	4	13	21	10	0	2	0	0	0	0	0	0	0	0	39.7	23.7	58.1	46.2
08:00	09:00	86	0	77	0	5	2	0	1	0	1	0	0	0	0	0	0	2	12	10	6	11	20	16	6	3	0	0	0	0	0	0	0	0	38.4	18.3	58.6	48.7
09:00	10:00	61	0	49	3	9	0	0	0	0	0	0	0	0	0	0	0	0	5	9	6	10	12	14	2	3	0	0	0	0	0	0	0	0	39.1	21.1	57.4	48.7
10:00	11:00	94	1	81	2	9	0	0	0	1	0	0	0	0	0	0	1	0	2	11	6	14	35	13	10	2	0	0	0	0	0	0	0	0	40.6	11.8	57.9	48.1
11:00	12:00	84	0	80	0	3	0	0	0	0	0	1	0	0	0	0	0	0	5	6	3	21	30	15	1	2	1	0	0	0	0	0	0	0	40.3	22.8	62.0	46.8
12:00	13:00	112	1	98	0	12	0	0	0	1	0	0	0	0	0	0	0	0	3	13	10	25	38	18	4	1	0	0	0	0	0	0	0	0	39.7	23.4	58.5	46.2
13:00	14:00	131	0	113	2	13	0	1	0	1	0	1	0	0	0	0	0	0	7	9	11	36	39	21	6	2	0	0	0	0	0	0	0	0	39.8	20.5	56.8	47.0
14:00	15:00	130	4	118	1	6	1	0	0	0	0	0	0	0	0	0	0	0	3	8	8	37	42	22	8	2	0	0	0	0	0	0	0	0	40.7	21.8	56.2	47.1
15:00	16:00	171	1	159	1	8	1	1	0	0	0	0	0	0	0	0	0	0	3	19	23	39	42	35	9	1	0	0	0	0	0	0	0	0	39.7	20.0	55.3	46.9
16:00	17:00	153	1	142	0	8	1	0	0	0	0	1	0	0	0	0	0	0	9	13	5	38	41	37	9	1	0	0	0	0	0	0	0	0	40.4	20.2	58.7	47.1
17:00	18:00	186	0	182	0	3	0	1	0	0	0	0	0	0	0	0	0	0	11	16	12	34	54	40	18	0	0	1	0	0	0	0	0	0	40.7	21.8	65.2	48.7
18:00	19:00	115	0	110	0	5	0	0	0	0	0	0	0	0	0	0	0	0	5	3	10	26	29	33	3	4	2	0	0	0	0	0	0	0	42.1	21.8	63.3	48.5
19:00	20:00	87	1	79	0	6	0	0	1	0	0	0	0	0	0	0	0	1	4	7	16	21	15	15	5	2	0	1	0	0	0	0	0	0	39.1	18.0	65.9	47.8
20:00	21:00	50	0	49	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	2	3	10	20	6	4	3	0	0	0	0	0	0	0	0	41.7	21.0	58.7	50.2
21:00	22:00	62	1	60	0	1	0	0	0	0	0	0	0	0	0	0	0	0	4	3	0	20	17	11	7	0	0	0	0	0	0	0	0	0	41.0	20.3	52.8	49.3
22:00	23:00	29	1	27	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	6	10	6	2	1	0	0	0	0	0	0	0	0	42.1	22.3	59.1	48.0
23:00	00:00	16	0	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	2	5	3	3	0	1	0	0	0	0	0	0	0	43.1	21.0	61.7	52.8
07:00-19:00		**1382**	**8**	**1256**	**10**	**87**	**7**	**4**	**1**	**4**	**1**	**4**	**0**	**0**	**0**	**0**	**1**	**2**	**66**	**125**	**104**	**304**	**403**	**274**	**76**	**23**	**3**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**40.2**	**11.8**	**65.2**	**47.5**
06:00-22:00		**1601**	**10**	**1462**	**10**	**96**	**7**	**5**	**2**	**4**	**1**	**4**	**0**	**0**	**0**	**0**	**1**	**3**	**79**	**142**	**124**	**357**	**456**	**310**	**94**	**30**	**3**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**40.2**	**11.8**	**65.9**	**47.6**
06:00-00:00		**1646**	**11**	**1505**	**10**	**97**	**7**	**5**	**2**	**4**	**1**	**4**	**0**	**0**	**0**	**0**	**1**	**3**	**81**	**144**	**126**	**365**	**471**	**319**	**99**	**31**	**4**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**40.3**	**11.8**	**65.9**	**47.6**
00:00-00:00		**1680**	**11**	**1534**	**10**	**102**	**7**	**5**	**2**	**4**	**1**	**4**	**0**	**0**	**0**	**0**	**1**	**3**	**88**	**150**	**133**	**368**	**474**	**324**	**100**	**32**	**5**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**40.2**	**11.8**	**65.9**	**47.8**
Date: 12 October 2019																																						
00:00	01:00	12	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3	3	3	1	0	1	0	0	0	0	0	0	0	44.0	25.3	63.5	53.6
01:00	02:00	12	0	11	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	4	3	0	1	0	0	0	0	0	0	0	0	42.4	28.9	55.6	50.1
02:00	03:00	13	0	12	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	3	1	2	2	3	0	0	0	0	0	0	0	0	0	40.3	24.7	54.0	51.7
03:00	04:00	8	0	3	0	5	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	0	1	2	0	0	0	0	0	0	0	0	0	0	33.0	23.9	48.6	-
04:00	05:00	5	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1	1	1	0	0	0	0	0	0	0	0	0	38.6	27.3	52.0	-
05:00	06:00	7	0	6	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	0	3	1	0	1	0	0	0	0	0	0	0	0	0	37.8	25.5	52.8	-
06:00	07:00	10	0	9	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	2	4	1	0	0	0	0	0	0	0	0	0	43.4	33.1	51.9	-
07:00	08:00	30	0	25	0	5	0	0	0	0	0	0	0	0	0	0	0	1	2	2	2	5	9	6	3	0	0	0	0	0	0	0	0	0	39.8	18.9	52.5	47.2
08:00	09:00	54	2	45	1	5	0	0	0	0	1	0	0	0	0	1	1	0	3	9	0	13	15	7	5	0	0	0	0	0	0	0	0	0	37.7	8.5	52.9	47.5
09:00	10:00	79	5	65	0	8	0	1	0	0	0	0	0	0	0	0	0	2	8	6	8	15	28	6	3	2	1	0	0	0	0	0	0	0	38.2	17.6	60.7	45.9
10:00	11:00	97	1	86	2	7	0	0	1	0	0	0	0	0	0	0	1	1	6	11	7	20	24	18	8	1	0	0	0	0	0	0	0	0	39.1	12.3	57.6	47.6
11:00	12:00	112	1	107	1	3	0	0	0	0	0	0	0	0	0	0	0	0	2	14	11	23	29	21	11	1	0	0	0	0	0	0	0	0	40.5	22.4	55.1	48.3
12:00	13:00	134	4	120	0	10	0	0	0	0	0	0	0	0	0	0	0	2	1	11	10	25	48	21	12	2	1	1	0	0	0	0	0	0	41.3	17.7	68.9	49.3
13:00	14:00	142	2	130	0	9	1	0	0	0	0	0	0	0	0	0	0	1	9	8	11	28	36	32	10	5	2	0	0	0	0	0	0	0	40.8	18.5	62.9	48.3
14:00	15:00	131	3	123	3	2	0	0	0	0	0	0	0	0	0	0	0	0	4	15	8	23	43	25	8	1	3	1	0	0	0	0	0	0	41.0	20.9	66.6	48.9
15:00	16:00	119	1	116	0	2	0	0	0	0	0	0	0	0	0	0	0	0	4	7	8	17	35	32	7	4	4	0	0	1	0	0	0	0	43.0	21.5	78.9	49.7
16:00	17:00	140	2	133	0	5	0	0	0	0	0	0	0	0	0	0	0	0	3	12	16	26	50	22	7	2	2	0	0	0	0	0	0	0	40.6	23.3	63.0	47.4
17:00	18:00	104	0	103	0	1	0	0	0	0	0	0	0	0	0	0	0	1	6	6	1	20	38	25	4	2	1	0	0	0	0	0	0	0	41.3	18.9	60.5	47.5
18:00	19:00	98	0	94	0	3	0	1	0	0	0	0	0	0	0	0	0	0	2	8	3	22	32	22	7	2	0	0	0	0	0	0	0	0	41.4	23.9	57.3	48.6
19:00	20:00	78	0	75	0	2	0	0	0	1	0	0	0	0	0	0	0	0	5	4	9	18	20	13	5	4	0	0	0	0	0	0	0	0	40.1	21.4	58.5	48.7
20:00	21:00	46	0	46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	2	15	12	7	2	1	1	0	0	0	0	0	0	0	40.3	21.4	62.8	47.5
21:00	22:00	46	0	43	1	2	0	0	0	0	0	0	0	0	0	0	0	0	4	0	2	9	14	10	6	0	1	0	0	0	0	0	0	0	42.1	23.4	61.2	50.1
22:00	23:00	32	0	32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	3	1	9	7	6	1	1	0	0	0	0	0	0	0	0	38.3	21.8	57.1	46.3
23:00	00:00	29	1	25	1	2	0	0	0	0	0	0	0	0	0	0	0	0	1	1	3	6	8	7	3	0	0	0	0	0	0	0	0	0	41.7	22.4	53.6	49.0
07:00-19:00		**1240**	**21**	**1147**	**7**	**60**	**1**	**2**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**1**	**2**	**8**	**50**	**109**	**85**	**237**	**387**	**237**	**85**	**22**	**14**	**2**	**0**	**1**	**0**	**0**	**0**	**0**	**40.7**	**8.5**	**78.9**	**48.2**
06:00-22:00		**1420**	**21**	**1320**	**8**	**65**	**1**	**2**	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**1**	**2**	**8**	**62**	**116**	**100**	**280**	**435**	**271**	**99**	**27**	**16**	**2**	**0**	**1**	**0**	**0**	**0**	**0**	**40.7**	**8.5**	**78.9**	**48.3**
06:00-00:00		**1481**	**22**	**1377**	**9**	**67**	**1**	**2**	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**1**	**2**	**8**	**67**	**120**	**104**	**295**	**450**	**284**	**103**	**28**	**16**	**2**	**0**	**1**	**0**	**0**	**0**	**0**	**40.7**	**8.5**	**78.9**	**48.3**
00:00-00:00		**1538**	**22**	**1425**	**10**	**74**	**1**	**3**	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**1**	**2**	**8**	**71**	**129**	**108**	**304**	**462**	**295**	**109**	**29**	**17**	**2**	**0**	**1**	**0**	**0**	**0**	**0**	**40.6**	**8.5**	**78.9**	**48.4**
Date: 13 October 2019																																						
00:00	01:00	30	0	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	5	15	7	1	0	0	0	0	0	0	0	0	0	41.7	25.0	52.1	48.1
01:00	02:00	17	0	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	3	4	3	1	0	0	0	0	0	0	0	0	43.4	30.7	56.4	51.2
02:00	03:00	9	0	8	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3	1	3	1	0	0	0	0	0	0	0	0	0	41.9	29.3	50.6	-
03:00	04:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	0	0	0	0	0	0	0	0	0	0	42.0	38.4	46.6	-
04:00	05:00	5	0	4	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	1	1	0	0	0	0	0	0	52.0	41.5	65.2	-
05:00	06:00	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0	1	0	0	0	0	0	0	0	0	0	41.5	32.7	50.5	-
06:00	07:00	10	0	9	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	6	1	0	0	0	0	0	0	0	0	0	0	41.5	33.7	47.3	-
07:00	08:00	19	1	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	4	2	4	3	1	2	0	0	0	0	0	0	0	0	40.3	27.5	57.0	52.1
08:00	09:00	32	0	29	0	3	0	0	0	0	0	0	0	0	0	0	0	0	4	2	3	7	8	5	1	0	2	0	0	0	0	0	0	0	39.7	21.3	64.4	49.0
09:00	10:00	39	1	37	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	4	2	5	12	11	2	0	1	0	0	0	0	0	0	0	41.0	16.0	64.3	48.0
10:00	11:00	53	0	49	0	4	0	0	0	0	0	0	0	0	0	0	0	0	3	6	0	6	20	14	4	0	0	0	0	0	0	0	0	0	40.7	20.0	52.1	47.2
11:00	12:00	82	0	80	0	2	0	0	0	0	0	0	0	0	0	0	0	0	4	8	3	10	26	20	6	3	1	1	0	0	0	0	0	0	42.3	20.7	68.5	48.6
12:00	13:00	96	3	88	0	4	0	0	1	0	0	0	0	0	0	0	0	1	5	13	10	21	19	20	3	3	1	0	0	0	0	0	0	0	39.2	18.9	60.7	48.9
13:00	14:00	110	0	107	0	3	0	0	0	0	0	0	0	0	0	0	0	0	2	10	8	18	35	28	6	3	0	0	0	0	0	0	0	0	41.4	22.6	59.8	48.3
14:00	15:00	129	0	125	0	4	0	0	0	0	0	0	0	0	0	0	0	1	2	6	10	18	52	28	7	3	0	1	0	1	0	0	0	0	42.2	15.3	75.6	47.6
15:00	16:00	112	1	108	1	2	0	0	0	0	0	0	0	0	0	0	0	0	7	5	6	16	38	18	16	4	2	0	0	0	0	0	0	0	42.5	21.3	64.3	51.4

TIME		TOTAL	ARX VEHICLE CLASSIFICATIONS												SPEED BIN TOTALS																				SPEED STATISTICS			
			LIGHT			MEDIUM			HEAVY						0-5 mph	5-10mph	10-15mph	15-20mph	20-25mph	25-30mph	30-35mph	35-40mph	40-45mph	45-50mph	50-55mph	55-60mph	60-65mph	65-70mph	70-75mph	75-80mph	80-85mph	85-90mph	90-95mph	95-100mph	AVERAGE	MINIMUM	MAXIMUM	85th%ile
			1	2	3	4	5	6	7	8	9	10	11	12																								
Date: 13 October 2019																																						
16:00	17:00	123	0	119	2	2	0	0	0	0	0	0	0	0	0	0	0	0	2	12	12	14	33	32	13	4	1	0	0	0	0	0	0	0	42.3	24.8	61.0	50.4
17:00	18:00	100	0	95	1	4	0	0	0	0	0	0	0	0	0	0	0	0	4	9	3	14	37	13	15	5	0	0	0	0	0	0	0	0	42.3	21.0	59.3	50.9
18:00	19:00	78	0	73	0	5	0	0	0	0	0	0	0	0	0	0	0	1	5	11	9	11	20	15	4	2	0	0	0	0	0	0	0	0	39.1	19.8	57.9	48.0
19:00	20:00	56	0	54	0	1	0	1	0	0	0	0	0	0	0	0	0	0	3	4	3	14	23	5	3	1	0	0	0	0	0	0	0	0	40.2	21.9	57.7	48.1
20:00	21:00	51	0	49	0	2	0	0	0	0	0	0	0	0	0	0	0	0	4	7	8	17	9	5	1	0	0	0	0	0	0	0	0	0	36.3	20.4	50.6	42.9
21:00	22:00	40	0	38	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	4	4	13	7	6	4	0	0	0	0	0	0	0	0	0	39.0	20.0	53.7	48.4
22:00	23:00	17	0	15	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	2	5	3	0	4	1	1	0	0	0	0	0	0	0	0	37.9	24.8	56.3	48.9
23:00	00:00	9	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	2	1	0	2	0	0	0	0	0	0	0	0	43.7	33.9	58.0	-
07:00-19:00		**973**	**6**	**928**	**4**	**34**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**39**	**89**	**70**	**142**	**304**	**207**	**78**	**29**	**8**	**2**	**0**	**1**	**0**	**0**	**0**	**0**	**41.4**	**15.3**	**75.6**	**49.0**
06:00-22:00		**1130**	**6**	**1078**	**5**	**39**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**47**	**104**	**86**	**188**	**349**	**224**	**86**	**30**	**8**	**2**	**0**	**1**	**0**	**0**	**0**	**0**	**41.0**	**15.3**	**75.6**	**48.7**
06:00-00:00		**1156**	**6**	**1102**	**6**	**40**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**48**	**106**	**92**	**194**	**351**	**229**	**87**	**33**	**8**	**2**	**0**	**1**	**0**	**0**	**0**	**0**	**41.0**	**15.3**	**75.6**	**48.7**
00:00-00:00		**1226**	**6**	**1170**	**6**	**41**	**0**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**49**	**108**	**94**	**210**	**374**	**246**	**93**	**34**	**9**	**3**	**0**	**1**	**0**	**0**	**0**	**0**	**41.1**	**15.3**	**75.6**	**48.7**
Date: 14 October 2019																																						
00:00	01:00	8	0	7	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	3	2	1	0	0	0	0	0	0	0	0	0	42.6	29.3	52.7	-
01:00	02:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	0	0	0	0	0	0	0	0	46.7	38.7	55.6	-
02:00	03:00	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26.5	26.5	26.5	-
03:00	04:00	6	0	2	0	4	0	0	0	0	0	0	0	0	0	0	0	2	3	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	25.9	19.5	45.4	-
04:00	05:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	41.8	38.6	45.1	-
05:00	06:00	9	0	8	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	4	0	0	2	0	0	0	0	0	0	0	0	0	0	34.6	26.0	48.0	-
06:00	07:00	27	0	25	0	1	1	0	0	0	0	0	0	0	0	0	0	0	2	10	5	2	3	4	0	0	1	0	0	0	0	0	0	0	35.2	24.5	61.3	47.1
07:00	08:00	69	0	64	0	4	1	0	0	0	0	0	0	0	0	0	0	1	8	8	7	12	13	12	6	2	0	0	0	0	0	0	0	0	38.4	19.3	59.3	48.3
08:00	09:00	62	1	55	0	6	0	0	0	0	0	0	0	0	0	1	0	2	2	16	11	3	12	11	2	1	1	0	0	0	0	0	0	0	36.4	9.0	63.2	47.2
09:00	10:00	87	0	74	0	12	0	0	0	0	0	1	0	0	0	0	0	2	5	12	9	18	25	15	1	0	0	0	0	0	0	0	0	0	37.8	16.1	54.2	46.6
10:00	11:00	74	2	64	1	7	0	0	0	0	0	0	0	0	0	0	2	1	1	11	5	12	25	13	1	3	0	0	0	0	0	0	0	0	38.9	10.4	59.0	48.2
11:00	12:00	89	0	71	2	14	0	1	0	1	0	0	0	0	0	0	0	0	3	10	9	17	30	16	3	1	0	0	0	0	0	0	0	0	39.4	20.6	56.0	46.5
12:00	13:00	99	0	83	0	16	0	0	0	0	0	0	0	0	0	0	0	0	5	10	6	17	35	19	6	1	0	0	0	0	0	0	0	0	40.1	21.9	55.4	46.4
13:00	14:00	99	1	92	1	4	0	0	0	0	0	1	0	0	0	1	0	0	4	10	4	19	32	14	9	5	1	0	0	0	0	0	0	0	41.1	6.8	64.5	50.6
14:00	15:00	128	0	112	0	11	1	1	0	1	1	1	0	0	0	0	0	0	4	17	7	32	27	27	10	2	2	0	0	0	0	0	0	0	40.3	23.9	61.4	48.8
15:00	16:00	122	0	106	3	9	2	2	0	0	0	0	0	0	0	0	0	0	4	7	10	28	39	21	12	1	0	0	0	0	0	0	0	0	41.1	22.5	57.4	48.3
16:00	17:00	194	3	175	2	12	1	0	0	0	0	1	0	0	0	0	1	3	9	26	17	37	53	33	10	2	1	1	1	0	0	0	0	0	39.2	13.9	70.2	47.2
17:00	18:00	216	1	203	0	12	0	0	0	0	0	0	0	0	0	0	0	4	8	15	17	27	81	45	12	7	0	0	0	0	0	0	0	0	40.7	15.7	59.3	46.9
18:00	19:00	122	1	115	1	4	1	0	0	0	0	0	0	0	0	0	0	0	4	9	12	24	34	28	8	3	0	0	0	0	0	0	0	0	41.2	23.5	58.9	49.0
19:00	20:00	81	1	75	0	5	0	0	0	0	0	0	0	0	0	0	0	1	2	5	3	20	21	22	5	2	0	0	0	0	0	0	0	0	41.7	18.1	56.1	48.6
20:00	21:00	63	0	60	0	3	0	0	0	0	0	0	0	0	0	0	0	1	1	4	0	10	20	14	9	2	2	0	0	0	0	0	0	0	43.8	19.8	60.9	51.9
21:00	22:00	43	0	42	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	5	1	5	17	6	7	0	1	0	0	0	0	0	0	0	42.4	21.8	64.5	51.7
22:00	23:00	25	0	23	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	6	5	4	6	0	1	0	0	0	0	0	0	0	43.3	24.4	63.9	51.7
23:00	00:00	22	0	21	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3	3	6	4	5	0	0	0	0	0	0	0	0	0	42.7	23.3	54.1	50.6
07:00-19:00		**1361**	**9**	**1214**	**10**	**111**	**6**	**4**	**0**	**2**	**1**	**4**	**0**	**0**	**0**	**2**	**3**	**13**	**57**	**151**	**114**	**246**	**406**	**254**	**80**	**28**	**5**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**39.8**	**6.8**	**70.2**	**47.8**
06:00-22:00		**1575**	**10**	**1416**	**10**	**121**	**7**	**4**	**0**	**2**	**1**	**4**	**0**	**0**	**0**	**2**	**3**	**15**	**63**	**175**	**123**	**283**	**467**	**300**	**101**	**32**	**9**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**40.1**	**6.8**	**70.2**	**48.1**
06:00-00:00		**1622**	**10**	**1460**	**10**	**124**	**7**	**4**	**0**	**2**	**1**	**4**	**0**	**0**	**0**	**2**	**3**	**15**	**66**	**175**	**127**	**292**	**478**	**308**	**112**	**32**	**10**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**40.2**	**6.8**	**70.2**	**48.3**
00:00-00:00		**1652**	**10**	**1483**	**10**	**131**	**7**	**4**	**0**	**2**	**1**	**4**	**0**	**0**	**0**	**2**	**3**	**17**	**69**	**180**	**131**	**295**	**482**	**315**	**113**	**33**	**10**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**40.1**	**6.8**	**70.2**	**48.2**
Date: 15 October 2019																																						
00:00	01:00	6	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	1	1	0	0	0	0	0	0	0	48.4	40.9	64.8	-
01:00	02:00	3	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	43.5	23.4	55.0	-
02:00	03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
03:00	04:00	8	0	3	0	5	0	0	0	0	0	0	0	0	0	0	0	1	3	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	28.4	18.9	43.7	-
04:00	05:00	5	0	4	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	1	0	0	0	0	0	0	0	0	0	40.5	30.1	51.9	-
05:00	06:00	8	0	7	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	1	1	0	0	0	0	0	0	0	0	0	0	36.0	28.3	50.0	-
06:00	07:00	26	0	20	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	3	5	7	5	3	2	1	0	0	0	0	0	0	0	0	39.4	26.7	58.3	49.5
07:00	08:00	63	0	48	0	14	0	0	0	1	0	0	0	0	0	1	0	0	4	8	12	8	15	10	5	0	0	0	0	0	0	0	0	0	37.9	8.2	54.6	46.6
08:00	09:00	83	0	69	0	14	0	0	0	0	0	0	0	0	0	0	0	2	9	17	14	6	17	10	3	5	0	0	0	0	0	0	0	0	36.4	17.0	59.9	47.3
09:00	10:00	68	0	50	0	18	0	0	0	0	0	0	0	0	0	0	0	0	6	11	9	13	19	9	1	0	0	0	0	0	0	0	0	0	37.1	22.3	50.6	45.2
10:00	11:00	96	0	84	0	9	1	0	0	1	1	0	0	0	0	0	1	3	2	6	5	19	31	18	9	1	1	0	0	0	0	0	0	0	40.7	13.8	63.8	48.5
11:00	12:00	109	0	95	1	13	0	0	0	0	0	0	0	0	0	0	0	0	6	12	11	23	31	14	10	2	0	0	0	0	0	0	0	0	39.4	21.2	56.7	48.1
12:00	13:00	131	0	116	1	14	0	0	0	0	0	0	0	0	0	0	0	0	5	20	8	20	43	21	10	4	0	0	0	0	0	0	0	0	40.0	22.9	58.3	48.3
13:00	14:00	118	4	103	1	10	0	0	0	0	0	0	0	0	0	1	0	0	2	7	11	18	45	22	10	2	0	0	0	0	0	0	0	0	41.3	9.4	55.4	48.2
14:00	15:00	114	0	104	1	7	0	0	0	1	1	0	0	0	0	0	0	2	7	13	7	18	39	18	8	2	0	0	0	0	0	0	0	0	39.6	19.1	59.6	48.0
15:00	16:00	141	0	125	3	13	0	0	0	0	0	0	0	0	0	0	0	2	5	11	8	38	34	34	7	1	1	0	0	0	0	0	0	0	40.3	16.7	60.8	47.4
16:00	17:00	195	1	175	0	14	1	2	0	0	0	2	0	0	0	0	1	1	11	18	16	39	59	35	12	3	0	0	0	0	0	0	0	0	39.6	14.8	55.8	47.6
17:00	18:00	196	1	179	1	13	0	1	0	0	1	0	0	0	0	0	0	1	10	13	12	30	71	39	10	7	2	1	0	0	0	0	0	0	41.3	19.6	68.4	47.9
18:00	19:00	136	0	123	1	11	0	0	0	0	1	0	0	0	0	0	0	0	4	15	9	30	36	30	8	2	0	1	1	0	0	0	0	0	41.0	22.3	71.4	48.8
19:00	20:00	75	0	74	0	1	0	0	0	0	0	0	0	0	0	0	0	2	3	8	4	15	19	15	9	0	0	0	0	0	0	0	0	0	40.0	17.0	54.6	49.6
20:00	21:00	69	1	64	0	4	0	0	0	0	0	0	0	0	0	0	0	1	4	1	9	8	23	17	5	1	0	0	0	0	0	0	0	0	41.1	18.2	55.2	48.9
21:00	22:00	49	0	48	0	1	0	0	0	0	0	0	0	0	0	0	1	1	2	0	5	7	13	8	5	4	1	2	0	0	0	0	0	0	43.4	15.0	67.7	54.9
22:00	23:00	28	0	27	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	3	6	10	3	1	0	0	0	0	0	0	0	0	43.0	24.0	55.7	50.3
23:00	00:00	18	0	17	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	5	3	2	2	3	1	0	0	0	0	0	0	0	0	40.9	27.7	58.6	52.5
07:00-19:00		**1450**	**6**	**1271**	**9**	**150**	**2**	**3**	**0**	**3**	**4**	**2**	**0**	**0**	**0**	**2**	**2**	**11**	**71**	**151**	**122**	**262**	**440**	**260**	**93**	**29**	**4**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**39.9**	**8.2**	**71.4**	**47.6**
06:00-22:00		**1669**	**7**	**1477**	**9**	**162**	**2**	**3**	**0**	**3**	**4**	**2**	**0**	**0**	**0**	**2**	**3**	**15**	**80**	**163**	**145**	**299**	**500**	**303**	**114**	**35**	**5**	**4**	**1**	**0**	**0**	**0**	**0**	**0**	**40.0**	**8.2**	**71.4**	**48.0**
06:00-00:00		**1715**	**7**	**1521**	**9**	**164**	**2**	**3**	**0**	**3**	**4**	**2**	**0**	**0**	**0**	**2**	**3**	**15**	**81**	**167**	**152**	**305**	**508**	**315**	**120**	**37**	**5**	**4**	**1**	**0**	**0**	**0**	**0**	**0**	**40.1**	**8.2**	**71.4**	**48.1**
00:00-00:00		**1745**	**7**	**1543**	**9**	**172**	**2**	**3**	**0**	**3**	**4**	**2**	**0**	**0**	**0**	**2**	**3**	**16**	**85**	**171**	**156**	**308**	**516**	**316**	**122**	**39**	**6**	**4**	**1**	**0**	**0**	**0**	**0**	**0**	**40.1**	**8.2**	**71.4**	**48.1**
Date: 16 October 2019																																						
00:00	01:00	7	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3	0	0	2	1	0	0	0	0	0	0	0	0	44.1	28.8	57.5	-
01:00	02:00	8	0	6	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	1	2	0	1	0	0	0	0	0	0	0	0	0	36.3	23.8	53.1	-
02:00	03:00	4	0	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	33.6	23.7	38.7	-
03:00	04:00	6	0	4	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	1	0	1	0	0	0	0	0	0	0	0	0	0	32.4	22.6	46.6	-
04:00	05:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	27.4	22.9	31.8	-
05:00	06:00	12	0	11	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	4	1	2	2	1	1	0	0	0	0	0	0	0	0	40.3	30.0	59.0	51.3
06:00	07:00	31	0	26	0	4	0	0	0	0	1	0	0	0	0	0	0	0	2	7	6	3	2	8	3	0	0	0	0	0	0	0	0	0	37.7	23.5	54.6	47.2
07:00	08:00	68	0	59	0	8	1	0	0	0	0	0	0	0	0	0	0	0	1	13	11	12	16	11	3	1	0	0	0	0	0	0	0	0	38.3	24.2	55.1	48.6
08:00	09:00	95	0	75	1	15	1	0	0	2	0	1	0	0	0	0	0	1	4	25	13	11	21	12	5	3	0	0	0	0	0	0	0	0	37.2	17.9	57.8	47.5
09:00	10:00	79	0	69	0	10	0	0	0	0	0	0	0	0	0	0	0	0	5	10	6	14	26	14	4	0	0	0	0	0	0	0	0	0	39.4	21.7	54.6	47.3
10:00	11:00	86	0	72	0	13	1	0	0	0	0	0	0	0	0	0	0	0	9	15	2	13	26	16	4	1	0	0	0	0	0	0	0	0	38.3	20.5	58.8	47.5
11:00	12:00	100	0	91	0	8	1	0	0	0	0	0	0	0	0	0	0	0	4	14	5	34	26	15	1	1	0	0	0	0	0	0	0	0	38.5	21.7	55.2	45.8
12:00	13:00	124	0	107	1	12	2	0	0	0	1	1	0	0	0	0	0	0	7	15	14	26	32	19	9	1	1	0	0	0	0	0	0	0	39.3	20.9	62.6	48.3
13:00	14:00	102	0	91	0	9	2	0	0	0	0	0	0	0	0	0	0	0	5	6	10	16	34	23	7	1	0	0	0	0	0	0	0	0	40.7	21.5	57.2	48.3
14:00	15:00	111	1	99	0	10	0	1	0	0	0	0	0	0	0	0	0	0	3	8	11	26	39	16	5	3	0	0	0	0	0	0	0	0	40.2	22.5	56.9	46.1
15:00	16:00	146	1	134	0	9	0	0	0	1	0	1	0	0	0	0	0	0	3	13	11	30	49	32	8	0	0	0	0	0	0	0	0	0	40.4	21.4	53.8	46.8
16:00	17:00	163	0	154	0	8	1	0	0	0	0	0	0	0	0	0	0	0	4	18	6	33	58	36	4	4	0	0	0	0	0	0	0	0	40.6	22.3	57.3	47.1
17:00	18:00	207	0	196	0	10	0	0	0	0	0	1	0	0	0	0	0	1	6	15	18	54	62	36	13	2	0	0	0	0	0	0	0	0	40.1	19.9	57.5	46.8
18:00	19:00	143	0	134	0	8	0	1	0	0	0	0	0	0	0	0	0	1	9	13	9	33	43	23	10	2	0	0	0	0	0	0	0	0	39.9	19.0	56.8	48.0
19:00	20:00	83	1	78	0	4	0	0	0	0	0	0	0	0	0	0	0	1	3	3	4	18	25	21	7	1	0	0	0	0	0	0	0	0	41.7	19.8	55.8	48.0
20:00	21:00	68	0	64	1	1	0	2	0	0	0	0	0	0	0	0	0	0	5	5	7	14	16	12	5	4	0	0	0	0	0	0	0	0	40.6	22.6	58.6	48.6
21:00	22:00	55	0	55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	4	11	12	12	8	2	0	0	0	0	0	0	0	0	42.2	25.3	58.1	50.6
22:00	23:00	40	0	38	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	3	4	11	11	5	2	3	0	0	0	0	0	0	0	0	41.0	23.8	57.2	48.9
23:00	00:00	13	0	12	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	4	5	2	0	1	0	0	0	0	0	0	0	0	41.4	21.9	55.0	47.4
07:00-19:00		**1424**	**2**	**1281**	**2**	**120**	**9**	**2**	**0**	**3**	**1**	**4**	**0**	**0**	**0**	**0**	**0**	**3**	**60**	**165**	**116**	**302**	**432**	**253**	**73**	**19**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**39.6**	**17.9**	**62.6**	**47.2**
06:00-22:00		**1661**	**3**	**1504**	**3**	**129**	**9**	**4**	**0**	**3**	**2**	**4**	**0**	**0**	**0**	**0**	**0**	**4**	**70**	**186**	**137**	**348**	**487**	**306**	**96**	**26**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**39.8**	**17.9**	**62.6**	**47.3**
06:00-00:00		**1714**	**3**	**1554**	**3**	**132**	**9**	**4**	**0**	**3**	**2**	**4**	**0**	**0**	**0**	**0**	**0**	**4**	**72**	**189**	**141**	**363**	**503**	**313**	**98**	**30**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**39.8**	**17.9**	**62.6**	**47.4**
00:00-00:00		**1753**	**3**	**1587**	**3**	**137**	**10**	**4**	**0**	**3**	**2**	**4**	**0**	**0**	**0**	**0**	**0**	**4**	**77**	**193**	**150**	**371**	**507**	**316**	**102**	**32**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**39.8**	**17.9**	**62.6**	**47.4**
5 day (Weekday) Average																																						
07:00-19:00		**1389**	**6**	**1245**	**8**	**113**	**6**	**3**	**0**	**4**	**2**	**3**	**0**	**0**	**0**	**1**	**1**	**8**	**66**	**145**	**120**	**293**	**406**	**243**	**77**	**23**	**3**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**39.6**	**11.2**	**68.6**	**47.3**
06:00-22:00		**1611**	**7**	**1454**	**8**	**123**	**6**	**4**	**0**	**4**	**2**	**3**	**0**	**0**	**0**	**1**	**2**	**10**	**75**	**164**	**138**	**342**	**463**	**286**	**96**	**28**	**4**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**39.8**	**11.2**	**68.8**	**47.5**
06:00-00:00		**1658**	**7**	**1498**	**8**	**125**	**6**	**4**	**0**	**4**	**2**	**3**	**0**	**0**	**0**	**1**	**2**	**10**	**77**	**167**	**142**	**351**	**475**	**295**	**102**	**29**	**5**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**39.8**	**11.2**	**68.8**	**47.6**
00:00-00:00		**1691**	**7**	**1526**	**8**	**131**	**7**	**4**	**0**	**4**	**2**	**3**	**0**	**0**	**0**	**1**	**2**	**11**	**81**	**172**	**147**	**355**	**480**	**299**	**104**	**31**	**6**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**39.8**	**11.2**	**68.8**	**47.6**
7 day (Weekly) Average																																						
07:00-19:00		**1308**	**8**	**1185**	**7**	**94**	**4**	**3**	**0**	**3**	**1**	**2**	**0**	**0**	**0**	**1**	**1**	**7**	**60**	**132**	**108**	**264**	**389**	**237**	**79**	**24**	**5**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**40.0**	**11.4**	**71.1**	**47.7**
06:00-22:00		**1515**	**9**	**1381**	**8**	**103**	**5**	**3**	**1**	**3**	**1**	**2**	**0**	**0**	**0**	**1**	**1**	**9**	**69**	**149**	**125**	**311**	**443**	**275**	**95**	**28**	**7**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**40.1**	**11.4**	**71.2**	**47.8**
06:00-00:00		**1561**	**9**	**1424**	**8**	**105**	**5**	**3**	**1**	**3**	**1**	**2**	**0**	**0**	**0**	**1**	**1**	**9**	**71**	**151**	**130**	**321**	**454**	**284**	**100**	**30**	**7**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**40.1**	**11.4**	**71.2**	**47.8**
00:00-00:00		**1603**	**9**	**1460**	**8**	**110**	**5**	**4**	**1**	**3**	**1**	**2**	**0**	**0**	**0**	**1**	**1**	**10**	**75**	**157**	**134**	**327**	**463**	**291**	**103**	**31**	**8**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**40.1**	**11.4**	**71.2**	**47.9**

ATC CLASSIFIED LINK & SPEED SURVEY

Project: Kellas Road, Dundee
Client: Cameron + Ross
Project.Ref. TS-19-058

Location 2: Kellas Road - Approx. 30m south of Unnamed Road
Movement: Southbound

TIME		TOTAL	ARX VEHICLE CLASSIFICATIONS												SPEED BIN TOTALS																				SPEED STATISTICS			
			LIGHT			MEDIUM			HEAVY						0-5 mph	5-10mph	10-15mph	15-20mph	20-25mph	25-30mph	30-35mph	35-40mph	40-45mph	45-50mph	50-55mph	55-60mph	60-65mph	65-70mph	70-75mph	75-80mph	80-85mph	85-90mph	90-95mph	95-100mph	AVERAGE	MINIMUM	MAXIMUM	85th%ile
			1	2	3	4	5	6	7	8	9	10	11	12																								
Date: 10 October 2019																																						
00:00	01:00	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	2	0	0	0	0	0	0	0	0	0	0	39.2	27.2	48.7	-
01:00	02:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21.7	21.7	21.7	-
02:00	03:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	35.3	35.3	35.3	-
03:00	04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
04:00	05:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	39.0	35.2	42.7	-
05:00	06:00	12	0	11	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	4	6	1	0	0	0	0	0	0	0	0	0	0	40.1	30.0	46.5	42.9
06:00	07:00	54	0	49	0	3	0	0	0	0	2	0	0	0	0	0	0	0	2	4	1	16	20	8	2	1	0	0	0	0	0	0	0	0	40.5	23.3	56.4	46.1
07:00	08:00	158	2	134	1	19	2	0	0	0	0	0	0	0	0	0	1	2	6	8	7	28	47	33	21	2	1	1	1	0	0	0	0	0	42.1	12.5	70.3	51.0
08:00	09:00	147	0	133	0	12	1	1	0	0	0	0	0	0	0	0	0	2	9	7	3	19	25	58	17	4	3	0	0	0	0	0	0	0	43.3	16.8	64.4	50.3
09:00	10:00	134	1	120	0	13	0	0	0	0	0	0	0	0	0	0	1	0	16	15	4	19	37	33	9	0	0	0	0	0	0	0	0	0	39.2	14.8	54.8	47.5
10:00	11:00	112	1	93	0	17	0	0	0	1	0	0	0	0	0	0	0	2	7	5	3	16	32	27	17	1	2	0	0	0	0	0	0	0	42.4	17.2	61.0	51.1
11:00	12:00	111	1	100	1	8	0	0	0	1	0	0	0	0	0	0	0	0	8	4	10	25	44	11	8	0	1	0	0	0	0	0	0	0	39.9	20.3	60.6	46.3
12:00	13:00	130	1	120	1	8	0	0	0	0	0	0	0	0	0	0	2	0	16	7	6	40	39	14	5	1	0	0	0	0	0	0	0	0	37.9	13.0	58.0	45.2
13:00	14:00	112	0	100	0	10	0	0	0	1	1	0	0	0	0	0	0	4	10	8	4	29	37	15	4	1	0	0	0	0	0	0	0	0	38.4	18.1	58.5	46.2
14:00	15:00	141	3	128	0	7	1	1	0	1	0	0	0	0	0	0	0	5	17	15	10	35	37	17	3	0	2	0	0	0	0	0	0	0	36.8	16.2	63.5	45.6
15:00	16:00	110	0	98	0	11	1	0	0	0	0	0	0	0	0	0	0	3	9	12	8	19	33	22	4	0	0	0	0	0	0	0	0	0	38.5	18.8	54.3	46.9
16:00	17:00	115	2	102	2	8	1	0	0	0	0	0	0	0	0	0	0	2	18	11	9	35	29	7	3	1	0	0	0	0	0	0	0	0	35.9	16.0	57.1	43.8
17:00	18:00	131	0	122	1	7	0	0	0	0	1	0	0	0	0	0	0	1	14	24	6	28	26	20	9	2	1	0	0	0	0	0	0	0	37.9	18.3	61.6	48.1
18:00	19:00	111	0	104	0	6	0	0	0	0	0	1	0	0	0	0	0	0	10	15	11	16	30	19	9	1	0	0	0	0	0	0	0	0	38.7	23.5	55.5	47.0
19:00	20:00	70	0	67	0	3	0	0	0	0	0	0	0	0	0	0	0	0	4	4	5	17	26	9	5	0	0	0	0	0	0	0	0	0	39.7	20.6	54.1	46.2
20:00	21:00	35	0	32	0	2	1	0	0	0	0	0	0	0	0	0	0	0	6	3	7	6	8	3	2	0	0	0	0	0	0	0	0	0	36.2	21.0	50.8	45.0
21:00	22:00	32	0	31	0	0	1	0	0	0	0	0	0	0	0	0	0	0	4	0	1	4	11	5	4	2	0	1	0	0	0	0	0	0	43.3	23.4	66.6	53.4
22:00	23:00	14	0	13	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	3	3	1	2	2	0	0	0	0	0	0	0	0	42.0	22.1	57.5	54.9
23:00	00:00	10	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	1	0	5	0	0	1	0	0	0	0	0	0	0	41.9	22.3	62.1	-
07:00-19:00		**1512**	**11**	**1354**	**6**	**126**	**6**	**2**	**0**	**4**	**2**	**1**	**0**	**0**	**0**	**0**	**4**	**21**	**140**	**131**	**81**	**309**	**416**	**276**	**109**	**13**	**10**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**39.3**	**12.5**	**70.3**	**48.1**
06:00-22:00		**1703**	**11**	**1533**	**6**	**134**	**8**	**2**	**0**	**4**	**4**	**1**	**0**	**0**	**0**	**0**	**4**	**21**	**156**	**142**	**95**	**352**	**481**	**301**	**122**	**16**	**10**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**39.4**	**12.5**	**70.3**	**47.9**
06:00-00:00		**1727**	**11**	**1556**	**6**	**135**	**8**	**2**	**0**	**4**	**4**	**1**	**0**	**0**	**0**	**0**	**4**	**21**	**159**	**144**	**96**	**356**	**484**	**307**	**124**	**18**	**11**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**39.4**	**12.5**	**70.3**	**48.0**
00:00-00:00		**1748**	**11**	**1576**	**6**	**136**	**8**	**2**	**0**	**4**	**4**	**1**	**0**	**0**	**0**	**0**	**4**	**21**	**160**	**146**	**96**	**364**	**491**	**310**	**124**	**18**	**11**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**39.4**	**12.5**	**70.3**	**48.0**
Date: 11 October 2019																																						
00:00	01:00	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	52.5	40.4	60.6	-
01:00	02:00	4	0	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	27.6	23.4	39.3	-
02:00	03:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	36.2	36.2	36.2	-
03:00	04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
04:00	05:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	35.2	35.2	35.2	-
05:00	06:00	10	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	4	0	0	0	0	0	0	0	0	0	0	42.6	35.7	49.2	-
06:00	07:00	52	0	42	0	8	0	0	0	0	2	0	0	0	0	0	0	0	4	5	0	10	14	14	3	2	0	0	0	0	0	0	0	0	41.0	20.7	58.3	48.2
07:00	08:00	131	0	123	0	7	1	0	0	0	0	0	0	0	0	0	0	2	6	6	5	28	43	32	7	1	1	0	0	0	0	0	0	0	40.9	17.4	60.1	47.3
08:00	09:00	144	1	132	1	9	0	0	0	0	0	1	0	0	0	0	1	0	9	5	6	30	52	33	7	1	0	0	0	0	0	0	0	0	40.6	14.3	57.2	47.7
09:00	10:00	132	0	120	1	8	3	0	0	0	0	0	0	0	0	0	0	3	17	11	6	32	36	22	4	1	0	0	0	0	0	0	0	0	37.6	17.0	56.7	46.6
10:00	11:00	111	1	101	0	9	0	0	0	0	0	0	0	0	0	0	1	0	4	4	5	20	46	21	6	3	0	1	0	0	0	0	0	0	41.4	14.3	65.9	47.2
11:00	12:00	135	0	116	1	15	1	1	0	0	0	1	0	0	0	0	2	0	8	8	5	18	42	36	9	4	3	0	0	0	0	0	0	0	41.8	13.3	62.7	49.3
12:00	13:00	120	2	111	2	3	0	1	0	0	0	1	0	0	0	0	0	1	10	8	6	34	36	18	6	0	1	0	0	0	0	0	0	0	39.1	16.7	60.4	47.3
13:00	14:00	120	2	109	0	6	1	0	0	0	1	1	0	0	0	0	2	1	15	6	12	31	35	13	3	2	0	0	0	0	0	0	0	0	37.2	11.5	59.6	45.2
14:00	15:00	118	1	103	1	13	0	0	0	0	0	0	0	0	0	0	0	1	9	5	6	29	42	17	6	3	0	0	0	0	0	0	0	0	40.1	19.9	59.0	46.9
15:00	16:00	140	2	121	0	15	1	0	0	0	1	0	0	0	0	0	0	1	18	13	6	33	39	18	11	1	0	0	0	0	0	0	0	0	38.4	19.7	59.2	47.9
16:00	17:00	139	0	129	0	9	0	1	0	0	0	0	0	0	0	0	0	2	28	11	7	14	52	18	7	0	0	0	0	0	0	0	0	0	37.2	19.1	54.6	45.6
17:00	18:00	118	0	110	0	5	0	0	0	0	3	0	0	0	0	0	0	1	17	11	5	22	29	17	12	4	0	0	0	0	0	0	0	0	38.8	19.8	57.6	49.2
18:00	19:00	104	0	99	0	5	0	0	0	0	0	0	0	0	0	0	0	1	13	13	3	19	28	21	3	3	0	0	0	0	0	0	0	0	38.5	18.5	56.5	47.5
19:00	20:00	68	0	60	0	6	2	0	0	0	0	0	0	0	0	0	0	1	6	6	7	13	16	8	6	2	3	0	0	0	0	0	0	0	39.8	19.7	63.8	50.6
20:00	21:00	39	0	37	0	1	0	0	1	0	0	0	0	0	0	0	0	1	3	1	2	8	9	9	5	1	0	0	0	0	0	0	0	0	41.0	19.0	58.4	50.4
21:00	22:00	32	0	31	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3	0	1	6	11	6	3	2	0	0	0	0	0	0	0	0	42.4	20.4	59.3	50.9
22:00	23:00	14	0	13	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	3	4	2	2	0	0	0	0	0	0	0	0	0	40.3	17.7	53.8	52.5
23:00	00:00	7	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	3	0	0	0	0	0	0	0	0	0	0	0	0	32.3	24.8	39.4	-
07:00-19:00		**1512**	**9**	**1374**	**6**	**104**	**7**	**3**	**0**	**0**	**5**	**4**	**0**	**0**	**0**	**0**	**6**	**13**	**154**	**101**	**72**	**310**	**480**	**266**	**81**	**23**	**5**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**39.3**	**11.5**	**65.9**	**47.2**
06:00-22:00		**1703**	**9**	**1544**	**6**	**120**	**9**	**3**	**1**	**0**	**7**	**4**	**0**	**0**	**0**	**0**	**6**	**15**	**170**	**113**	**82**	**347**	**530**	**303**	**98**	**30**	**8**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**39.5**	**11.5**	**65.9**	**47.5**
06:00-00:00		**1724**	**9**	**1564**	**6**	**121**	**9**	**3**	**1**	**0**	**7**	**4**	**0**	**0**	**0**	**0**	**6**	**16**	**171**	**116**	**84**	**353**	**534**	**305**	**100**	**30**	**8**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**39.5**	**11.5**	**65.9**	**47.5**
00:00-00:00		**1745**	**9**	**1584**	**6**	**121**	**10**	**3**	**1**	**0**	**7**	**4**	**0**	**0**	**0**	**0**	**6**	**16**	**174**	**116**	**84**	**358**	**539**	**310**	**101**	**31**	**9**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**39.5**	**11.5**	**65.9**	**47.5**
Date: 12 October 2019																																						
00:00	01:00	17	0	17	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	3	1	8	0	1	1	0	0	0	0	0	0	0	42.8	17.3	62.0	52.9
01:00	02:00	4	0	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	31.5	23.6	39.9	-
02:00	03:00	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	1	0	0	0	0	0	0	0	0	0	0	39.1	34.5	45.3	-
03:00	04:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	44.2	40.5	48.0	-
04:00	05:00	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	47.0	46.1	47.5	-
05:00	06:00	6	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	4	0	0	0	0	0	0	0	0	0	0	45.2	35.7	48.4	-
06:00	07:00	20	0	17	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	8	5	1	2	0	0	0	0	0	0	0	0	44.0	30.4	57.5	51.4
07:00	08:00	52	0	44	0	7	0	1	0	0	0	0	0	0	0	0	0	0	3	2	1	9	17	12	4	2	2	0	0	0	0	0	0	0	42.9	20.5	64.3	50.5
08:00	09:00	76	0	69	1	6	0	0	0	0	0	0	0	0	0	0	0	0	6	4	2	19	19	18	7	1	0	0	0	0	0	0	0	0	40.8	20.7	55.3	49.4
09:00	10:00	118	0	111	0	6	1	0	0	0	0	0	0	0	0	0	0	0	7	5	3	23	40	24	12	4	0	0	0	0	0	0	0	0	42.0	20.1	55.9	49.3
10:00	11:00	133	4	119	1	8	1	0	0	0	0	0	0	0	0	0	1	1	7	7	3	12	30	52	14	5	0	1	0	0	0	0	0	0	43.3	13.1	66.9	50.4
11:00	12:00	124	2	111	0	9	1	1	0	0	0	0	0	0	0	0	1	0	4	16	8	20	46	21	6	2	0	0	0	0	0	0	0	0	39.9	14.1	59.3	47.1
12:00	13:00	140	1	128	0	9	0	0	1	0	1	0	0	0	0	0	0	3	10	7	5	18	48	33	14	1	0	1	0	0	0	0	0	0	41.3	17.7	65.9	49.4
13:00	14:00	110	3	98	1	7	0	1	0	0	0	0	0	0	0	0	0	1	10	8	11	17	31	20	9	1	1	1	0	0	0	0	0	0	39.8	16.3	69.4	49.0
14:00	15:00	150	3	138	2	7	0	0	0	0	0	0	0	0	0	0	1	2	10	9	6	24	49	31	11	3	4	0	0	0	0	0	0	0	41.0	14.4	63.4	48.3
15:00	16:00	118	1	109	1	6	0	0	0	0	0	1	0	0	0	0	2	1	8	13	5	27	31	21	5	3	2	0	0	0	0	0	0	0	39.2	12.1	63.4	47.6
16:00	17:00	121	5	113	0	3	0	0	0	0	0	0	0	0	0	0	0	0	6	8	4	24	39	33	4	1	1	1	0	0	0	0	0	0	41.5	20.0	68.1	47.8
17:00	18:00	100	2	91	0	7	0	0	0	0	0	0	0	0	0	0	0	2	5	3	3	19	32	26	8	1	1	0	0	0	0	0	0	0	41.7	16.4	62.9	49.1
18:00	19:00	94	0	90	1	2	1	0	0	0	0	0	0	0	0	0	0	1	13	5	3	21	30	16	4	1	0	0	0	0	0	0	0	0	38.4	19.3	56.2	47.3
19:00	20:00	72	0	70	0	1	1	0	0	0	0	0	0	0	0	0	0	0	5	2	9	16	22	12	3	3	0	0	0	0	0	0	0	0	40.5	20.6	57.9	47.9
20:00	21:00	41	1	38	0	1	1	0	0	0	0	0	0	0	0	0	1	0	3	2	2	12	4	10	5	1	1	0	0	0	0	0	0	0	41.1	11.4	61.9	51.0
21:00	22:00	25	0	23	0	2	0	0	0	0	0	0	0	0	0	0	0	1	5	2	2	2	5	4	3	1	0	0	0	0	0	0	0	0	37.6	18.9	55.1	51.0
22:00	23:00	19	0	17	0	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	2	6	5	3	0	0	0	0	0	0	0	0	0	0	37.7	19.2	48.4	45.7
23:00	00:00	16	0	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	9	3	1	0	0	0	0	0	0	0	0	47.7	31.9	57.0	54.2
07:00-19:00		**1336**	**21**	**1221**	**7**	**77**	**4**	**3**	**1**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**5**	**11**	**89**	**87**	**54**	**233**	**412**	**307**	**98**	**25**	**11**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**41.0**	**12.1**	**69.4**	**48.8**
06:00-22:00		**1494**	**22**	**1369**	**9**	**82**	**6**	**3**	**1**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**6**	**12**	**102**	**93**	**70**	**264**	**451**	**338**	**110**	**32**	**12**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**40.9**	**11.4**	**69.4**	**48.8**
06:00-00:00		**1529**	**22**	**1402**	**9**	**83**	**7**	**3**	**1**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**6**	**13**	**103**	**94**	**73**	**270**	**458**	**350**	**113**	**33**	**12**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**41.0**	**11.4**	**69.4**	**48.8**
00:00-00:00		**1566**	**22**	**1438**	**9**	**84**	**7**	**3**	**1**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**6**	**14**	**106**	**95**	**74**	**278**	**462**	**367**	**113**	**34**	**13**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**41.0**	**11.4**	**69.4**	**48.8**
Date: 13 October 2019																																						
00:00	01:00	19	0	18	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	9	6	1	1	0	0	0	0	0	0	0	0	44.6	35.1	56.8	49.4
01:00	02:00	11	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	7	1	0	0	0	0	0	0	0	0	0	0	39.8	21.7	45.5	44.6
02:00	03:00	6	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	1	0	0	0	0	0	0	0	0	0	0	41.8	38.5	47.1	-
03:00	04:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	1	0	0	0	0	0	0	48.5	40.4	67.4	-
04:00	05:00	4	0	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	1	0	0	0	0	0	0	0	0	50.8	45.3	59.4	-
05:00	06:00	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	1	0	0	0	0	0	0	0	0	0	43.7	38.2	52.5	-
06:00	07:00	17	0	14	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	2	0	4	9	1	1	0	0	0	0	0	0	0	0	45.3	32.0	55.8	50.9
07:00	08:00	24	0	23	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	2	1	0	7	9	1	1	0	1	0	0	0	0	0	0	43.1	22.4	67.8	50.2
08:00	09:00	27	0	24	0	0	3	0	0	0	0	0	0	0	0	0	0	0	4	1	1	7	7	6	1	0	0	0	0	0	0	0	0	0	39.1	21.6	50.4	46.5
09:00	10:00	67	2	60	1	2	0	0	0	1	1	0	0	0	0	0	0	1	2	1	1	11	17	20	11	3	0	0	0	0	0	0	0	0	44.1	19.6	56.1	52.3
10:00	11:00	106	1	93	0	10	1	1	0	0	0	0	0	0	0	0	0	0	5	3	9	7	28	36	14	4	0	0	0	0	0	0	0	0	43.5	21.2	59.2	50.7
11:00	12:00	96	4	87	2	3	0	0	0	0	0	0	0	0	0	0	0	2	6	10	7	14	20	14	18	3	2	0	0	0	0	0	0	0	41.0	15.9	63.1	51.4
12:00	13:00	91	0	86	0	4	1	0	0	0	0	0	0	0	0	0	1	0	5	6	1	15	33	23	6	0	1	0	0	0	0	0	0	0	41.3	13.0	60.5	48.2
13:00	14:00	114	2	109	1	2	0	0	0	0	0	0	0	0	0	0	0	0	4	11	4	10	21	30	26	6	2	0	0	0	0	0	0	0	44.2	21.5	64.8	52.8
14:00	15:00	140	2	131	0	7	0	0	0	0	0	0	0	0	0	0	0	1	7	9	5	30	38	30	11	8	0	1	0	0	0	0	0	0	41.8	19.3	65.4	49.9
15:00	16:00	133	0	129	0	4	0	0	0	0	0	0	0	0	0	0	0	2	9	6	10	19	40	36	8	2	0	1	0	0	0	0	0	0	41.1	18.3	66.1	48.2

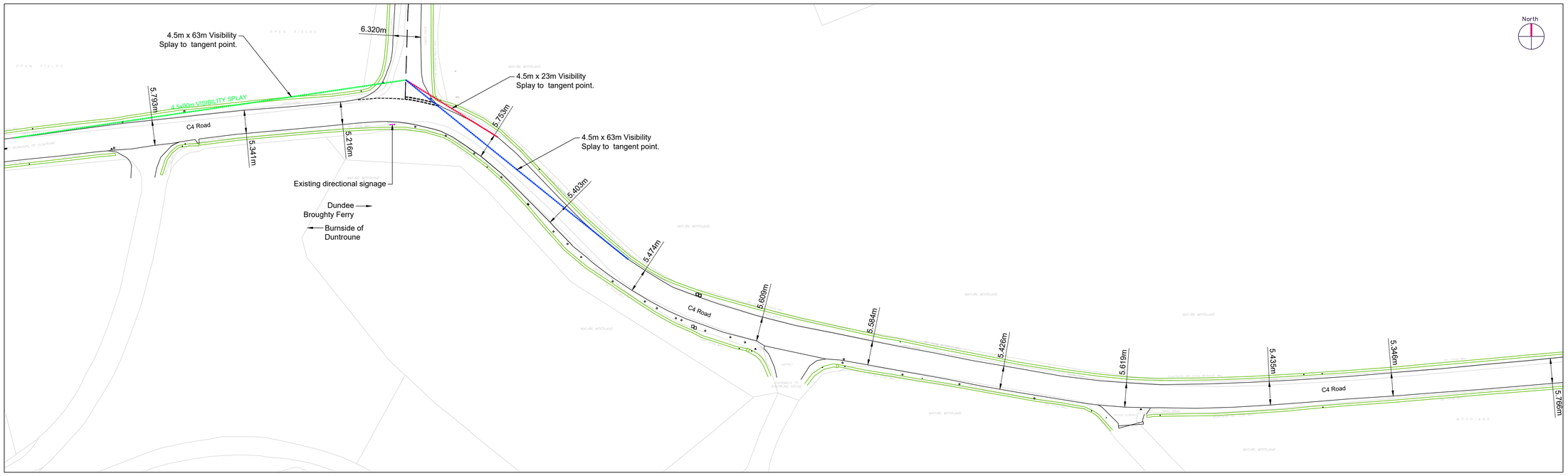
TIME	TOTAL	ARX VEHICLE CLASSIFICATIONS												SPEED BIN TOTALS																				SPEED STATISTICS			
		LIGHT			MEDIUM			HEAVY																													
		1	2	3	4	5	6	7	8	9	10	11	12	0-5 mph	5-10mph	10-15mph	15-20mph	20-25mph	25-30mph	30-35mph	35-40mph	40-45mph	45-50mph	50-55mph	55-60mph	60-65mph	65-70mph	70-75mph	75-80mph	80-85mph	85-90mph	90-95mph	95-100mph	AVERAGE	MINIMUM	MAXIMUM	85th%ile
Date: 13 October 2019																																					
16:00 17:00	86	0	81	0	4	0	0	0	0	1	0	0	0	0	0	0	0	5	5	2	7	19	21	21	5	1	0	0	0	0	0	0	0	44.5	21.3	61.4	53.3
17:00 18:00	98	0	93	0	3	0	1	0	0	1	0	0	0	0	0	0	3	11	6	1	12	25	16	14	8	2	0	0	0	0	0	0	0	41.8	16.7	62.5	53.8
18:00 19:00	57	0	53	1	1	2	0	0	0	0	0	0	0	0	0	0	1	3	3	2	9	21	9	6	2	1	0	0	0	0	0	0	0	41.8	17.0	60.9	51.0
19:00 20:00	49	0	46	0	2	0	0	1	0	0	0	0	0	0	0	0	0	0	5	1	14	9	11	7	1	1	0	0	0	0	0	0	0	42.6	25.0	63.3	51.2
20:00 21:00	42	0	39	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3	3	10	11	10	5	0	0	0	0	0	0	0	0	0	0	37.0	21.6	48.3	43.7
21:00 22:00	19	0	18	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	6	6	3	1	1	0	0	0	0	0	0	0	0	41.9	22.8	55.5	48.5
22:00 23:00	15	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0	3	6	1	1	0	0	0	0	0	0	0	0	0	37.4	17.6	52.2	45.3
23:00 00:00	6	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	1	1	1	0	0	0	0	0	0	0	0	0	36.8	23.0	54.1	-
07:00-19:00	**1039**	**11**	**969**	**5**	**41**	**7**	**2**	**0**	**1**	**3**	**0**	**0**	**0**	**0**	**0**	**1**	**10**	**63**	**63**	**44**	**141**	**276**	**250**	**137**	**42**	**9**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**42.4**	**13.0**	**67.8**	**50.8**
06:00-22:00	**1166**	**11**	**1086**	**5**	**48**	**7**	**2**	**1**	**2**	**3**	**1**	**0**	**0**	**0**	**0**	**1**	**10**	**67**	**71**	**58**	**172**	**305**	**278**	**146**	**45**	**10**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**42.2**	**13.0**	**67.8**	**50.7**
06:00-00:00	**1187**	**11**	**1107**	**5**	**48**	**7**	**2**	**1**	**2**	**3**	**1**	**0**	**0**	**0**	**0**	**1**	**11**	**69**	**75**	**58**	**175**	**312**	**280**	**148**	**45**	**10**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**42.1**	**13.0**	**67.8**	**50.7**
00:00-00:00	**1236**	**11**	**1154**	**5**	**50**	**7**	**2**	**1**	**2**	**3**	**1**	**0**	**0**	**0**	**0**	**1**	**11**	**70**	**75**	**59**	**182**	**335**	**292**	**150**	**47**	**10**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**42.2**	**13.0**	**67.8**	**50.7**
Date: 14 October 2019																																					
00:00 01:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	1	0	0	0	0	0	0	0	0	0	45.9	33.4	53.3	-
01:00 02:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	44.5	43.0	46.0	-
02:00 03:00	3	0	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	33.8	30.0	40.4	-
03:00 04:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	48.7	48.7	48.7	-
04:00 05:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
05:00 06:00	13	0	11	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	2	6	1	1	0	0	0	0	0	0	0	0	44.9	29.3	55.3	50.7
06:00 07:00	49	0	39	1	6	2	0	0	0	1	0	0	0	0	0	0	0	0	2	2	8	13	12	9	2	1	0	0	0	0	0	0	0	44.7	25.0	61.4	52.3
07:00 08:00	159	1	134	1	20	1	0	0	0	1	1	0	0	0	0	0	0	11	1	2	27	44	52	18	3	1	0	0	0	0	0	0	0	43.4	21.0	60.2	50.0
08:00 09:00	136	2	119	0	13	1	0	0	0	0	1	0	0	0	0	0	2	7	9	2	19	34	48	11	3	1	0	0	0	0	0	0	0	42.2	16.7	60.5	48.8
09:00 10:00	117	2	101	0	9	3	0	0	1	0	1	0	0	0	0	1	1	11	7	4	24	34	22	8	5	0	0	0	0	0	0	0	0	40.2	14.5	57.6	48.8
10:00 11:00	95	0	87	0	7	0	0	0	0	0	1	0	0	0	0	0	0	4	5	4	19	32	16	13	1	0	1	0	0	0	0	0	0	42.1	22.3	68.0	50.2
11:00 12:00	102	1	84	0	15	0	0	0	1	0	1	0	0	0	0	0	1	5	8	6	21	30	24	7	0	0	0	0	0	0	0	0	0	40.5	19.5	52.9	48.8
12:00 13:00	114	1	101	0	11	0	0	0	1	0	0	0	0	0	0	0	1	7	12	2	12	34	28	15	2	1	0	0	0	0	0	0	0	41.7	18.2	62.0	50.2
13:00 14:00	128	1	111	2	13	0	0	0	0	1	0	0	0	0	0	1	2	9	11	10	21	25	19	21	8	1	0	0	0	0	0	0	0	41.0	14.7	61.0	52.6
14:00 15:00	110	0	98	3	9	0	0	0	0	0	0	0	0	0	0	0	1	9	6	4	15	41	23	7	4	0	0	0	0	0	0	0	0	41.2	17.5	59.0	49.3
15:00 16:00	90	1	73	0	14	0	1	0	0	1	0	0	0	0	1	0	2	8	7	4	14	21	23	7	2	1	0	0	0	0	0	0	0	40.1	5.8	63.0	48.9
16:00 17:00	127	0	120	0	5	1	0	0	1	0	0	0	0	0	0	0	2	13	19	3	22	38	16	13	1	0	0	0	0	0	0	0	0	38.4	16.3	57.9	48.8
17:00 18:00	150	2	134	1	10	0	1	0	0	1	1	0	0	0	0	0	4	14	25	14	18	36	29	7	3	0	0	0	0	0	0	0	0	37.7	15.9	58.2	47.7
18:00 19:00	114	2	107	0	5	0	0	0	0	0	0	0	0	0	0	1	1	6	15	3	17	24	35	11	0	1	0	0	0	0	0	0	0	40.3	12.3	60.2	49.3
19:00 20:00	72	0	67	0	4	1	0	0	0	0	0	0	0	0	0	0	1	8	5	1	11	20	13	7	6	0	0	0	0	0	0	0	0	41.1	16.3	59.4	50.6
20:00 21:00	33	0	31	0	2	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0	5	11	7	4	1	0	0	0	0	0	1	0	0	43.7	19.1	87.8	50.4
21:00 22:00	25	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	1	0	9	6	4	1	0	0	0	0	0	0	0	0	42.2	21.4	58.1	53.2
22:00 23:00	21	0	19	0	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	4	11	3	1	0	0	0	0	0	0	0	0	0	40.4	17.7	52.9	47.2
23:00 00:00	13	0	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	3	3	3	1	1	0	0	0	0	0	0	0	0	41.7	20.4	59.0	54.3
07:00-19:00	**1442**	**13**	**1269**	**7**	**131**	**6**	**2**	**0**	**4**	**4**	**6**	**0**	**0**	**0**	**1**	**3**	**17**	**104**	**125**	**58**	**229**	**393**	**335**	**138**	**32**	**6**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**40.7**	**5.8**	**68.0**	**49.3**
06:00-22:00	**1621**	**13**	**1431**	**8**	**143**	**9**	**2**	**0**	**4**	**5**	**6**	**0**	**0**	**0**	**1**	**3**	**19**	**116**	**135**	**62**	**253**	**446**	**373**	**162**	**42**	**7**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**40.9**	**5.8**	**87.8**	**49.4**
06:00-00:00	**1655**	**13**	**1463**	**8**	**145**	**9**	**2**	**0**	**4**	**5**	**6**	**0**	**0**	**0**	**1**	**3**	**20**	**118**	**135**	**63**	**260**	**460**	**379**	**164**	**43**	**7**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**40.9**	**5.8**	**87.8**	**49.4**
00:00-00:00	**1678**	**13**	**1483**	**8**	**147**	**10**	**2**	**0**	**4**	**5**	**6**	**0**	**0**	**0**	**1**	**3**	**20**	**118**	**137**	**65**	**262**	**464**	**389**	**166**	**44**	**7**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**41.0**	**5.8**	**87.8**	**49.4**
Date: 15 October 2019																																					
00:00 01:00	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	43.3	40.4	46.8	-
01:00 02:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	41.0	41.0	41.0	-
02:00 03:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	43.5	41.1	45.8	-
03:00 04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-
04:00 05:00	3	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	42.9	40.9	45.9	-
05:00 06:00	12	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3	7	1	0	0	0	0	0	0	0	0	0	45.3	33.5	53.0	49.6
06:00 07:00	51	0	46	0	5	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	2	15	15	10	5	0	0	0	1	0	0	0	0	47.0	24.2	77.1	53.5
07:00 08:00	159	1	136	1	19	1	0	0	0	0	0	1	0	0	0	0	0	8	6	7	12	49	44	21	11	1	0	0	0	0	0	0	0	44.1	21.4	62.7	51.7
08:00 09:00	151	0	134	1	13	1	0	0	0	0	2	0	0	0	0	0	0	5	5	8	16	57	28	23	5	4	0	0	0	0	0	0	0	43.8	22.5	64.0	51.2
09:00 10:00	130	0	112	0	15	1	1	0	1	0	0	0	0	0	0	0	1	9	11	4	16	38	34	14	2	1	0	0	0	0	0	0	0	41.3	16.0	61.6	49.5
10:00 11:00	143	0	122	1	18	2	0	0	0	0	0	0	0	0	0	0	1	8	8	9	14	40	34	22	5	2	0	0	0	0	0	0	0	42.7	18.6	61.9	51.4
11:00 12:00	113	1	96	0	15	0	1	0	0	0	0	0	0	0	0	0	0	6	9	1	21	30	29	12	4	1	0	0	0	0	0	0	0	42.3	21.8	60.2	50.2
12:00 13:00	117	1	101	0	14	0	0	0	1	0	0	0	0	0	0	0	1	4	12	5	9	40	22	15	8	1	0	0	0	0	0	0	0	42.5	19.3	62.3	51.9
13:00 14:00	145	1	120	1	20	0	1	0	0	1	1	0	0	0	0	0	0	11	15	6	38	45	17	4	9	0	0	0	0	0	0	0	0	39.7	20.5	58.6	47.3
14:00 15:00	118	0	107	0	11	0	0	0	0	0	0	0	0	0	0	0	0	8	10	5	23	39	20	10	3	0	0	0	0	0	0	0	0	40.5	20.5	59.5	49.1
15:00 16:00	107	1	91	0	14	1	0	0	0	0	0	0	0	0	0	0	0	14	8	9	26	26	13	7	3	0	1	0	0	0	0	0	0	38.6	22.1	68.1	47.0
16:00 17:00	121	1	105	0	12	1	0	0	1	1	0	0	0	0	0	0	0	20	17	6	18	30	20	6	3	0	1	0	0	0	0	0	0	37.8	20.4	65.8	47.5
17:00 18:00	129	0	116	2	10	0	1	0	0	0	0	0	0	0	0	1	0	23	25	8	17	22	23	6	3	1	0	0	0	0	0	0	0	36.3	14.6	64.1	47.1
18:00 19:00	117	0	107	2	7	0	0	0	0	0	1	0	0	0	0	0	1	11	20	6	20	35	16	5	3	0	0	0	0	0	0	0	0	37.8	16.0	58.4	46.9
19:00 20:00	50	0	46	2	1	1	0	0	0	0	0	0	0	0	0	0	0	1	6	5	3	16	12	4	3	0	0	0	0	0	0	0	0	41.7	22.0	56.7	50.0
20:00 21:00	38	0	37	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	2	6	8	7	10	2	1	0	0	0	0	0	0	0	0	40.2	22.0	55.9	47.9
21:00 22:00	24	0	22	0	0	2	0	0	0	0	0	0	0	0	0	0	0	1	3	4	2	4	3	3	2	2	0	0	0	0	0	0	0	41.9	23.5	62.7	55.5
22:00 23:00	20	0	19	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	4	1	7	2	3	1	0	0	0	0	0	0	0	0	40.7	22.3	55.5	51.3
23:00 00:00	13	0	12	0	0	1	0	0	0	0	0	0	0	0	0	0	0	4	0	1	2	2	3	1	0	0	0	0	0	0	0	0	0	37.1	21.0	54.9	47.3
07:00-19:00	**1550**	**6**	**1347**	**8**	**168**	**7**	**4**	**0**	**3**	**2**	**4**	**1**	**0**	**0**	**0**	**1**	**4**	**127**	**146**	**74**	**230**	**451**	**300**	**145**	**59**	**11**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**40.8**	**14.6**	**68.1**	**49.6**
06:00-22:00	**1713**	**6**	**1498**	**10**	**175**	**10**	**4**	**0**	**3**	**2**	**4**	**1**	**0**	**0**	**0**	**1**	**4**	**132**	**158**	**90**	**245**	**493**	**340**	**164**	**70**	**13**	**2**	**0**	**1**	**0**	**0**	**0**	**0**	**41.0**	**14.6**	**77.1**	**49.8**
06:00-00:00	**1746**	**6**	**1529**	**10**	**176**	**11**	**4**	**0**	**3**	**2**	**4**	**1**	**0**	**0**	**0**	**1**	**4**	**137**	**159**	**95**	**248**	**502**	**345**	**168**	**71**	**13**	**2**	**0**	**1**	**0**	**0**	**0**	**0**	**41.0**	**14.6**	**77.1**	**49.8**
00:00-00:00	**1767**	**6**	**1549**	**10**	**177**	**11**	**4**	**0**	**3**	**2**	**4**	**1**	**0**	**0**	**0**	**1**	**4**	**137**	**159**	**96**	**248**	**511**	**355**	**169**	**71**	**13**	**2**	**0**	**1**	**0**	**0**	**0**	**0**	**41.0**	**14.6**	**77.1**	**49.8**
Date: 16 October 2019																																					
00:00 01:00	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	34.6	21.1	41.9	-
01:00 02:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	32.2	32.2	32.2	-
02:00 03:00	3	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	35.7	28.1	44.4	-
03:00 04:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	37.4	37.4	37.4	-
04:00 05:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	40.1	36.1	44.2	-
05:00 06:00	15	0	14	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	8	3	2	0	0	0	0	0	0	0	0	0	43.8	32.9	51.4	49.8
06:00 07:00	59	0	49	0	9	1	0	0	0	0	0	0	0	0	0	0	0	1	4	1	3	14	18	15	2	1	0	0	0	0	0	0	0	45.7	23.6	62.0	53.0
07:00 08:00	154	2	133	0	15	1	1	0	0	2	0	0	0	0	0	0	1	9	9	6	13	29	46	28	13	0	0	0	0	0	0	0	0	44.0	19.5	58.7	52.4
08:00 09:00	155	0	125	2	23	2	1	0	1	0	1	0	0	0	0	0	1	7	5	6	22	43	32	28	6	4	0	1	0	0	0	0	0	43.9	16.0	74.2	52.3
09:00 10:00	172	0	163	0	8	0	1	0	0	0	0	0	0	0	0	0	0	11	11	2	24	53	50	15	6	0	0	0	0	0	0	0	0	42.2	20.1	59.2	49.5
10:00 11:00	116	0	97	0	19	0	0	0	0	0	0	0	0	0	0	0	1	11	4	2	17	28	34	15	3	1	0	0	0	0	0	0	0	42.3	16.0	61.2	50.4
11:00 12:00	117	0	100	1	13	1	1	0	0	1	0	0	0	0	0	0	0	5	9	5	13	36	30	19	0	0	0	0	0	0	0	0	0	42.6	20.7	54.9	50.3
12:00 13:00	121	0	103	0	16	1	0	0	1	0	0	0	0	0	0	0	1	6	5	2	17	39	28	15	7	1	0	0	0	0	0	0	0	43.5	19.4	60.8	51.4
13:00 14:00	109	0	96	0	10	0	1	0	0	1	1	0	0	0	0	0	0	5	13	1	16	25	28	17	4	0	0	0	0	0	0	0	0	42.3	23.3	59.1	50.4
14:00 15:00	107	0	99	0	6	0	1	0	0	1	0	0	0	0	0	0	2	7	7	3	21	33	25	8	1	0	0	0	0	0	0	0	0	40.7	17.0	58.7	47.9
15:00 16:00	119	0	108	1	10	0	0	0	0	0	0	0	0	0	0	1	0	9	12	5	22	42	23	5	0	0	0	0	0	0	0	0	0	39.2	12.3	53.3	46.3
16:00 17:00	129	0	114	1	12	0	0	0	0	1	1	0	0	0	0	0	0	18	14	7	21	41	18	6	3	1	0	0	0	0	0	0	0	38.4	20.5	61.2	46.2
17:00 18:00	147	0	138	1	8	0	0	0	0	0	0	0	0	0	0	0	0	24	24	4	22	32	33	7	1	0	0	0	0	0	0	0	0	37.6	20.5	55.1	48.4
18:00 19:00	99	1	91	0	7	0	0	0	0	0	0	0	0	0	0	1	2	7	16	10	20	25	17	1	0	0	0	0	0	0	0	0	0	36.9	14.8	52.6	46.9
19:00 20:00	74	0	70	0	4	0	0	0	0	0	0	0	0	0	0	0	0	6	2	5	17	30	10	3	1	0	0	0	0	0	0	0	0	40.1	23.6	57.0	46.0
20:00 21:00	38	0	32	2	4	0	0	0	0	0	0	0	0	0	0	0	1	1	2	4	6	14	8	2	0	0	0	0	0	0	0	0	0	40.5	19.1	52.4	47.1
21:00 22:00	25	0	21	0	4	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	7	12	2	1	1	0	0	0	0	0	0	0	0	40.6	23.7	55.9	46.5
22:00 23:00	20	0	19	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	3	1	4	4	2	3	0	0	1	0	0	0	0	0	0	39.6	20.5	68.5	52.2
23:00 00:00	7	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	2	2	0	0	0	0	0	0	0	0	0	0	39.3	30.4	48.5	-
07:00-19:00	**1545**	**3**	**1367**	**6**	**147**	**5**	**6**	**0**	**2**	**6**	**3**	**0**	**0**	**0**	**0**	**2**	**8**	**119**	**129**	**53**	**228**	**426**	**364**	**164**	**44**	**7**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**41.3**	**12.3**	**74.2**	**49.7**
06:00-22:00	**1741**	**3**	**1539**	**8**	**168**	**6**	**6**	**0**	**2**	**6**	**3**	**0**	**0**	**0**	**0**	**2**	**9**	**129**	**137**	**63**	**261**	**496**	**402**	**185**	**48**	**8**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**41.3**	**12.3**	**74.2**	**49.7**
06:00-00:00	**1768**	**3**	**1565**	**8**	**168**	**7**	**6**	**0**	**2**	**6**	**3**	**0**	**0**	**0**	**0**	**2**	**9**	**131**	**140**	**66**	**266**	**502**	**406**	**188**	**48**	**8**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**41.3**	**12.3**	**74.2**	**49.7**
00:00-00:00	**1793**	**3**	**1588**	**8**	**169**	**7**	**6**	**0**	**2**	**7**	**3**	**0**	**0**	**0**	**0**	**2**	**9**	**132**	**141**	**69**	**269**	**514**	**409**	**190**	**48**	**8**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**41.3**	**12.3**	**74.2**	**49.7**
5 day (Weekday) Average																																					
07:00-19:00	**1512**	**8**	**1342**	**7**	**135**	**6**	**3**	**0**	**3**	**4**	**4**	**0**	**0**	**0**	**0**	**3**	**13**	**129**	**126**	**68**	**261**	**433**	**308**	**127**	**34**	**8**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**40.3**	**11.3**	**69.3**	**48.8**
06:00-22:00	**1696**	**8**	**1509**	**8**	**148**	**8**	**3**	**0**	**3**	**5**	**4**	**0**	**0**	**0**	**0**	**3**	**14**	**141**	**137**	**78**	**292**	**489**	**344**	**146**	**41**	**9**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**40.4**	**11.3**	**75.1**	**48.9**
06:00-00:00	**1724**	**8**	**1535**	**8**	**149**	**9**	**3**	**0**	**3**	**5**	**4**	**0**	**0**	**0**	**0**	**3**	**14**	**143**	**139**	**81**	**297**	**496**	**348**	**149**	**42**	**9**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**40.4**	**11.3**	**75.1**	**48.9**
00:00-00:00	**1746**	**8**	**1556**	**8**	**150**	**9**	**3**	**0**	**3**	**5**	**4**	**0**	**0**	**0**	**0**	**3**	**14**	**144**	**140**	**82**	**300**	**504**	**355**	**150**	**42**	**10**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**40.4**	**11.3**	**75.1**	**48.9**
7 day (Weekly) Average																																					
07:00-19:00	**1419**	**11**	**1272**	**6**	**113**	**6**	**3**	**0**	**2**	**3**	**3**	**0**	**0**	**0**	**0**	**3**	**12**	**114**	**112**	**62**	**240**	**408**	**300**	**125**	**34**	**8**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**40.7**	**11.7**	**69.1**	**49.1**
06:00-22:00	**1592**	**11**	**1429**	**7**	**124**	**8**	**3**	**0**	**2**	**4**	**3**	**0**	**0**	**0**	**0**	**3**	**13**	**125**	**121**	**74**	**271**	**457**	**334**	**141**	**40**	**10**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**40.7**	**11.6**	**73.2**	**49.1**
06:00-00:00	**1619**	**11**	**1455**	**7**	**125**	**8**	**3**	**0**	**2**	**4**	**3**	**0**	**0**	**0**	**0**	**3**	**13**	**127**	**123**	**76**	**275**	**465**	**339**	**144**	**41**	**10**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**40.7**	**11.6**	**73.2**	**49.1**
00:00-00:00	**1648**	**11**	**1482**	**7**	**126**	**9**	**3**	**0**	**2**	**4**	**3**	**0**	**0**	**0**	**0**	**3**	**14**	**128**	**124**	**78**	**280**	**474**	**347**	**145**	**42**	**10**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**40.8**	**11.6**	**73.2**	**49.1**

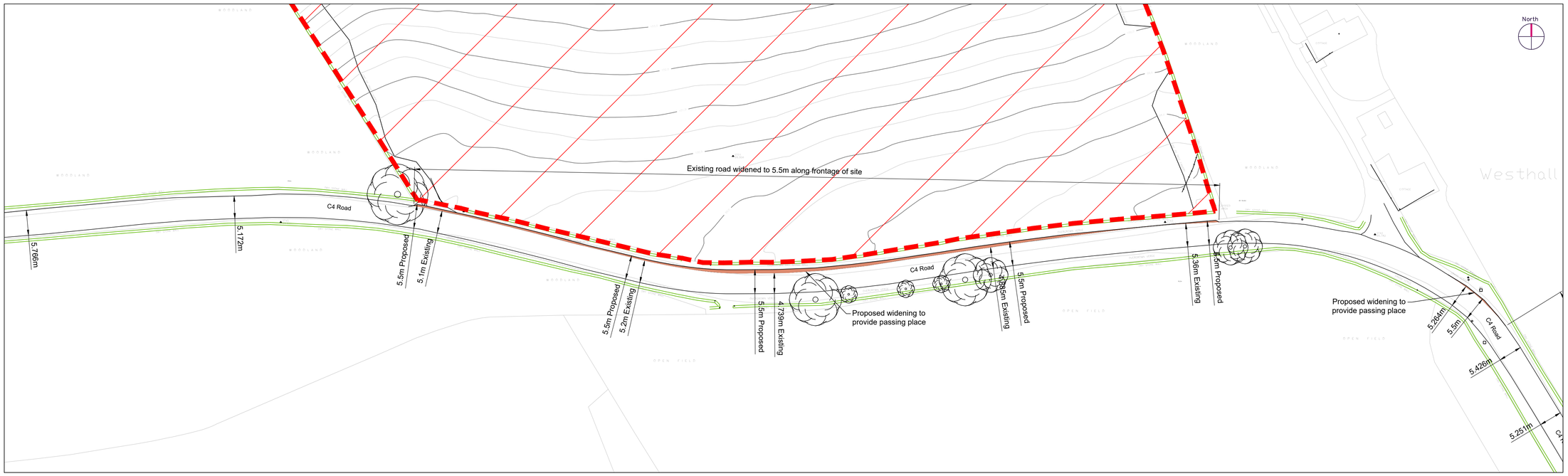
APPENDIX B – ROAD LAYOUT DRAWINGS

FIGURED DIMENSIONS ONLY TO BE USED

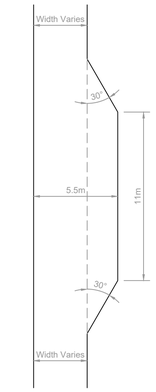
General notes:
1. Locations of viewports can be found on C+R Drg A/190889-900 - Roads Layout Plan.

VIEWPORT 1





VIEWPORT 2



Typical Passing Place Detail
Scale 1:200

Issue	Revision	Initial	Date
1	Full site frontage widened to 5.5m & Typical Passing Place detail amended to suit NRDG.	CRM	26/03/20

Cameron+Ross
CIVIL + STRUCTURAL ENGINEERING
Forbes House | 15 Victoria Street | Aberdeen | AB10 1XB
T. 01224 642 400 | W. cameronross.co.uk
Mulberry House | 39-41 Harbour Road | Inverness | IV1 1UF
T. 01463 570 100 | W. cameronross.co.uk

Client:
FM & G Batchelor

Project:
Crematorium at Burnside of Duntrune, Duntrune, Angus

Drawing Title:
Roads Layout Plan
Sheet 1 of 3

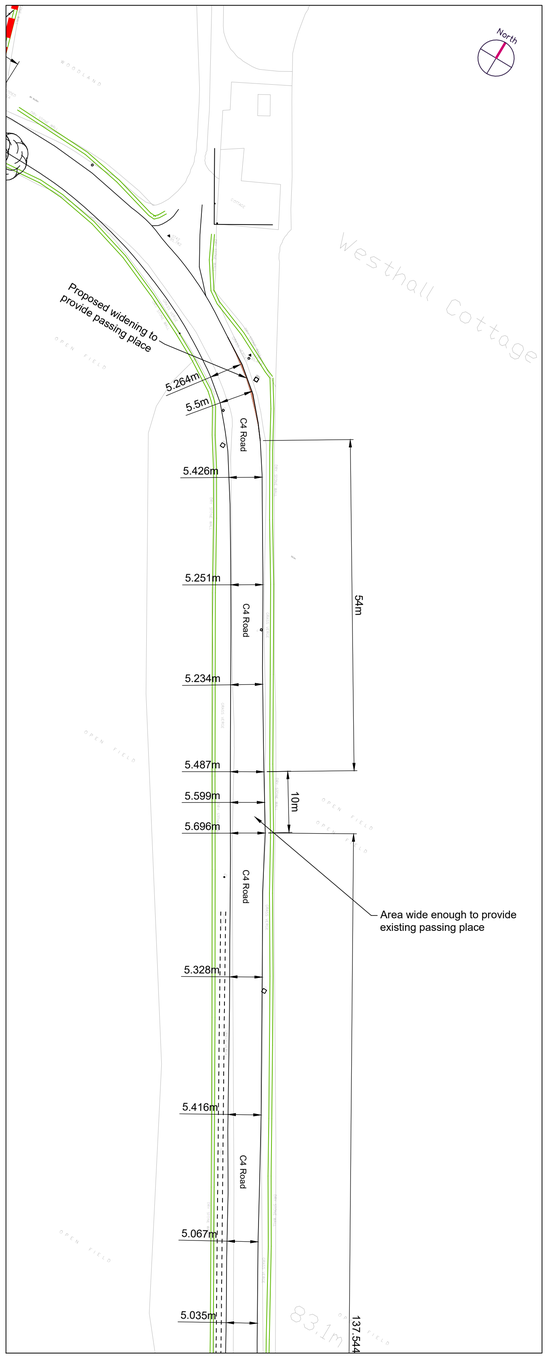
Status:
Concept

Scale:	1:500 @ A1	Date:	20/02/2020
By:	CRM	Checked: BAC	Approved: RAG

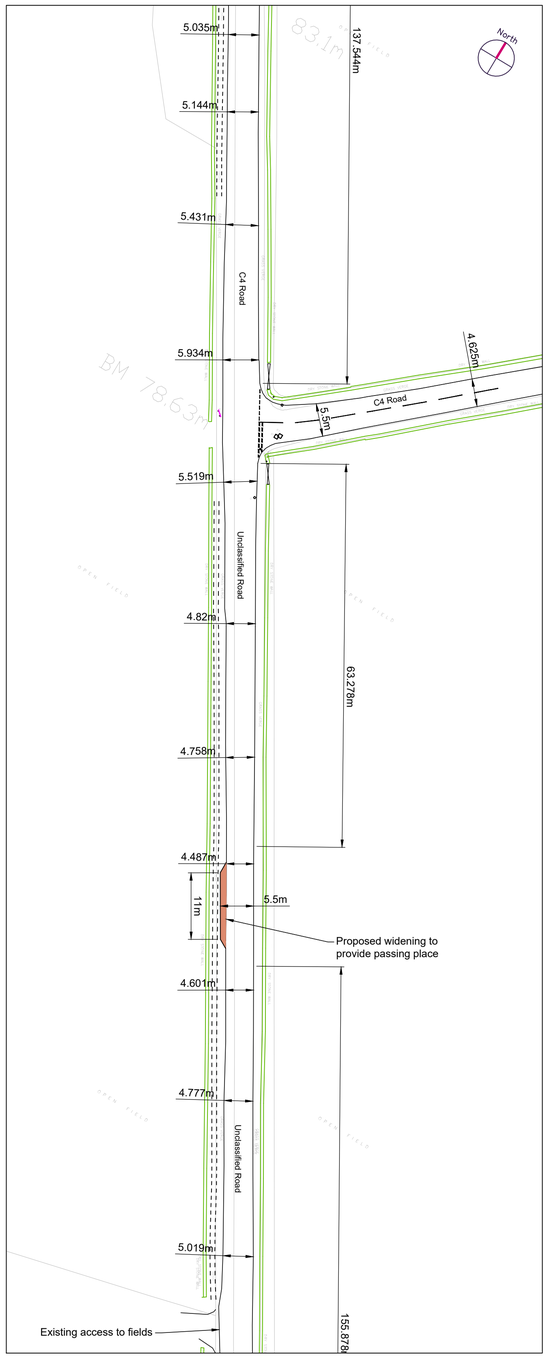
Dwg. No.	Rev.
A/190889 – 901	1

FIGURED DIMENSIONS ONLY TO BE USED

General notes:
1. Locations of viewports can be found on C+R Drg A/190889-900 - Roads Layout Plan.



VIEWPORT 3



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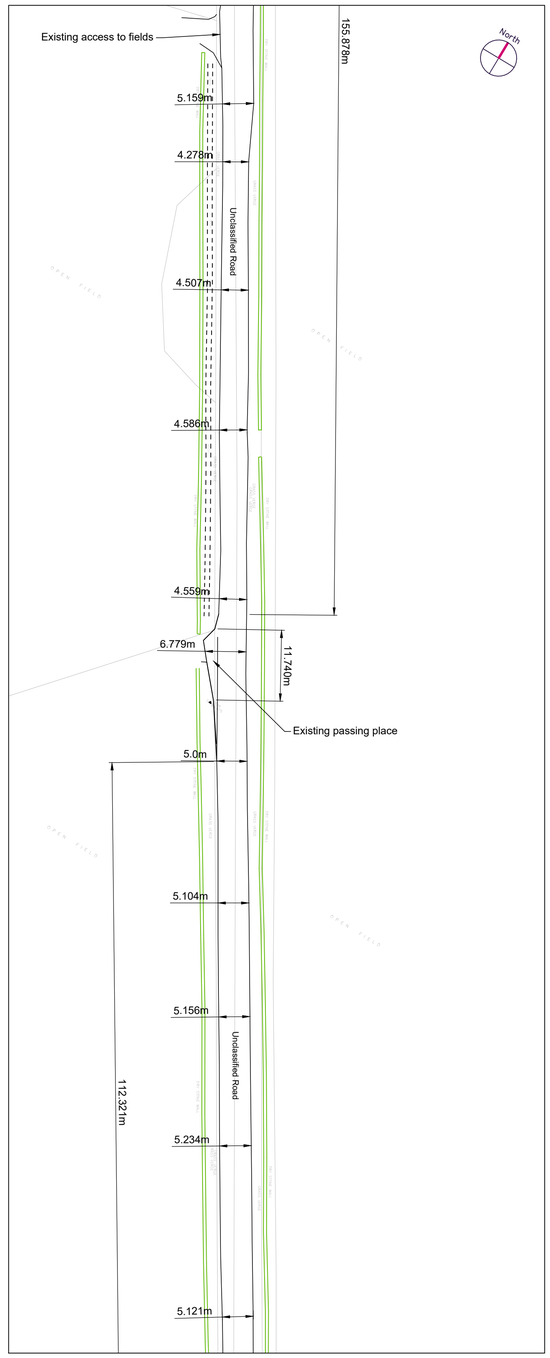

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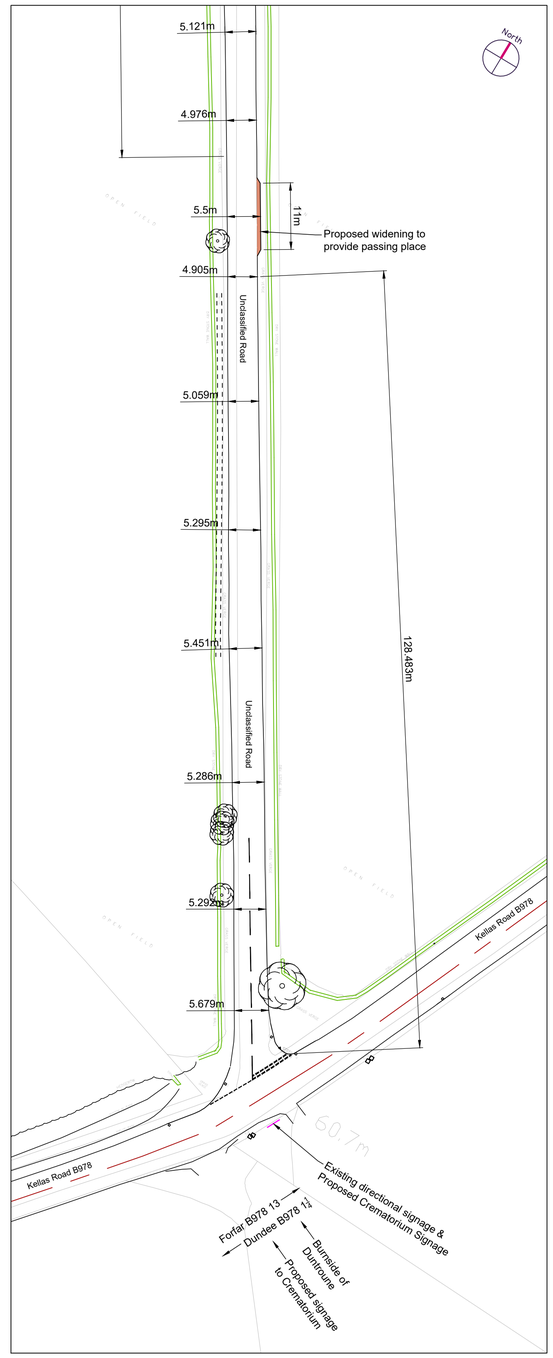

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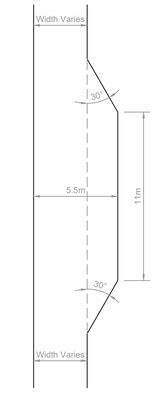


Typical Passing Place Detail
Scale 1:200

Issue	Revision	Initial	Date
1	Proposed passing places & Typical Passing Place detail amended to suit NRDG.	CRM	26/03/20

Cameron+Ross
CIVIL + STRUCTURAL ENGINEERING
Forbes House | 15 Victoria Street | Aberdeen | AB10 1XB
t 01224 642 400 | w cameronross.co.uk
Mulberry House | 39-41 Harbour Road | Inverness | IV1 1UF
t 01463 570 100 | w cameronross.co.uk

Client:
FM & G Batchelor

Project:
Crematorium at Burnside of Duntrune, Duntrune, Angus

Drawing Title:
Roads Layout Plan
Sheet 2 of 3

Status:
Concept

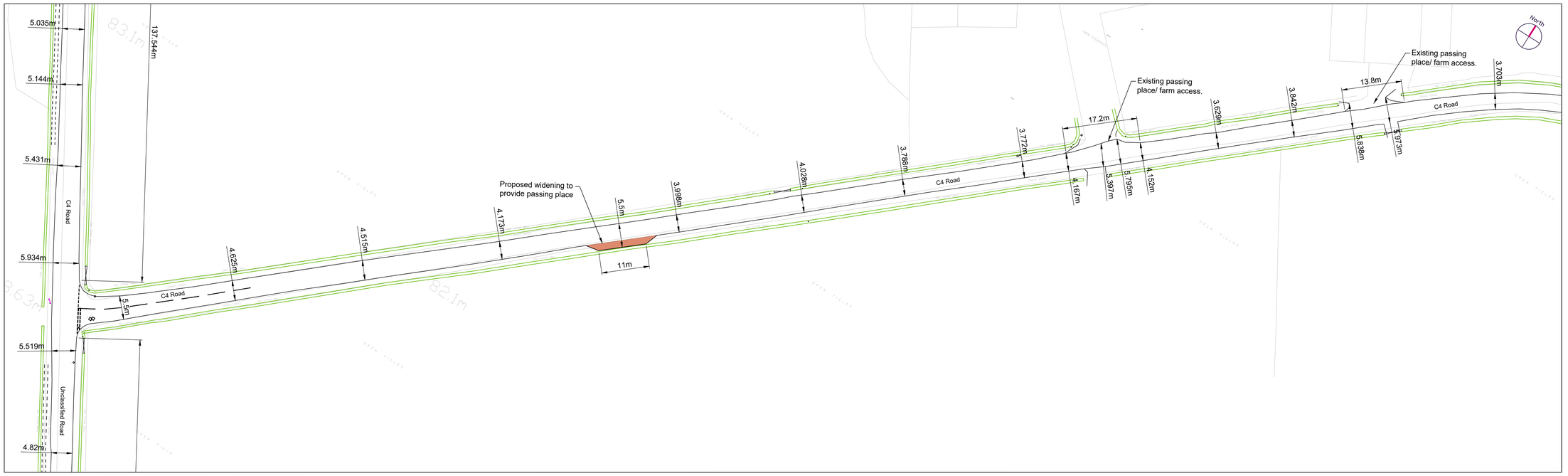
Scale:	1:500 @ A1	Date:	20/02/2020
By:	CRM	Checked: BAC	Approved: RAG

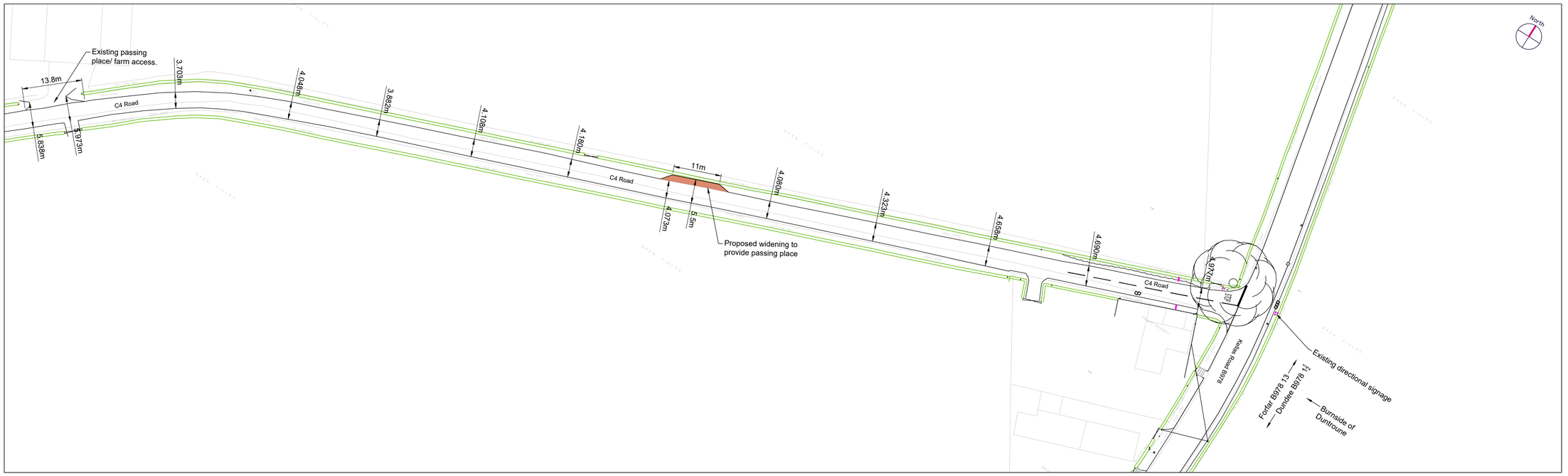
Dwg. No.	Rev.
A/190889 – 902	1

FIGURED DIMENSIONS ONLY TO BE USED

General notes:
1. Locations of viewports can be found on C+R Drg A/190889-900 - Roads Layout Plan.

VIEWPORT 7





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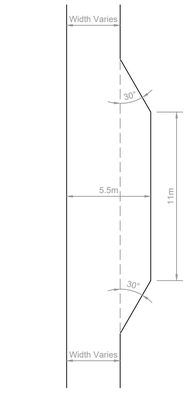


Typical Passing Place Detail
Scale 1:200

Issue	Revision	Initial	Date
1	Additional passing places added & Typical Passing Place detail amended to suit NRDG.	CRM	26/03/20

Cameron+Ross
CIVIL + STRUCTURAL ENGINEERING
Forbes House | 15 Victoria Street | Aberdeen | AB10 1XB
T: 01224 642 400 | W: cameronross.co.uk
Mulberry House | 39–41 Harbour Road | Inverness | IV1 1UF
T: 01463 570 100 | W: cameronross.co.uk

Client:
FM & G Batchelor

Project:
Crematorium at Burnside of Duntrune, Duntrune, Angus

Drawing Title:
Roads Layout Plan
Sheet 3 of 3

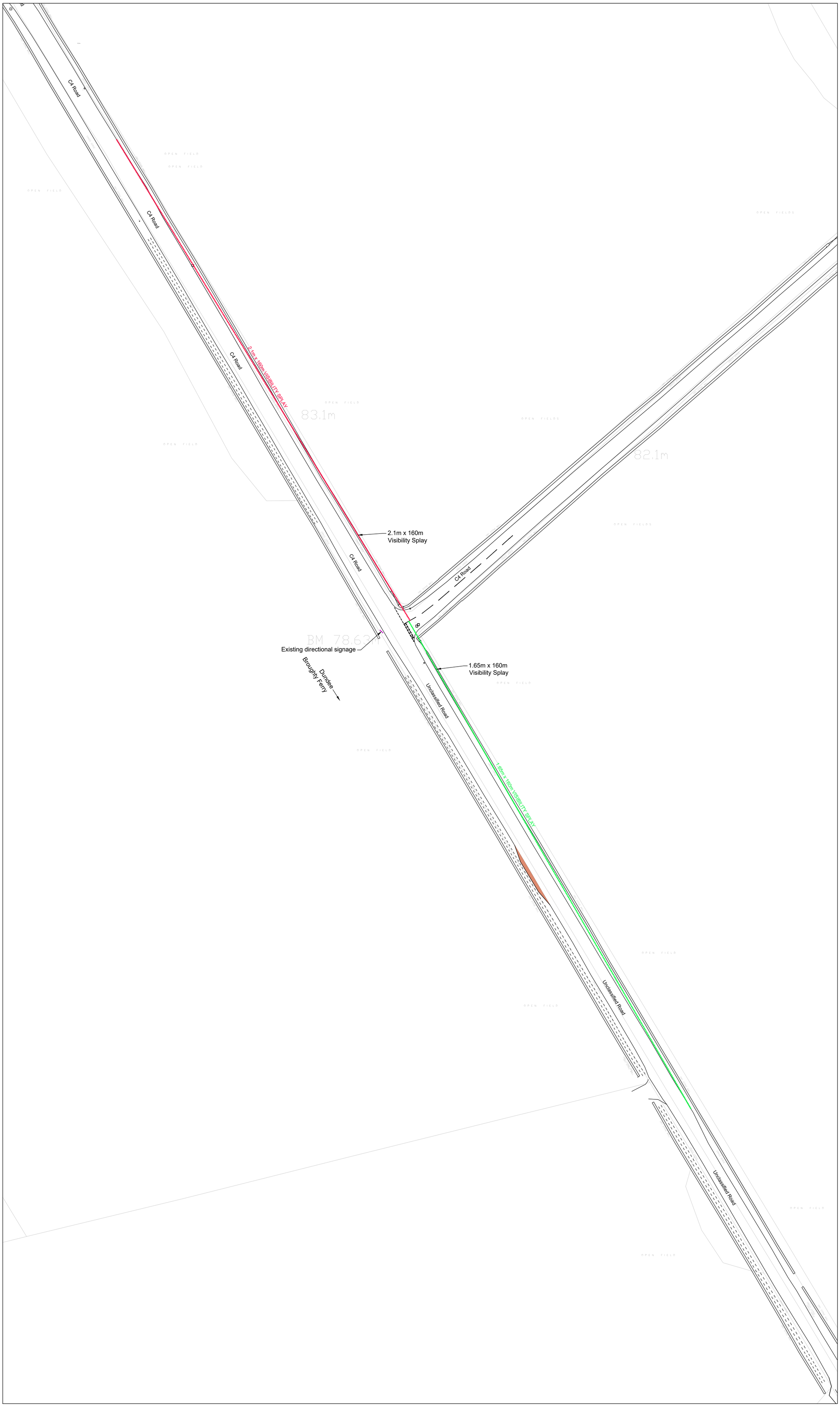
Status:
Concept

Scale:	1:500 @ A1	Date:	20/02/2020
By:	CRM	Checked: BAC	Approved: RAG

Dwg. No. A/190889 – 903
Rev. 1

FIGURED DIMENSIONS ONLY TO BE USED

North



Issue	Revision	Initial	Date

Cameron+Ross

CIVIL + STRUCTURAL ENGINEERING

Forbes House | 15 Victoria Street | Aberdeen | AB10 1XB
t 01224 642 400 | w cameronross.co.uk

Mulberry House | 39–41 Harbour Road | Inverness | IV1 1UF
t 01463 570 100 | w cameronross.co.uk

Client:
FM & G Batchelor

Project:
Crematorium at Burnside of Duntrune, Duntrune, Angus

Drawing Title:
Roads Visibility Splays
Sheet 1 of 3

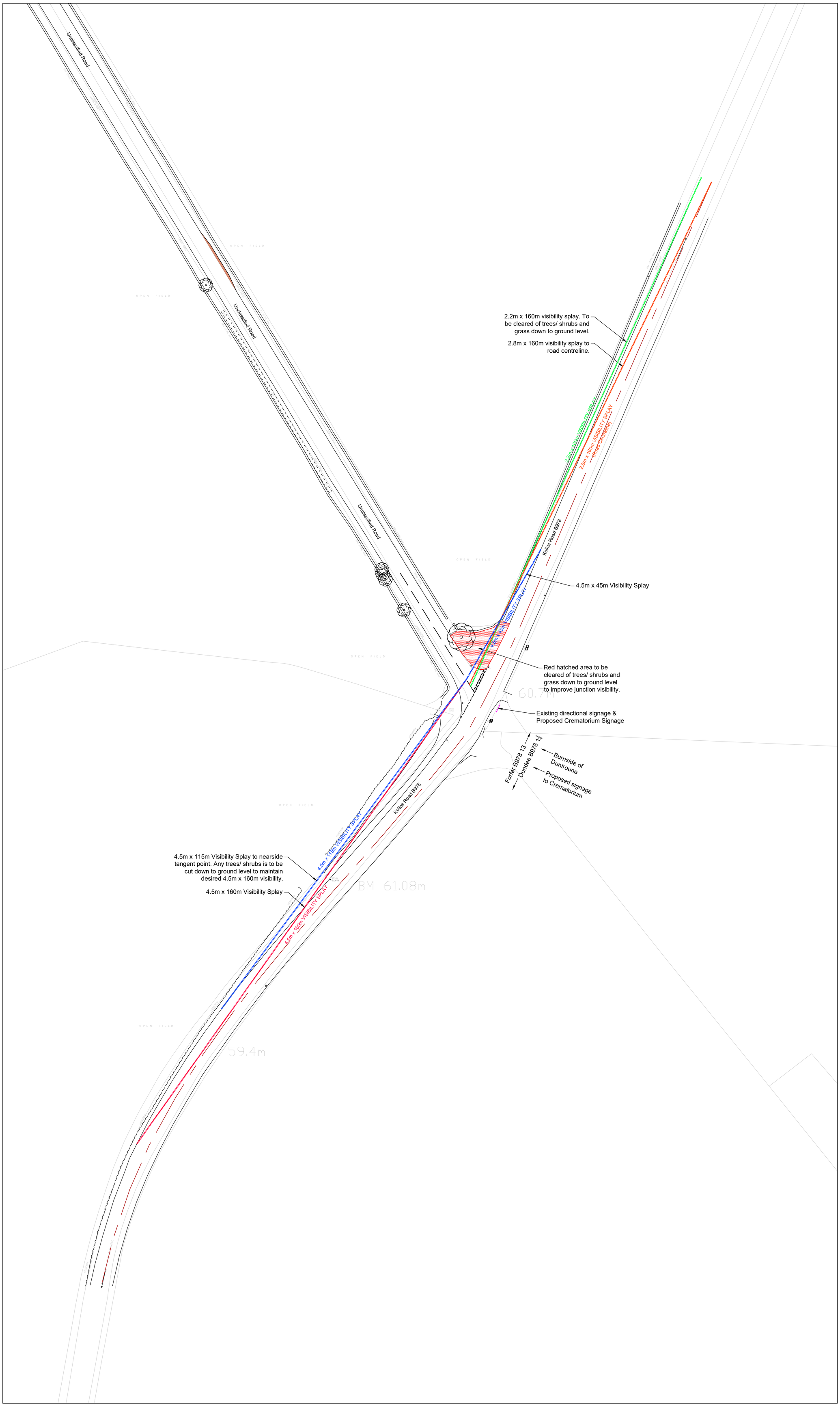
Status:
Concept

Scale:	1:500 @ A1	Date:	20/02/2020
By:	CRM	Checked: BAC	Approved: RAG

Dwg. No.	Rev.
A/190889 – 904	–

FIGURED DIMENSIONS ONLY TO BE USED

North



Issue	Revision	Initial	Date

Cameron + Ross

CIVIL + STRUCTURAL ENGINEERING

Forbes House | 15 Victoria Street | Aberdeen | AB10 1XB
t 01224 642 400 | w cameronross.co.uk

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t 01463 570 100 | w cameronross.co.uk

Client:
FM & G Batchelor

Project:
Crematorium at Burnside of Duntrune, Duntrune, Angus

Drawing Title:
Roads Visibility Splays
Sheet 2 of 3

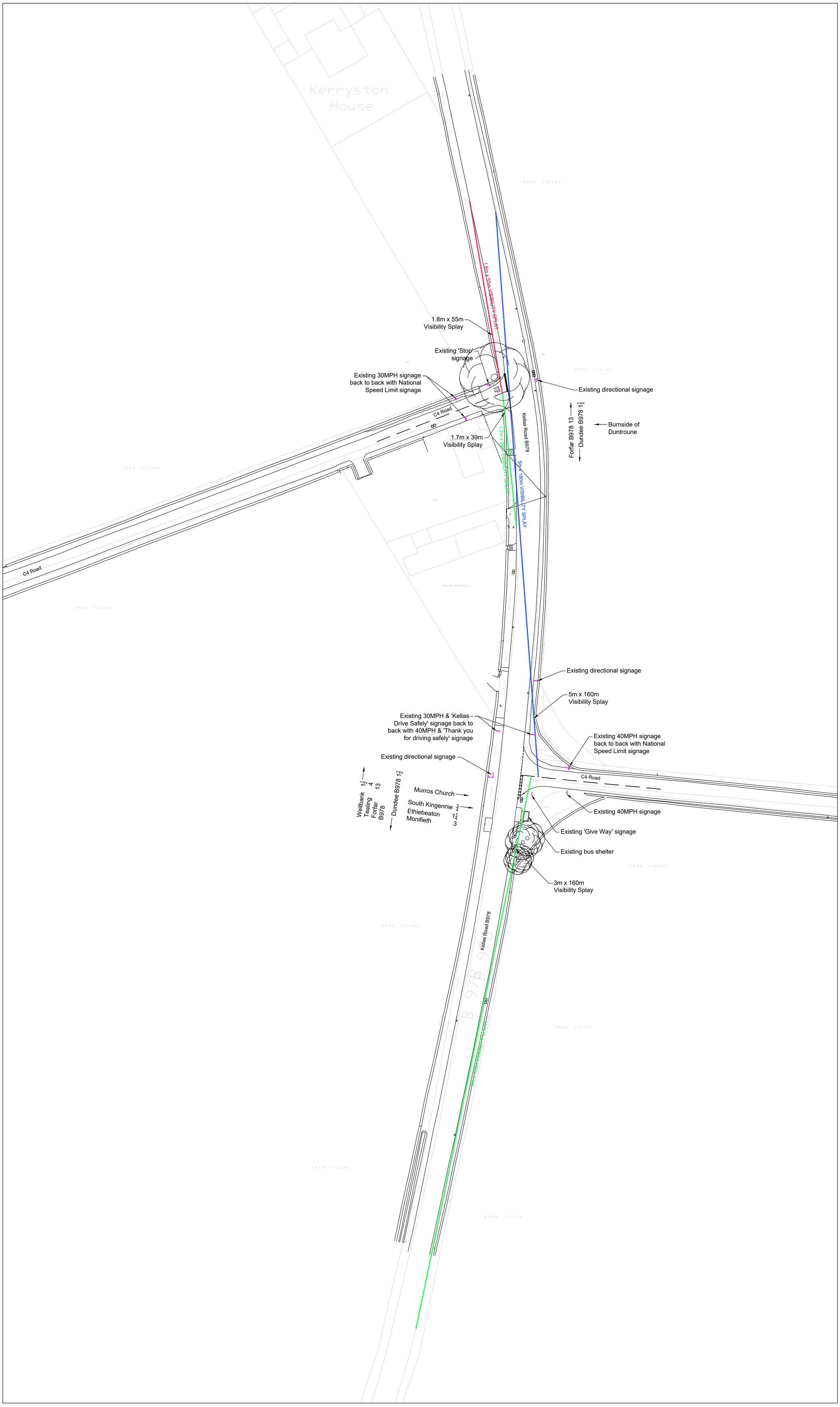
Status:
Concept

Scale:	1:500 @ A1	Date:	20/02/2020
By: CRM	Checked: BAC	Approved: RAG	

Dwg. No.	Rev.
A/190889 – 905	–

FIGURED DIMENSIONS ONLY TO BE USED

North



Issue	Revision	Initial	Date

Cameron+Ross

CIVIL + STRUCTURAL ENGINEERING

Forbes House | 15 Victoria Street | Aberdeen | AB10 1XB
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Mulberry House | 39–41 Harbour Road | Inverness | IV1 1UF
t 01463 570 100 | w cameronross.co.uk

Client:
FM & G Batchelor

Project:
Crematorium at Burnside of Duntrune, Duntrune, Angus

Drawing Title:
Roads Visibility Splays
Sheet 3 of 3

Status:
Concept

Scale:	1:500 @ A1	Date:	20/02/2020
By: CRM	Checked: BAC	Approved: RAG	

Dwg. No.	Rev.
A/190889 – 906	–

APPENDIX C

POPULATION DISTRIBUTION MODEL

PROPOSED CREMATORIUM DEVELOPMENT ORIGIN/DESTINATION POPULATION GRAVITY MODEL.

				ROUTE SPLIT						% TOTAL TRIPS ROUTE SPLIT						
Origin-Destination Town-Area	Population	% of Total Population		C6 West	C6 North	Kellas Rd North	C4 East	Baldovie Rd	Drumgeith Rd	C6 West	C6 North	Kellas Rd North	C4 East	Baldovie Rd	Drumgeith Rd	
Electoral Ward 2007																
Arbroath East and Lunan	16283	6.2%					50.0%	50.0%		0.0%	0.0%	0.0%	3.1%	3.1%	0.0%	
Arbroath West and Letham	15600	5.9%					50.0%	50.0%		0.0%	0.0%	0.0%	3.0%	3.0%	0.0%	
Brechin and Edzell	11668	4.4%		100.0%						4.4%	0.0%	0.0%	0.0%	0.0%	0.0%	
Carnoustie and District	13302	5.1%					50.0%	50.0%		0.0%	0.0%	0.0%	2.5%	2.5%	0.0%	
Coldside	19956	7.6%		33.3%			33.3%	33.3%		2.5%	0.0%	0.0%	2.5%	2.5%	0.0%	
East End	16550	6.3%						25.0%	75.0%	0.0%	0.0%	0.0%	0.0%	1.6%	4.7%	
Forfar and District	15931	6.1%			100.0%					0.0%	6.1%	0.0%	0.0%	0.0%	0.0%	
Kirriemuir and Dean	10749	4.1%			100.0%					0.0%	4.1%	0.0%	0.0%	0.0%	0.0%	
Lochee	19223	7.3%		50.0%				25.0%	25.0%	3.7%	0.0%	0.0%	0.0%	1.8%	1.8%	
Maryfield	16397	6.2%		33.3%				33.3%	33.3%	2.1%	0.0%	0.0%	0.0%	2.1%	2.1%	
Monifieth and Sidlaw	16518	6.3%					50.0%	50.0%		0.0%	0.0%	0.0%	3.1%	3.1%	0.0%	
Montrose and District	15927	6.1%			25.0%	50.0%	25.0%			0.0%	1.5%	3.0%	1.5%	0.0%	0.0%	
North East (Dundee City)	15667	6.0%		50.0%					50.0%	3.0%	0.0%	0.0%	0.0%	0.0%	3.0%	
Strathmartine	19387	7.4%		100.0%						7.4%	0.0%	0.0%	0.0%	0.0%	0.0%	
The Ferry	19463	7.4%						100.0%		0.0%	0.0%	0.0%	0.0%	7.4%	0.0%	
West End	20625	7.8%		50.0%				25.0%	25.0%	3.9%	0.0%	0.0%	0.0%	2.0%	2.0%	
TOTALS	**263246**	**100.0%**								**26.9%**	**11.6%**	**3.0%**	**15.8%**	**29.1%**	**13.5%**	**100.0%**

Total Pull Factor	**0.0**

ANGUS COUNCIL

THE TOWN AND COUNTRY PLANNING (ENVIRONMENTAL IMPACT ASSESSMENT) (SCOTLAND) REGULATIONS 2017

EIA SCREENING OPINION

ERECTION OF CREMATORIUM BUILDING AND ASSOCIATED PARKING, ACCESS, TURNING SPACE, LANDSCAPING AND BOUNDARY ENCLOSURES
LAND NORTH EAST OF DUNTRUNE HOUSE
DUNTRUNE
APPLICATION REFERENCE – 20/00830/FULL

Angus Council has received an application for planning permission for the erection of crematorium building and associated parking, access, turning space, landscaping and boundary enclosures at Land North East of Duntrune House, Duntrune. The Planning Authority must screen the development against The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 to determine whether the proposed development requires EIA.

1. The proposed development does not fall within Schedule 1 of the above Regulations;

2. The proposed development does fall within Schedule 2 of the above Regulations under (10) Infrastructure Project (b) "Urban development projects, including the construction of shopping centres and car parks, sport stadiums, leisure centres and multiplex cinemas," where the area of development exceeds 0.5hectare, for the following reason:

In determining whether a particular development is of a type listed in Schedule 1or 2, planning authorities should have regard to the ruling of the European Court that the EIA Directive has a "wide scope and broad purpose". The fact that a particular type of development is not specifically identified in one of the Schedules does not necessarily mean that it falls outside the scope of the Regulations. In particular, authorities should be aware that "urban development" in paragraph 10(b) of Schedule 2, embraces residential development (houses and flats) as well as what might be regarded as development of a more obviously urban nature. It should also be borne in mind that, in this context, the term "urban" applies not only to development which is to be sited in an already existing urban area. It could apply to development proposed for out of town or even rural areas which might have an urbanising effect on the local environment. This might be the case for example, where the development will bring a significant increase in the amount of traffic in that area (e.g. an out of town shopping complex).

3. The proposed development does not fall within a sensitive area, eg: SAC, SPA, SSSI, National Park, World Heritage Site or Scheduled Monument etc;

4. Would this particular development be likely to have significant effects on the environment?

   Having regard to the selection criteria in Schedule 3 of the Regulations and the information submitted in support of the application, it is considered that the development in unlikely to result in significant effects on the environment by virtue of factors such as its nature, size or location.

   In coming to this view, it is noted that the development does not appear to involve any unusually complex or potentially hazardous operations. Impacts associated with the construction process would be relatively short term and impacts associated with the operation of the development would relatively predictable and not unusually complex having regard to the impacts of the development alone and in combination with other existing or planned development in the surrounding area.

Accordingly, in terms of Regulation 9(1) of the 2017 Regulations, the proposal does not constitute Environmental Impact Assessment development and does not require the submission of an Environmental Impact Assessment Report as required by regulation 5(1) and Schedule 4 of the Regulations.

Fraser MacKenzie
Planning Officer (Development Standards)

Tuesday, 22 December 2020

Local Planner
Planning Service
Angus Council
Forfar
DD8 1AN

Dear Sir/Madam

SITE: Land North East Of, Duntrune House, Duntrune
PLANNING REF: 20/00830/FULL
OUR REF: DSCAS-0029300-LPJ
PROPOSAL: Erection Erection of Crematorium Building and associated Parking, Access, Turning Space, Landscaping and Boundary Enclosuresof Crematorium Building and associated Parking, Access, Turning Space, Landscaping and Boundary Enclosures

Please quote our reference in all future correspondence

Audit of Proposal

Scottish Water has no objection to this planning application; however, the applicant should be aware that this does not confirm that the proposed development can currently be serviced and would advise the following:

Water Capacity Assessment

Scottish Water has carried out a Capacity review and we can confirm the following:

- There is currently sufficient capacity in the Clatto Water Treatment Works to service your development. However, please note that further investigations may be required to be carried out once a formal application has been submitted to us.

Waste Water Capacity Assessment

- Unfortunately, according to our records there is no public Scottish Water, Waste Water infrastructure within the vicinity of this proposed development therefore we would advise applicant to investigate private treatment options.

Please Note

- The applicant should be aware that we are unable to reserve capacity at our water and/or waste water treatment works for their proposed development. Once a formal connection application is submitted to Scottish Water after full planning permission has been granted, we will review the availability of capacity at that time and advise the applicant accordingly.

Surface Water

For reasons of sustainability and to protect our customers from potential future sewer flooding, Scottish Water will not accept any surface water connections into our combined sewer system.

There may be limited exceptional circumstances where we would allow such a connection for brownfield sites only, however this will require significant justification from the customer taking account of various factors including legal, physical, and technical challenges.

In order to avoid costs and delays where a surface water discharge to our combined sewer system is anticipated, the developer should contact Scottish Water at the earliest opportunity with strong evidence to support the intended drainage plan prior to making a connection request. We will assess this evidence in a robust manner and provide a decision that reflects the best option from environmental and customer perspectives.

General notes:

- Scottish Water asset plans can be obtained from our appointed asset plan providers:
    - Site Investigation Services (UK) Ltd
    - Tel: 0333 123 1223
    - Email: sw@sisplan.co.uk
    - www.sisplan.co.uk
- Scottish Water's current minimum level of service for water pressure is 1.0 bar or 10m head at the customer's boundary internal outlet. Any property which cannot be adequately serviced from the available pressure may require private pumping arrangements to be installed, subject to compliance with Water Byelaws. If the developer wishes to enquire about Scottish Water's procedure for checking the water pressure in the area, then they should write to the Customer Connections department at the above address.
- If the connection to the public sewer and/or water main requires to be laid through land out-with public ownership, the developer must provide evidence of formal approval from the affected landowner(s) by way of a deed of servitude.
- Scottish Water may only vest new water or waste water infrastructure which is to be laid through land out with public ownership where a Deed of Servitude has been obtained in our favour by the developer.

- The developer should also be aware that Scottish Water requires land title to the area of land where a pumping station and/or SUDS proposed to vest in Scottish Water is constructed.

- Please find information on how to submit application to Scottish Water at our Customer Portal.

Next Steps:

All Proposed Developments

All proposed developments require to submit a Pre-Development Enquiry (PDE) Form to be submitted directly to Scottish Water via our Customer Portal prior to any formal Technical Application being submitted. This will allow us to fully appraise the proposals.

Where it is confirmed through the PDE process that mitigation works are necessary to support a development, the cost of these works is to be met by the developer, which Scottish Water can contribute towards through Reasonable Cost Contribution regulations.

Non Domestic/Commercial Property:

Since the introduction of the Water Services (Scotland) Act 2005 in April 2008 the water industry in Scotland has opened to market competition for non-domestic customers. All Non-domestic Household customers now require a Licensed Provider to act on their behalf for new water and waste water connections. Further details can be obtained at www.scotlandontap.gov.uk

Trade Effluent Discharge from Non Dom Property:

- Certain discharges from non-domestic premises may constitute a trade effluent in terms of the Sewerage (Scotland) Act 1968. Trade effluent arises from activities including; manufacturing, production and engineering; vehicle, plant and equipment washing, waste and leachate management. It covers both large and small premises, including activities such as car washing and launderettes. Activities not covered include hotels, caravan sites or restaurants.
- If you are in any doubt as to whether the discharge from your premises is likely to be trade effluent, please contact us on 0800 778 0778 or email TEQ@scottishwater.co.uk using the subject “Is this Trade Effluent?". Discharges that are deemed to be trade effluent need to apply separately for permission to discharge to the sewerage system. The forms and application guidance notes can be found here.
- Trade effluent must never be discharged into surface water drainage systems as these are solely for draining rainfall run off.

- For food services establishments, Scottish Water recommends a suitably sized grease trap is fitted within the food preparation areas, so the development complies with Standard 3.7 a) of the Building Standards Technical Handbook and for best management and housekeeping practices to be followed which prevent food waste, fat oil and grease from being disposed into sinks and drains.
- The Waste (Scotland) Regulations which require all non-rural food businesses, producing more than 50kg of food waste per week, to segregate that waste for separate collection. The regulations also ban the use of food waste disposal units that dispose of food waste to the public sewer. Further information can be found at www.resourceefficientscotland.com

I trust the above is acceptable however if you require any further information regarding this matter please contact me on **0800 389 0379** or via the e-mail address below or at planningconsultations@scottishwater.co.uk.

Yours sincerely,

Planning Application Team
Development Operations Analyst
developmentoperations@scottishwater.co.uk

Scottish Water Disclaimer:

"It is important to note that the information on any such plan provided on Scottish Water's infrastructure, is for indicative purposes only and its accuracy cannot be relied upon. When the exact location and the nature of the infrastructure on the plan is a material requirement then you should undertake an appropriate site investigation to confirm its actual position in the ground and to determine if it is suitable for its intended purpose. By using the plan you agree that Scottish Water will not be liable for any loss, damage or costs caused by relying upon it or from carrying out any such site investigation."

From: Claire Herbert
Sent: Tue, 29 Dec 2020 16:00:19 +0000
To:PLNProcessing
Cc: MacKenzieF
Subject: Planning consultation 20/00830/FULL - Archaeology response

Planning Reference: 20/00830/FULL

Case Officer Name: Fraser MacKenzie

Proposal: Erection of Crematorium Building and associated Parking, Access, Turning Space, Landscaping and Boundary Enclosures

Site Address: Land North East Of Duntrune House Duntrune

Site Post Code:

Grid Reference: NO 4492 3511

Thank you for consulting us on the above application. I can advise that in this particular instance, no archaeological mitigation is required.

Should you have any comments or queries regarding the above, please do not hesitate to contact me

Kind regards,

Claire

Claire Herbert MA(Hons) MA MCIfA

Archaeologist
Archaeology Service, Planning and Environment Service, Infrastructure Services
Aberdeenshire Council, Woodhill House, Westburn Road, Aberdeen, AB16 5GB

T: 01467 537717

E: Claire.herbert@aberdeenshire.gov.uk

W: https://www.aberdeenshire.gov.uk/leisure-sport-and-culture/archaeology

W: https://online.aberdeenshire.gov.uk/smrpub

Archaeology Service for Aberdeenshire, Moray, Angus & Aberdeen City Councils

Your feedback is important to us and helps us to improve our service ☐ we value your comments.

Please note office working hours: Monday - Friday, 9am - 5pm

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Instagram	Twitter	YouTube
@abshire_archaeology	@AbshireArch_CH	Aberdeenshire Council Archaeology Service

From: GrahamIH
Sent: Mon, 11 Jan 2021 15:04:22 +0000
To: MacKenzieF
Cc: ThomsonSD
Subject:20/00830/FULL Erection of Crematorium Building and associated Parking, Access, Turning Space, Landscaping and Boundary Enclosures Land North East Of Duntrune House Duntrune

Fraser

I refer to the above application and would thank you for the opportunity to provide comment in respect of potential amenity impacts that may arise.

The cremation and associated processes have the potential to give rise to both air quality and noise impacts. In respect of air quality I note that reports containing monitoring data obtained from other installations has been submitted but no site specific assessment has been undertaken. I am aware that there are existing residential properties nearby therefore a detailed assessment of the potential impact of emissions to air from the operation of the cremator at the proposed location requires to be undertaken. The assessment should be undertaken in accordance with the Local Air Quality Management Technical Guidance TG(16) and should also consider potential odour impacts at sensitive locations. It is strongly recommended that any assessment methodology is agreed in writing with this Service prior to any monitoring/modelling work being undertaken. In terms of noise I am satisfied that any emissions are likely to meet our standard conditions for fixed plant within rural locations however any available noise data relating to the proposed equipment that can be submitted would be helpful.

I trust you find the above acceptable but please do not hesitate to contact me if you wish to discuss anything further at this stage.

Regards

Iain

Iain Graham | **Environmental Health Officer** | Angus Council - Place | Housing, Regulatory and Protective Services | Angus House, Orchardbank Business Park, Forfar, DD8 1AN | ☎01307 492026

Angus Council
Comhairle Aonghais

Memorandum

Infrastructure
Roads & Transportation

TO: DEVELOPMENT STANDARDS MANAGER, PLANNING

FROM: TRAFFIC MANAGER, ROADS

YOUR REF:

OUR REF: CH/AB/TD1.3

DATE: 19 JANUARY 2021

SUBJECT: **PLANNING APPLICATION REF. NO. 20/00830/FULL – PROPOSED ERECTION OF A CREMATORIUM ON LAND NORTH-EAST OF DUNTRUNE HOUSE, DUNTRUNE**

I refer to the above planning application.

The National Roads Development Guide, adopted by the Council as its road standards, is relative to the consideration of the application and the following comments take due cognisance of that document.

The site is located on the north side of the unnumbered classified, Monifieth to Kingennie to Duntrune road near to Duntrune Hill. The roads in the vicinity of the site are typical of rural roads in Angus, being twisty and relatively narrow in some places. Carriageway widths between the site and the B978 Broughty Ferry to Wellbank to Draffin road typically vary between 4.65 to 5.7 metres.

The proposal is for a 120-seat crematorium with 90 car parking spaces, including overflow. However, the submitted site plan shows only 61 general parking spaces and 8 disabled spaces. No provision is made for the parking of bicycles, motorbikes or coaches. Although coach waiting areas are sited in front of the indicated overflow parking areas.

A Transport Assessment (TA) has been submitted in support of the application.

Pedestrian Accessibility

Due to the rural location there are no formalised pedestrian links in the immediate vicinity of the crematorium site. There is no footpath provision from the site until the Poplar Drive,

Ballumbie junction with the B978 (Kellas Road), approximately 1.4 kilometres from the proposed crematorium site.

Cycling Accessibility

Due to the rural location there are no formalised cycling links in the immediate vicinity of the crematorium site, so attending cyclists will be required to share the surrounding carriageways with vehicular traffic. This is not unusual for rural sites throughout Angus. As a result, no public cycling parking facilities are proposed to be provided for those who wish to cycle to the crematorium. Such provision should therefore be conditional, based on the requirements within the Angus Council parking standards.

Public Transport

There are no public transport stops within the immediate vicinity of the site. The nearest bus stops are on Poplar Drive, Ballumbie and Kellas Road near the junction with Fithie Bank, Dundee. These stops are approximately 1.5 kilometres walking distance from the site which is well in excess of the accepted 400 metres or so that would serve to encourage travel by public transport. A further bus stop is located at Braeside Cottages, Duntrune, approximately 1.2 kilometres from the site. The infrequency of service at these stops is an additional barrier to this sustainable mode of transport. A more frequent service is available on Ballumbie Road, off the Drumgeith Road/Berwick Drive, Dundee but that is approximately 2.5 kilometres from the site.

The scarcity of dedicated footways or off-road footpaths between the identified bus stops and the site will also reduce the likelihood of visitors using public transport to access the site. Indeed, it is accepted within the TA that given the rural nature of the site there is little opportunity for crematorium staff or visitors to travel to and from the site by public transport. Therefore, the only travel to the site by bus would be via private hire where parking would be available on the allocated overspill parking area. Only 3% of funerals are expected to generate travel by private coach hire.

Road Network & Access

The TA has considered access to the site via the following roads:

- B978 Broughty Ferry – Wellbank – Draffin / Baldovie Road / B961 Drumgeith Road;
- Monifieth – Kingennie – Duntrune (C4);
- Dundee – Tealing – Auchterhouse (C6);
- Unclassified, [U315] West of Westhall (C4 – B978).

The B961/B978 road junction is in the Dundee City Council administrative area. Dundee City Council has been consulted and has raised no concerns with the TA.

Having reviewed the above road junctions and carriageway widths in the vicinity of the application site, mitigation measures are proposed by way of improvements to the public roads. Those improvements include, the widening of the carriageway of the Monifieth to Duntrune road (C4) along the entire site frontage, the provision of passing places on that road as well as the unclassified, (U315) West of Westhall road, and the provision of additional road directional signs to encourage traffic to use the West of Westhall road as the preferred access route from the B978.

Traffic counts and speed surveys were carried out in October 2019 to inform the production of the TA. Speed surveys show that the 85th percentile speeds (the speed at

which 85% of traffic is travelling at or below) on the C4 adjacent to the proposed site access were 40mph eastbound and 42mph westbound. On the B978 near to its junction with the U315 the respective 85th percentile speeds were measured at 48mph eastbound and 49mph westbound.

Network Analysis

The TA has assessed the surrounding road network based on an anticipated opening year of 2021. This would appear optimistic given the current status of the planning application and the national pandemic that is presently upon us.

Trip generation has been based on two similar crematoria developments at Parkgrove, Friockheim and 100 Acre Wood in Fife.

It was agreed with the consultant at the scoping stage that a population gravity/distribution model should be used to determine the percentage distribution of the generated trips. A population gravity model was thereafter considered for use to determine the percentage trip distribution however it was felt that this would likely lead to a disproportionately high proportion of trips from Dundee given its high population and short distance to the site. The distribution is therefore based on a population distribution model which has been determined using the populations of nearby electoral wards. This has considered the catchment area of the crematorium to be within the Angus and Dundee City electoral wards.

Although it was anticipated that funerals will take place an hour apart the TA has assessed the generated trips for the eventuality of two funerals taking place back to back. This is seen as the worst-case scenario with the vehicles for two funerals arriving and leaving within the same hourly period.

Using the above distribution model parameters, it was determined that the majority (61.4%) of traffic generated by the development is likely to arrive via the B978 Broughty Ferry to Wellbank road, as opposed to 38.5% via the C6 Dundee to Tealing to road.

Based on the surveyed and predicted trip generation figures it was shown that due to the relatively low pre-existing traffic flows on the minor roads there is likely to be a large percentage increase in post development traffic flows as a result of the proposed development with a 27% increase on the C4 past the site frontage during the AM peak period. In comparison, surveyed and predicted traffic flows on the busier B978 Broughty Ferry to Wellbank road would result in an increase of 3.3% in traffic flows on the B978 between Drumgeith Road and the U315 West of Westhall during the AM and PM peak periods. An increase in traffic flows from between 5% and 10% is usually acceptable on unsensitive roads as this is within the daily levels of traffic flow fluctuation that is commonly experienced under normal road traffic conditions.

It was therefore accepted that the resultant, aggregated traffic flows are anticipated to be below those expected to cause capacity and queuing issues. In the circumstances, no further junction capacity analysis was required to be undertaken.

Parking

The proposed car parking provisions were assessed based on the existing provisions at Parkgrove Crematorium in Friockheim which has a capacity of 164 seats; compared to the 120 seats proposed in this application. At Parkgrove, 24 formal car parking spaces are provided with provision for overspill increasing the maximum capacity to 100 spaces.

It is claimed that on average 3 funeral services are undertaken each day with vehicles occupied on average by 3 persons, however no documented surveys are provided to support this statement.

As previously indicated, there is no proposed provisions for the parking of bicycles.

In accordance with Angus Council's parking standards the following rates for parking should apply:

Mode	**Standard requirement**	**Spaces**
Bicycle	Non specific	
Motorcycle	Non specific	
Cars	1 space per seat	120
Disabled Bays	Non specific	

The proposal includes for the provision of 50 standard parking spaces with allowance for overspill parking to increase numbers to 90 spaces. The provision of four disabled spaces is included within the proposals as are four staff spaces.

The proposed overspill parking areas should be increased to provide a minimum of 120 general car parking spaces with an additional minimum of 7 disabled bays provided.

Mitigating Measures

It is proposed to provide road directional signage so that those accessing the site from the C4 are directed to use the U315 unclassified road rather than the C4 (Westhall section) between the U315 and B978 Kellas Road due to this section of the C4 having a narrower road width than the unclassified road. In addition, the sightlines at the junction of the C4 with the B978 Kellas Road are sub-standard and are lesser than those at the U315 junction with the B978. A mandatory "Stop" sign exists at the C4 junction to emphasise the poor visibility available.

In order to assist the free flow of traffic on the public roads between the site and the B978, road widenings and passing places are proposed at the various locations to provide a carriageway width of 5.5 metres. This means that a number of additional passing places will be provided along the C4 and U315, as identified on the drawings in Appendix B of the TA. To allow for the passing of large agricultural vehicles with funeral cortege vehicles the passing places should be extended to 20 metres in length.

The carriageway on the C4 along the full length of the site frontage will be widened to 5.5m.

In taking account of the surveyed traffic speeds and in order to provide safe and satisfactory access to the site, the following new and improved visibility sightlines are proposed:

- 4.5 x 120 metres on both sides of the proposed site access at its junction with the C4;
- 4.5 x 160 metres on the south side of the U315 at its junction with the B978; and
- 2.4 x 160 metres on the north side of the U315 at its junction with the B978.

While it is noted that not all visibility splays shown on the drawings are appropriately sized or drafted to the carriageway edge or nearest tangent point, to suit a 50mph design

speed, the desirable visibility sightlines at the junction of the U315 unclassified road with the B978 Kellas Road are 4.5 metres by 160 metres with a relaxation allowable to 2.4 x 160 metres. Bushes and shrubs within the adopted road verge require to be cleared for this to be achieved. Once the clearing is undertaken it will improve the existing visibility at the junction which will provide a benefit to the wider community.

As a result of the low traffic impact on the surrounding road network and the proposed mitigating improvements to existing roads and visibility splays, I am minded that there is no significant cause to object to the planning application by reason of traffic impacts.

I have considered the application in terms of the traffic likely to be generated by it, and its impact on the public road network. As a result, I do not object to the application but would recommend that any consent granted shall be subject to the following conditions:

1 That, prior to the commencement of development, visibility splays shall be provided at the junction of the proposed site access with the C4 Monifieth – Kingennie – Duntrune road giving a minimum sight distance of 120 metres in each direction at a point 4.5 metres from the nearside channel line of the C4 Monifieth – Kingennie – Duntrune road.
Reason: to enable drivers of vehicles leaving the site to have a clear view over a length of road sufficient to allow safe exit.

2 That, prior to the commencement of development, a visibility splay shall be provided at the junction of the U315 West of Westhall (C4 – B978) with the B978 Broughty Ferry – Wellbank – Draffin road giving a minimum sight distance of 160 metres in a southerly direction at a point 4.5 metres from the nearside channel line of the B978 Broughty Ferry – Wellbank – Draffin road.
Reason: to enable drivers of vehicles leaving the site to have a clear view over a length of road sufficient to allow safe exit.

3 That, prior to the commencement of development, a visibility splay shall be provided at the junction of the U315 West of Westhall (C4 – B978) with the B978 Broughty Ferry – Wellbank – Draffin road giving a minimum sight distance of 160 metres in a northerly direction at a point 2.4 metres from the nearside channel line of the B978 Broughty Ferry – Wellbank – Draffin road.
Reason: to enable drivers of vehicles leaving the site to have a clear view over a length of road sufficient to allow safe exit.

4 That, within the above visibility splays nothing shall be erected, or planting permitted to grow to a height in excess of 1050 millimetres above the adjacent road channel level.
Reason: to enable drivers of vehicles leaving the junctions to have a clear view over a length of road sufficient to allow safe exit.

5 That, prior to the commencement of development, further details of the proposed scheme of improvements to the public roads, shown on drawing numbers A/190889/901 Revision 1; 902 Revision 1, 903 Revision 1, 904, 905 & 906 shall be submitted for the consideration of the planning authority. The scheme of improvements shall include correctly drafted visibility sightlines, full construction details, material specifications, road sign designs and extended passing places. The development shall not commence until the planning authority has agreed the scheme of improvements in writing. The scheme of improvements to the public roads shall thereafter be completed prior to the opening of the building for cremations.

Reason: to provide a safe and suitable standard of access, to maintain the free flow of traffic on the roads leading to the site and to prevent extraordinary damage being caused to the nearby public roads.

6 *That, the proposed gully on the site access nearest to the public road, shown on drawing no. 920 Revision 1, shall not connect to Soakaway 2 but shall outfall to Soakaway 1 or another suitably formed soakaway beyond the resulting extents of the public road.*
Reason: to prevent the flow of surface water from within the site being carried onto the public road or into its drainage system.

7 That, prior to the occupation or use of the crematorium, additional parking spaces shall be provided within the site at the following minimum rates:

Cycles: 10 spaces
Motorcycles: 6 spaces
Cars: 120
Disabled Bays: 7 spaces

The provision for cyclists shall be conveniently located for the main public entrance to the building and shall be covered, lit and adequately signed.
Reason: to ensure that suitable parking arrangements are provided to the standards of Angus Council in a timely manner.

8 That, an advisory, informative note be added to the decision notice to inform the applicant that the improvements to the public roads must be formed and constructed in accordance with the standards of Angus Council.

I trust the above comments are of assistance but should you have any queries, please contact Andrew Barnes on extension 1770.

From: BarnesA <BarnesA@angus.gov.uk>
Sent: 01 April 2020 10:20
To: Bruce A. Clark [redacted]
Cc: GwynneAG <GwynneAG@angus.gov.uk>
Subject: RE: 190889 - Crematorium, Burnside of Duntrune

Bruce

Thank you for providing the below east to follow updated information and revised TA which are all accepted.

Regards

Andrew Barnes | Team Leader - Traffic | Angus Council | Tel: 01307 491770 | Email: barnesa@angus.gov.uk | www.angus.gov.uk

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Fraser MacKenzie

From: Andy Barnes
Sent: 21 June 2021 11:53
To: Fraser MacKenzie
Subject: RE: 20/00830/FULL ROADS CONSULTATION

Fraser

Sorry for the delay in responding to your below email.

Visibility Sightlines at C4/B978

Drawing No. A/190889 – 906 shows visibility sightlines at the junctions of the C4 Monifieth – Kingennie – Duntrune road at its junctions with B978 Broughty Ferry – Wellbank – Draffin road south of Kellas.

The following sightlines are shown on the drawing from the C4:

- C4 Western leg (Duntrune): 1.8 x 55 metres northwards and 1.7 x 39 metres southwards
- C4 Eastern leg (Murroes): 5 x 160 metres northwards and 3 x 160 metres southwards

The western leg sightlines stipulate 'x' distances that are less than the required minimum of 2. 4 metres and the 'y' distances show the sightlines to be sub-standard. The sightlines on the western leg are impacted and lessened further at the car drivers' eye height by way of stonework boundary walls.

I consider the realistic sightlines on the Duntrune leg to be 2.4 x 12 metres, northwards and 2.4 x 21 metres, southwards. These sightlines are significantly sub-standard but the junction appears to operate in an acceptable manner with no accidents being reported within the latest three year reporting period.

Standard sightlines of 2.4 x 160 metres are available on both sides of the Murroes leg.

Visibility Sightlines at U315/B978

Further to your email of 2 June 2021, I would agree with the comments of Dougall Ballie Associates in that the proposed south-westerly sightline of 4.5 x 160 metres is obstructed by the natural topography of the B978 . I would further agree that the maximum sightline available in this case is in the region of 4.5 x 110 metres.

In a similar vein to the C4 junctions, no accidents have been reported at or in the vicinity of this junction within the latest three year reporting period. This indicates that the junction is operating safely under the existing conditions.

If Committee is minded to grant consent for this application it would be inappropriate to make such consent conditional upon the provision of a sightline that cannot be achieved. To that end, if approved the stipulated sightline should be 4.5 x 100 metres.

I hope this helps.

Regards

Ed Taylor

From: Andy Barnes
Sent: 13 August 2021 09:35
To: Ed Taylor
Subject: FW: 20/00830/FULL; Erection of Crematorium on Land North East of Duntrune House, Duntrune
Attachments: 20231let03.pdf

Ed

Further to the above planning application and with reference to the letter of representation submitted of behalf of a local resident by Dougall Ballie Associates Ltd on 01 July 2021.

Visibility Sightline at U315/B978

As stated by DBA it is appropriate to consider the requirements for visibility splays as set out in the DMRB. This is the relevant advice to be used for new and improved all-purpose and motorway trunk roads. While the DMRB applies directly to trunk roads it is also adopted for use on higher speed local authority roads where there is a need to depart from the Scottish Planning Policy document Designing Streets, since the advice on sightlines in Designing Street does not extend to roads subject to speed limits in excess of 37mph (60kph).

The National Road Development Guide (NRDG) compares situations where DMRB may be used in preference to Designing Streets and recommends that on roads where the movement function outweighs the place function the DMRB should be applied. However, the NRDG also accepts that local authority roads should not require such strict adherence to the design parameters of the DMRB. It is accepted that the desirable minimum values for stopping sight distances should be provided, except where a relaxation is permitted.

The NRDG recognises that relaxations within the DMRB may be allowed on trunk roads by application to Transport Scotland. Similarly, such relaxations may be permitted by the local roads authority when dealing with issues on local roads. Relaxations are considered to be in compliance with the design standards and therefore do not render the relaxed sightlines as sub-standard.

While an original relaxation of one step below the minimum desirable standard was recommended in this case, a relaxation of three steps is permitted. Allowing a three step relaxation would result in a requirement for sightlines of 4.5 x 90 metres at this junction. Taking the B978 road layout and local topography into consideration the final recommended relaxation of the sightlines at this junction to 4.5 x 110 metres is therefore without the scope permitted by the roads authority and therefore remains to meet the aim of ensuring that drivers of vehicles leaving the U315 have a clear view over a length of road sufficient to allow safe exit. As previously commented, this is in part borne out by the lack of accidents over the latest three year period.

It is normal practice, when performing accident cluster analysis, for Angus Council to use the accident data available over the previous 3 years. To consider accidents over longer periods, such as twenty years, is not truly representative of current traffic flows and makes no allowance for changes in local traffic patterns or driving styles.

Visibility Sightline at C4/B978

The comments of DBA are noted with respect to the above junction and I can confirm that this is the reasoning for the erection of the mandatory stop sign in this case.

Regards

Andrew Barnes | Team Leader - Traffic | Angus Council | Tel: 01307 491770 | Email: barnesa@angus.gov.uk |www.angus.gov.uk

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Angus Council
Comhairle Aonghais

Memorandum

Infrastructure
Roads & Transportation

TO: DEVELOPMENT STANDARDS MANAGER, PLANNING

FROM: TRAFFIC MANAGER, ROADS

YOUR REF:

OUR REF: CH/AB/TD1.3

DATE: 14 DECEMBER 2021

SUBJECT: **PLANNING APPLICATION REF. NO. 20/00830/FULL – PROPOSED ERECTION OF A CREMATORIUM ON LAND NORTH-EAST OF DUNTRUNE HOUSE, DUNTRUNE**

Further to the above application, I refer to the letter submitted by Dougal Bailie Associates, dated 1 September 2021, the comments in representations with respect to a recent spate of accidents in the vicinity of the site and public transport service updates that are provided in Revision 3 of the applicant's Transport Assessment.

Visibility Sightlines at U315 West of Westhall (C4 – B978) /B978 Kellas Road

I agree that the DMRB is an established road design document and therefore provides a good basis for the application of safe road design parameters. The DMRB provides requirements and advice for all aspects of highway link design to be used for both new and improved all-purpose and motorway trunk roads. In that respect, it is noted that DBA accepts that local authorities have a degree of flexibility in how the DMRB standards are applied on their own local roads network.

However, I do concur with DBA in that DMRB CD109, Section 2.13 annotates that in respect of relaxations below desirable minimum in stopping sight distance, desirable minimum vertical curvature for crest curves and sag curves, described in Sections 3 and 5 of the document, shall not be used on the immediate approaches to junctions.

In consideration of the sightlines at the U315/B978 junction due regard is given to the Transport Assessment and associated drawings submitted by the applicant. Paragraph 2.6 of the TA states, "*…the desired visibility in both directions at the Unclassified Road junction with Kellas Road is 4.5m x 160m as a result of the weekly average 85%tile surveyed speeds being 48mph eastbound and 49mph westbound. This corresponds to a 50mph or 85A kph design speed.*" In accordance with the applicant's survey derived design speed the 4.5 by 160 metres sightline is proposed on the southwest side of the junction, and a sightline of

2.2 by 160 metres is proposed on the northeast side of the junction, each as detailed on submitted drawing no. A/190889 - 905. It should be noted that an 'x' distance of 2.2 metres is generally insufficient to prevent the nose of vehicles from overhanging the give way line when giving way at the junction if the full 'y' distance of 160 metres is to be relied upon.

Having reviewed the TA information, it is apparent that the sightline to the southwest cannot be achieved due to the topography of the road. However, it may be possible for the applicant to improve the topography of the B978 as part of the development mitigation to provide a visibility splay that complies with the 85%ile speed of traffic, that is, the applicant's originally proposed sightline of 4.5 by 160 metres. No evidence has been provided so far to suggest that the applicant can provide the sightlines that they have indicated are required. The physical works to do this would require the vertical alignment of the B978 to be lowered on the north-eastbound approach to the junction. Those works would be significant in engineering terms and may require land beyond the extents of the existing public road (B978).

If the application is approved, a negative suspensive condition should be attached that requires provision of the full 4.5 by 160 metres sightline, in both directions, prior to the commencement of development on site. The intensification of use of a sub-standard junction by concentrated levels of new traffic is undesirable and has the potential to be detrimental to road safety.

Visibility Sightlines at U315 West of Westhall (C4 – B978)/C4 Monifieth – Kingennie – Duntrune

The proposed sightlines for this junction are detailed on drawing no. A/190889 – 904 and are stated as being 2.1 by 160 metres to the northwest and 1.65 by 160 metres to the southeast. In a similar circumstance to the above B978 Kellas Road junction the stated 'x' distances are sub-standard.

At the standard 'x' distance it is estimated that existing sightlines of 2.4 by 14.5 metres to the northwest and 2.4 by 100 metres to the southeast are currently available. Provision of sightlines that comply with DMRB requires provision of the full 2.4 by 160 metres sightline, in both directions, and may require land which is beyond the control of the applicant. Given the nature of the development and associated traffic movement it would be desirable to see the sightlines improved.

If the application is approved, a negative suspensive condition should be attached that requires provision of the full 2.4 by 160 metres sightline, in both directions, prior to the commencement of development on site. The intensification of use of a sub-standard junction by concentrated levels of new traffic is undesirable and has the potential to be detrimental to road safety.

Accidents

Concerns have been raised and evidence provided through representations relating to a recent spate of six collisions in the Duntrune and Murroes area during late October/early November 2021.

Since December 2012 the Roads service has received data from Police Scotland relating to injury collisions only. Record are no longer kept of collisions resulting in damage only, therefore, not all collisions will be reported to Police Scotland. The recorded collision data for the most recent three-year recording period, from 30/10/2018 to 29/10/2021, is now available. The recorded data shows that three collisions have been reported, as follows.

Collison 1:

- 27/8/20 at 6.15pm – **slight** injury at the junction of Poplar Drive with B978 Kellas Road

"V001 was travelling east and exiting the junction to turn south on the B978. V001 pulled out of the junction and failed to give way to V002 which was travelling north on the B978. V002 has taken evasive action and skidded across the junction behind V001, colliding with V003 which was also exiting the junction at the same time to travel north".

Collison 2:

- 02/01/2021 at 7.40am – **slight** injury at C4 Ballumbie to Burnside of Duntrune road - 87 metres from junction with unclassified road

"V001 travelling south-eastwards having negotiated a right bend to travel, however lost control, collided with verge and overturned".

Collison 3:

- 11/10/2021 at 4.00pm – **slight** injury at C6 near junction with unclassified road

"Vehicle 1 travelling west lost control on left hand bend, collides with wall on nearside, causing rear of vehicle to step out colliding with vehicle 2 which was travelling in the opposite direction, extensively damaging both vehicles".

As evidenced, the number of collisions that resulted in injury in the vicinity of the site over the last three years is low. While damage only collisions are no longer recorded and therefore are not normally considered by the traffic authority when analysing collision data, that does not mean to imply that the concerns raised by local residents are not valid.

Public Transport

Previous comments regarding the poor accessibility of the site by sustainable means have been further considered in Revision 3 of the Transport Assessment which at paragraph 3.6 states, *"There is currently two existing bus services that run directly past the proposed crematorium site. The A17 & A38 which run one in each direction each working day. Bus services in this area run on a hail and ride basis and as such would stop outside the site, even if no fixed stop was installed should someone require."*

These services are school bus services and operate before and after school, on school days only during term time.

Two additional local bus services (No's. 22 & 139) are cited as running approximately 450 metres west of the proposed site access. However, this is above the recommended desirable walking catchment distance of 400 metres.

The frequency of bus services is very low and no footways are provided between the site and the bus route. The nature of the road is such that it would not be desirable to encourage pedestrians to walk on a section of carriageway which is twisty, with changes in level, darkened by tree canopy, unlit, and with a verge with limited opportunities for harbourage by pedestrians to allow vehicles to pass. As such, it is not a route which we would wish to see pedestrians walk from a bus route to the crematorium facility.

Suggested options for enhancements to public transport facilities are provided in paragraphs 3.12 and 3.13 of the updated TA and include the provision of an appropriate bus stop or pull in area, or alternatively, the incorporation of a call-up service for users who wished to be collected from the nearest, existing bus stops. It is suggested that such a service could be provided by way of electric vehicles to keep emissions to an absolute minimum.

Given the location of the site and the fact that the existing public transport services are very low in frequency, the site is not readily accessible by sustainable means of transport. The provision of bus stops/pull in area alone would not address the fact that the bus frequency would remain very low. Similarly, the provision of a call up service to collect people from the nearest bus stops would not address the infrequent nature of existing bus services and could not be regarded as convenient. However, if the application is approved these measures should be secured by planning condition.

Summary

As discussed above, if the application is approved, I would recommend that negative suspensive conditions should be attached to the approval as described above.

I trust the above is of assistance and will now allow you to progress to determination of the application.

pp

From: mike.giblin@dundeecity.gov.uk <mike.giblin@dundeecity.gov.uk> **On Behalf Of** developmentroads@dundeecity.gov.uk

D40

Sent: 07 April 2020 11:56
To: Bruce A. Clark [redacted]
Subject: Re: 190889 - Crematorium, Burnside of Duntrune

Bruce,

Thank you for the opportunity to comment on the TA.

I can confirm that the TA has been reviewed and I can agree with the conclusions regarding junctions within the DCC boundary.

No further action is required from a DCC Roads perspective.

Regards,

Mike

==========

Development Roads Team
Traffic & Transportation Division
City Development Department
Dundee City Council,
Dundee House, 50 North Lindsay Street
Dundee. DD1 1LS

Telephone: +44 (0) 1382 433341
Fax: +44 (0) 1382 433013
E-mail: developmentroads@dundeecity.gov.uk

From: Caitlin Duffy
Sent: Thu, 4 Feb 2021 14:34:32 +0000
To: MacKenzieF;PLNProcessing
Cc:customerservices
Subject: Consultation Response 20/00830/FULL

Dear Mr Mackenzie,

TOWN AND COUNTRY PLANNING (SCOTLAND) ACT 1997 as amended
PROPOSED CREMATORIUM BUILDING AND ASSOCIATED PARKING, ACCESS, TURNING SPACE, LANDSCAPING AND BOUNDARY ENCLOSURES
LAND NORTH EAST OF DUNTRUNE HOUSE, DUNTRUNE, ANGUS
APPLICATION REFERENCE NO 20/00830/FULL

I refer to your email correspondence dated 6 January 2021 regarding the above planning application which you have referred to Dundee City Council as a development adjacent to the Dundee City Council /Angus Council boundary with potential cross-boundary issues.

The application proposes the development of a crematorium with associated works on land north east of Duntrune House, Duntrune. The site is around 1km away from the Dundee City Council boundary. The Transport Assessment has been reviewed and there are no comments on the application from a roads perspective.

I consider that the planning application does not raise any issues of strategic significance for Dundee City Council and we have no objections to the proposal.

Yours faithfully

Caitlin Duffy
Planning Officer
Planning Team
City Development Department
Dundee City Council
50 North Lindsay Street
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DD1 1LS

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E-mail: caitlin.duffy@dundeecity.gov.uk
Corporate Web Site http://www.dundeecity.gov.uk

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Corporate Web Site http://www.dundeecity.gov.uk

Murroes and Wellbank Community Council

Fraser McKenzie
Planning Service
Angus Council

Dear Mr McKenzie

Concern over Planning Application No 20/00830/FULL

Erection of Crematorium Building and Associated Parking. Access, Turning Space, Landscaping and Boundary Enclosure/Land North East of Duntrune House

We as a Community Council firmly believe in supporting the entrepreneur in developing new business opportunities in the local community. However the Community Council is concerned about the impact of amenity, the Angus Development Plan designation, traffic safety on local residents, public access, public transport provision, flooding, drainage provision and suitability of access roads in the area surrounding the proposed planning application.

1. **Policy DS1, Development Boundaries & Priorities;**

    - **Location Priorities**; This proposal will bring suburbanisation to the countryside along with associated additional vehicles mainly cars due to the limited access by public transport, walking or cycling.

      The proposed development is located on a Greenfield site and is not in accordance with the policies of the Angus Local Development Plan (ALDP). **Policy TC9 Safeguard of land for Cemetery Use** confirms that land is reserved for cemetery purposes at Aberlemno, Dunnichen Cemetery, Kirkton of Auchterhouse, Liff and Panbride. This very significant and specific cemetery policy and wider Local Development Plan makes no requirement for a new crematorium in Angus which is already well served by the existing facility in Froickheim.

2. **Traffic, Policy DS2 Accessible Development;**

    - **Accessible to existing or proposed public transport networks;** This proposal does not provide suitable access to public transport with the nearest bus stop/bus route being 1.6Km from the development. There is no form of pedestrian access from the nearest public transport point to the proposed development.

- **Make provision for suitably located public transport infrastructure such as bus stops, shelters, lay-bys;** There is no provision for any public transport infrastructure as part of this proposed development.

- **Allow easy access for people with restricted mobility;** There is no suitable access to the proposed development for individuals with restricted mobility other than motor vehicle. There is no suitable access from any of the built up areas surrounding the development.

- **Adequate local road network capacity or where capacity can be made available;** The road network surrounding the proposed development is mainly narrow country roads with acute bends with poor visibility. The proposal to install passing places to accommodate traffic where in excess of 360 vehicles potentially attending this facility a day, will seriously impact school bus transport, local farming activities and residents going about their daily lives. The ingress and egress from the Kellas Road will be a significant safety concern due to the visibility, speed of traffic and blind summit. The build up of additional traffic at the Kellas Road/Drumgieth Road/Drumsturdy Road will only exacerbate the problem of traffic delays at this busy junction.

3. **Policy DS3 Design Quality and Place making;**

- **Designing Places;** Concerns this development does not meet the six qualities of a successful place and in particular the development being well connected. This proposal does not provide connectivity for pedestrians, cyclist, provides NO options to use public transport safely and as such every attendee to the premises will require to use a motor vehicle and as such we feel the parking available is not suitable.
- **Designing Streets;** Concerns are raised regarding the position over the narrow network of roads surrounding the facility and the capacity to sustain the increased level of traffic without significant widening of all C4 roads leading to the facility. Suitable pedestrian access is not part of this design proposal and therefore not providing safe/low cost access for people unable to drive.

4. **Policy DS4 Amenity;**

- **Air Quality;** Concern with the carbon emissions of the proposed boilers for this development. For every gas cremation Approx 245kg of carbon is released into the atmosphere and there for releasing hundreds of tonnes each year. The NOx emissions produced by crematorium has raised concerns and such emissions are a danger to public health especially children. There is also a concern with potential mercury pollution, which again is linked to health issues.

- **Levels of odour, fumes and dust;** Concerns with the potential impact on the residents living in close proximity of the development and the impact of odours,

burnt particles and fumes on gardens, washing and property. Not only from the proposed development, but the significant concentration of vehicles attending the premises on a daily basis.

- **The effect and timing of traffic movement to, car parking and impacts on highway safety;** Concerns with the provision of onsite parking for large mourner groups and the impact on the surrounding residents, safety of road users when mourners are parking on the verges and on the sides of an already narrow carriageway, creating difficulties for local farmers, businesses and residents. Lack of suitable footpaths may result in visitors attending funerals who have no option but to walk from the nearest bus stops, the added danger of walking on 60mph roads, putting them and other road users at danger.

- **Residential amenity in relation to overlooking and loss of privacy;** Concerns for the residents surrounding the development who have set up home in this quiet tranquil location, to obtain some form of peaceful lifestyle and who now are going to potentially have imposed on them, hundreds of people parking outside their properties, looking into their homes and daily experiencing the upset of people having endured a personal loss.

5. **Policy TC8 Community Facilities and Services;**

    - The ALDP aims to ensure that new facilities are accessible and of an appropriate scale and nature for their location. This Crematorium proposal does not fulfil this policy due to the access availability and we feel the access routes via the road network fall short in providing safe access and egress for the users of the facility and the impact of local residents and businesses surrounding the facility.

6. **Policy PV11 Energy Efficiency;**

    - Concerns this proposed development does not meet the ethos of reducing carbon output based on the methods of operating the facility, increase in car transport and as such will only increase the carbon output into the atmosphere. It is considered that the proposed development does not follow in line with Government reduction Green House gas targets.

7. **ALDP**;

    - We consider this application is in conflict with the approved development plan, land designation, carbon reduction targets, connectivity, impact on the amenity of local residents and the safety of road users.

Murroes and Wellbank Community Council

From: Iain H Graham
Sent:14 May 2021 11:16:35 +0100
To: Fraser MacKenzie
Cc: Steven D Thomson
Subject:20/00830/FULL Erection of Crematorium Building and associated Parking, Access, Turning Space, Landscaping and Boundary Enclosures Land North East Of Duntrune House Duntrune

Fraser

I refer to the above application and would advise that as requested in my previous email both an Air Quality Impact Assessment and an Odour Impact Assessment have now been submitted on behalf of the applicant. I have looked at both documents and would provide the following comments:

Air Quality

An assessment of cremation process pollutants has been undertaken by using emission dispersion modelling software (ADMS 5.0.0.1) which is widely used and deemed acceptable for such applications. The predicted pollutant process contributions are then added to background levels and the summed levels are compared against the corresponding Air Quality Objective where one exists. The assessment adopts a number of assumptions which results in very much a worse case scenario and these are as follows:

- The relevant pollutant emission rates are assumed to be the maximum permissible in terms of PG 5/12 at all times. (NB PG 5/12 Process Guidance Note is likely to form the basis of assessing initial and ongoing compliance with any emissions to air requirements included in any authorisation that may be issued by SEPA in the future.)
- All particulate matter emitted is assumed to be PM_{10} and all NO and NO_2 emitted is assumed to be NO_2.
- Emissions equivalent to the maximum levels above are assumed as being emitted 24 hrs a day, 365 days a year.
- Predicted pollutant levels at receptor locations are based on each receptor being downwind of all emissions.
- The highest levels predicted within the model (at 100m from the stack) have been used for comparison against the relevant Air Quality Objectives rather than the lower levels predicted at the nearest locations with relevant exposure (~200m).

The assessment report concludes that the proposed cremation process would result in a negligible increase in relevant pollutant levels and that these will remain significantly below the respective Air

Quality Objectives. This Service is satisfied that both the assessment methodology and data inputs are appropriate and accepts the report findings.

Odour

The submitted Odour Impact Assessment has been undertaken using a source-pathway-receptor model utilising the "FIDOL" system contained within guidance issued by the Institute of Air Quality Management. The assessment report concludes that no significant loss of amenity should occur as a result of odours arising from the proposed cremation process. This Service is satisfied that both the assessment methodology and data inputs are appropriate and accepts the findings of the report.

Noise

I indicated in my previous email to you that whilst I was satisfied that noise from the proposed development was unlikely to give rise to significant amenity impacts due to the distances to the nearest sensitive receptors this Service would look to safeguard this position by requesting a standard noise condition be attached to any planning consent that may be granted. I would therefore be obliged if the following condition could be attached to any consent issued:

- Noise from any fixed plant associated with this development shall not give rise to a noise level assessed within any dwelling or noise sensitive building with windows partially open for ventilation, in excess of that equivalent to Noise Rating Curve 30 between 0700 and 2200 and Noise Rating Curve 20 at all other times.

I trust you find the above response acceptable and I thank you for the opportunity to comment on this application. Should you wish to discuss anything further please do not hesitate to contact me.

Regards

Iain

Iain Graham | **Environmental Health Officer** | Angus Council - Place | Housing, Regulatory and Protective Services | Angus House, Orchardbank Business Park, Forfar, DD8 1AN | ☎01307 492026

From: Planning South East
Sent:28 May 2021 13:48:14 +0100
To: Fraser MacKenzie
Cc:PLNProcessing
Subject:20/00830/FULL Crematorium at Land North East of Duntrune House - SEPA comments

OFFICIAL ☐ BUSINESS

Fraser

20/00830/FULL

Erection of Crematorium Building and associated Parking, Access, Turning Space, Landscaping and Boundary Enclosures

Land North East Of Duntrune House, Duntrune

I refer to the application detailed above.

The cremation of human remains is a relevant activity under the Pollution Prevention and Control (PPC) Regulations (chapter 5, Section 5.1 Part B) therefore the applicant will require a permit from SEPA under these Regulations to operate. In line with PAN 51 guidance, we need certain information about a development to be submitted with the planning application in order to be able to provide a view on whether the associated activity is potentially capable of being consented. It is on this basis that our comments in respect of air quality below are made.

Based on the information available to us, we lodge a **holding objection** to this application because there is insufficient information to demonstrate that the proposed stack height has been suitably assessed to ensure it accords with the principle of Best Available Techniques (BAT).

The proposed stack is assumed by us to be 10m based on building design plans, but a stack height assessment should form part of the Air Quality Impact Assessment (AQIA) for BAT purposes

We would request clarification over the receptors. The approach taken to assessment differs from the norm as the applicant has not assessed compliance with air quality standards (AQS) at receptors, rather they have assessed it at the location of highest impact.

We ask for further info in relation to the following:

1. How many receptors are within the scope of the study? Please provide a table of receptors showing distance from proposed site and type (residential or other). The applicant states that there are dwellings within 800 -1000m from the site ☐ have these been included in the assessment? If not please provide a justification for exclusion.
2. Table 5 needs to be amended to show PC, PEC and % of the AQS at each receptor within the scope of the study
3. A stack height assessment should be carried out and included in the AQIA for BAT purposes
4. Please confirm which site the meteorological data is from. We recommend 5 years met data is used for AQIA with the ☐worst case☐ concentrations reported. It appears only 1 year☐s data has been used in this case and the year isn☐t specified.

I trust these comments are of assistance ☐ please do not hesitate to contact me if you require any further information.

Regards

Alasdair

Alasdair Milne

Senior Planning Officer

Scottish Environment Protection Agency

Strathallan House

Castle Business Park

Stirling

FK9 4TZ

Telephone 01786 452537

Mobile [redacted]

www.sepa.org.uk

Disclaimer This advice is given without prejudice to any decision made on elements of the proposal regulated by us, as such a decision may take into account factors not considered at this time. We prefer all the technical information required for any SEPA consents to be submitted at the same time as the planning or similar application. However, we consider it to be at the applicant's commercial risk if any significant changes required during the regulatory stage necessitate a further planning application or similar application and/or neighbour notification or advertising. We have relied on the accuracy and completeness of the information supplied to us in providing the above advice and can take no responsibility for incorrect data or interpretation, or omissions, in such information. If we have not referred to a particular issue in our response, it should not be assumed that there is no impact associated with that issue. For planning applications, if you did not specifically request advice on flood risk, then advice will not have been provided on this issue. Further information on our consultation arrangements generally can be found on our website planning pages

Courtney Summers (Brodies Solicitors)

Subject: Fw: Proposed Crematorium at Duntrune
Attachments: Bus Routes - Xplore Dundee.docx

From: Marc Winsland <marc.winsland@mcgillsbuses.co.uk>
Sent: 08 September 2021 22:52
To: AllardiceJ <AllardiceJ@angus.gov.uk>; leithiks@angus.gov.uk <leithiks@angus.gov.uk>; bennetts@angus.gov.uk <bennetts@angus.gov.uk>
Cc: [redacted]
Subject: Fw: Proposed Crematorium at Duntrune
Hi folks,

Guthrie Batchelor recently contacted us about forthcoming plans for a new crematorium near Burnside of Duntrune. He suggests that a bus stop could be located nearby and, of course, we'd be happy with anything to improve accessibility and make a service more useful for people.

With bus stop infrastructure being in the domain of the local authority, do you suppose this is something you'd be happy to explore?

Thanks,

Marc Winsland
Commercial Manager
T: 01382 340009
M: [redacted]
XPLORE a subsidiary of McGill's Dundee

From: travelcare <travelcare@mcgillsbuses.co.uk>
Sent: Wednesday, August 25, 2021 9:32 AM
To: Carole Roger <carole.roger@mcgillsbuses.co.uk>; Marc Winsland <marc.winsland@mcgillsbuses.co.uk>
Subject: Fw: Proposed Crematorium at Duntrune
Thought you guys would appreciate me forwarding this on to you both.

Wilma Flynn
Customer Services
T: 01382 340018
XPLORE a subsidiary of McGill's Dundee

From: Guthrie Batchelor [redacted]>
Sent: Tuesday, August 24, 2021 11:16 AM
To: travelcare <travelcare@mcgillsbuses.co.uk>
Subject: Proposed Crematorium at Duntrune
Good Afternoon,

We're currently going through the planning application process for a crematorium on the outskirts of Dundee. Please find attached drawings which outlines our site location and one of your existing routes.

We're aware that you have buses stopping fairly regularly at Burnside of Duntrune. We thought it was about the right time to contact yourselves to ask if you would facilitate a stop at our proposed site if demand dictated? We would either have a bus stop on the C4 road or contain one within the site.

If you have any queries at all please do not hesitate to get in touch.

Regards,

Guthrie Batchelor
[redacted]

POST-APPLICATION CONSULTATION RESPONSE REPORT

POST APPLICATION CONSULTATION REPORT

ERECTION OF CREMATORIUM BUILDING AND ASSOCIATED PARKING, ACCESS, TURNING SPACE, LANDSCAPING AND BOUNDARY ENCLOSURES ON LAND NORTH EAST OF DUNTRUNE HOUSE, DUNTRUNE (REF: 20/00830/FULL)

April 2021

REPORT PREPARED BY EMAC PLANNING ON BEHALF OF DUNTRUNE LIMITED

CONTENTS:

1.1 This Post-Application Consultation report has been prepared by Emac Planning to provide the applicants views on issues raised through consultee and third party representations received by Angus Council in response to the submission and advertisement of the following application for planning permission:

"ERECTION OF CREMATORIUM BUILDING AND ASSOCIATED PARKING, ACCESS, TURNING SPACE, LANDSCAPING AND BOUNDARY ENCLOSURES ON LAND NORTH EAST OF DUNTRUNE HOUSE, DUNTRUNE (REF: 20/00830/FULL)" on behalf of the applicant, Duntrune Limited.

1.2 It is our understanding that comments have been received from internal consultees and various interested third parties, both in support of and objecting to the proposals.

1.3 This report seeks to identify the main material planning issues raised through the various Statutory Consultee, Angus Council internal responses and external third party consultation responses and provides an assessment of each. As is common with applications for planning permission, there is to some degree overlap between consultee comments; Community Council comments and third party responses, although the intent within this report is to cover all relevant planning matters that have been raised.

1.4 At the time of writing there were a considerable number of objections and statements of support on the Angus Council planning portal and the applicant welcomes the interest that this new and exciting proposal has generated. Overall, the level of public interest from a well organised community is of course noted and appreciated, with both objections and statements of support submitted in response to the submission of the application. Local views, whilst encouraged through the consultation process, are of course only one consideration to be set alongside other planning issues and the planning authority can only consider objections or letters of support that raise relevant to planning issues. These can include, for example, the effect of the proposed development on traffic and parking, the appearance of the area, loss of significant landscape features, noise and disturbance, or adverse effect on privacy. Indeed, in our analysis of the submitted representations it is clear that many of the objectors have used similar generic lists as a guide to voice their concerns regarding the development. Many of the local supporters list positives such as the location; the associated community benefits to the area; the local economic benefits and the dearth of local crematoria provision.

1.5 In summary, it remains the applicants view that the matters raised by the various third party objectors do not have material weight and the proper and a rounded analysis of the Development Plan and relevant material considerations continue to support the approval of planning permission.

1.7 For ease of reference, this report therefore lists and analyses the 4 categories of respondent as follows.

- **Statutory Consultees;**
- **Angus Council Departmental Responses;**
- **Murroes and Wellbank Community Council; and**
- **Third Party Representations.**

2.0 Statutory Consultees

2.1 Statutory consultees submissions have been received and are responded to as follows:

- **Dundee City Council** (4th February 2021):
    - The Transport Assessment has been reviewed and there are no comments from a roads perspective.
    - ***Response:*** Noted.
    - The application, located only 1km from the DCC boundary, does not raise

any issues of strategic significance.
    - ***Response:*** Noted.
    - Overall, DCC have no objections to the proposals.
    - ***Response:*** Noted.

- **Scottish Water** (22nd December 2020):
    - Confirmed no objection to the application and advisory notes provided on the various assessments required.
    - ***Response:*** Noted, no actions are required in relation to the Scottish Water consultation responses at this stage of the planning process.

- **SEPA:**
    - Whilst no response has been received, it is the applicants understanding that any new crematorium will require further authorization from SEPA under 5.1, Part B, © of the Pollution Prevention Control Regulations 2012 (PPC) "cremation of human remains". This is not a material planning consideration and therefore there is no requirement to await a response from SEPA.

3.0 Angus Council

3.1 Angus Council internal consultee responses have been posted on the portal and are responded to as follows:

- **EIA Screening Opinion** (not dated):
    - The proposal does not require the submission of an Environmental Impact Assessment Report.
    - ***Response:*** Noted.
- **Archaeology** (29th December 2020):
    - No archaeological mitigation required.
    - ***Response:*** Noted.
- **Traffic Manager, Roads** (19th January 2021):
    - Acknowledges the submission of the TA and advises that the application has been considered in terms of traffic generation and impact on the public road network including specific matters of pedestrian accessibility; cycling accessibility; public transport; road network and access; and parking. In conclusion, no objection to the application subject to recommended conditions covering matters regarding access / visibility splays; improvements to public roads including passing places; and parking.
    - ***Response:*** Noted, the applicant acknowledges and accepts the proposed conditions.
- **Environmental Health Officer** (11th January 2021):
    - An assessment should be undertaken in accordance with the Local Air Quality Management Technical Guidance TG(16) and should also consider potential odour impacts at sensitive locations.
    - ***Response:*** Ethos Environmental have now prepared an Air Quality Impact Assessment and an Odour Impact Assessment. In summary, the overall air quality impact associated with the development can be assumed as negligible and no further evaluation is merited and no potential specific mitigation measures for air quality are warranted. Regarding the likely impact of odour on residential receptors is not sufficiently significant to warrant recommendation of additional pro-active mitigation and control measures. Both documents have now been submitted in support of the proposals.

4.0 Murroes and Wellbank Community Council

4.1 Murroes and Wellbank Community Council (CC) commented on the proposal as below, with the applicants responses also set out below. Whilst not within their area, we note that Fintry Community Council also commented on the proposals in terms of matters associated with loss of residential amenity; inappropriate community use; concerns with regard to road traffic; and insufficient parking provision. With all due respect to Fintry Community Council, these matters are covered elsewhere within this report and do not require repetition here. With some overlap with the Fintry Community Council submissions, the following comments are therefore provided in response to the Community Council that covers the application area, i.e. Murroes and Wellbank Community Council (CC). Please also note, the CC submission included 7 numbered titles with bullets beneath, therefore for ease of reference, the same numbering / bullets are used to provide the applicants response.

- ***CC:*** As a Community Council, firmly believe in supporting the entrepreneur in developing new business opportunities in the local community.
- ***Response:*** Noted and appreciated.
- ***CC:*** Concerned about lack of amenity, the Angus Local Development Plan designation, traffic safety on local residents, public access, public transport provision, flooding, drainage provision and suitability of access roads in the surrounding area.
- ***Response:*** The concerns are noted and responded to in detail as follows.
- ***CC: (1)*** **Policy DS1, Development Boundaries & Priorities.** This proposal will bring suburbanisation to the countryside along with associated additional vehicles, mainly cars, due to the limited access by public transport, walking or cycling.
- ***Response:*** A Planning, Design and Access Statement was submitted with the application pack and specifically addresses LDP Policy DS1 and the proposals compatibility with that policy. In particular, the applicant has undertaken an appropriate test in satisfaction that there are no alternative sites available. Whilst this approach has been criticised by others, including Clyde & Co on behalf of Dignity Funerals Limited*, no alternative evidence has been submitted to dispute the findings as set out within the applicant statement. As a general comment at this point, it is of course notable that the Community Council and for example Clyde and Co, have submitted statements seeking to discredit the submitted evidence, including the diligently carried out sequential test, whilst offering no counter evidence of their own. It is of course open to objectors to present counter evidence regarding for example the approach the applicant has taken to a sequential test in accordance with Policy DS1, however they have apparently declined to produce an opposing position, instead relying on often vague allegations with no actual substance. The applicant continues to diligently prepare and submit the required information and more weight must therefore be given to the applicants professional submissions, unless counter positions are prepared and put forward for anlaysis. In short, the positions put forward by the Community Council, Clyde & Co and the various third party objectors are not supported by any reasonable professional analysis. No weight can therefore be given to the various subjective statements and the unsubstantiated opinions certainly cannot carry more weight than professional reports prepared on the various matters. * We note that a letter of objection has been submitted by Clyde & Co on behalf of Dignity Funerals Limited. We have little to say on that particular representation which should be seen in context. It is a representation submitted by the legal representative of a competing company which no doubt sees a commercial benefit in frustrating the grant of planning permission for a crematorium on the site.

- ***CC:*** The proposed development is located on a Greenfield site and is not in accordance with the policies of the Angus Local Development Plan (ALDP). **Policy TC9 Safeguard of land for Cemetery Use** confirms that land is reserved for cemetery purposes at Aberlemno, Dunnichen Cemetery, Kirkton of Auchterhouse, Liff and Panbride. This very significant and specific cemetery policy and wider Local Development Plan makes no requirement for a new crematorium in Angus which is already well served by the existing facility in Friockheim.
- ***Response:*** With respect, LDP Policy TC9 relates to safeguarding of land for cemetery use and has no relevance to a proposal for a crematorium. Regarding the requirement for a new crematorium, this is covered in detail in the submitted Planning, Design & Access Statement which demonstrates a need and demand for the facility and the significant reduction in journey times for local crematorium services compared to journey times to Friockheim, Dundee or even Perth & Kinross.
- ***CC: (2)* Traffic, Policy DS2 Accessible Development. Accessible to existing or proposed public transport networks;** This proposal does not provide suitable access to public transport with the nearest bus stop/bus route being 1.6Km from the development. There is no form of pedestrian access from the nearest public transport point to the proposed development.
- ***Response:*** People travelling to cremations, due to the upsetting nature of the event, generally do not travel by public transport and alternatively pre-arrange car sharing. Provision has however already been made on site for buses access and turning. Whilst the distance to walk to a bus stop is above the desired 400m, any funeral attendee would be making this journey as a one off. It would be expected that for those travelling to a funeral without access to a private car, a lift from a friend or family member, a taxi or a private coach would be the more usual modes of transport. Generally, funerals by their very nature tend to lend themselves to car sharing for attendees. In terms of staffing, there are only 4 full time staff associated with the crematorium therefore the impact of the lack of nearby bus services is considered to be minimal. In summary, the setting and general environs of a crematorium require that it is situated away from residential developments and as such, it is therefore difficult to locate this where there are existing regular and convenient bus services. Finally, as would be expected, when assessing the proposals the Councils Traffic Manager: Roads considered the question of access to public transport, noting that given the rural nature of the site there is little opportunity for crematorium staff or visitors to travel to and from the site by public transport. Reasonably, travel to the site by bus would therefore be via private hire, where parking would be clearly be available on site. The Councils Traffic Manager: Roads offered no objection to the proposals, subject to appropriate conditions. The position regarding public transport cannot therefore be considered a reasonable reason for refusal.
- **CC: Make provision for suitably located public transport infrastructure such as bus stops, shelters, lay-bys;** There is no provision for any public transport infrastructure as part of this proposed development.
- **Response:** As referenced in detail above, above, the Councils Traffic Manager: Roads has considered this aspect of the proposal and offered no objection; the lack of public transport provision cannot therefore be considered a reasonable reason for refusal.
- ***CC:* Allow easy access for people with restricted mobility;** There is no suitable access to the proposed development for individuals with restricted mobility other than motor vehicle. There is no suitable access from any of the built up areas surrounding the development.

- ***Response:*** The position regarding public transport access is referenced in detail above. Specifically regarding disabled access, 7 disabled parking bays will be required by condition, a condition proposed by and agreed with the Councils Traffic Manager: Roads, and the building will be wheelchair accessible.
- **CC: Adequate local road network capacity or where capacity can be made available;** The road network surrounding the proposed development is mainly narrow country roads with acute bends with poor visibility. The proposal to install passing places to accommodate traffic where in excess of 360 vehicles potentially attending this facility a day, will seriously impact school bus transport, local farming activities and residents going about their daily lives. The ingress and egress from the Kellas Road will be a significant safety concern due to the visibility, speed of traffic and blind summit. The build up of additional traffic at the Kellas Road/Drumgieth Road/Drumsturdy Road will only exacerbate the problem of traffic delays at this busy junction.
- **Response:** The submitted Transport Assessment assessed the surrounding road network in great detail, including traffic counts and speed surveys. Within the TA, anticipated trip generation was based on two similar crematoria developments at Friockheim, Angus and at 100 Acre Wood, Fife. Both very local and relevant comparators. In assessing the relevant submissions, the Councils Traffic Manager: Roads agreed and accepted that the anticipated aggregated traffic flows will be below a level that would be expected to cause capacity and queuing issues. The Traffic Manager: Roads therefore offered no objection in relation to anticipated impact on the local road network.
- **CC. (3) Policy DS3 Design Quality and Place making; Designing Places;** Concerns this development does not meet the six qualities of a successful place and in particular the development being well connected. This proposal does not provide connectivity for pedestrians, cyclist, provides NO options to use public transport safely and as such every attendee to the premises will require to use a motor vehicle and as such we feel the parking available is not suitable.
- **Response:** Matters in relation to connectivity for pedestrians, cyclists and public transport are considered above and also within the formal consultation response provided by the Councils Traffic Manager: Roads, who offered no objection to the proposals. With regard to the six qualities of successful place, a Planning, Design & Access Statement was submitted in support of the application and included a specific and detailed section which set out the design proposals. In formulating the proposals, clear direction was also taken from Angus Councils Design & Placemaking Supplementary Guidance (October 2018) which advocates a design led approach to developing proposals and the need to demonstrate an understanding of the site and its wider context. It also sets out specific design requirements to ensure that places meet the design qualities of distinct in character, safe and pleasant, well connected, adaptable and resource efficient. The Community Council do not set out how the proposals do not meet these requirements whereas the applicant has within the detailed design statement. Again, in particular we note that the Traffic Manager: Roads offered no objection regarding the criteria 'well connected'.
- **CC. Designing Streets;** Concerns are raised regarding the position over the narrow network of roads surrounding the facility and the capacity to sustain the increased level of traffic without significant widening of all C4 roads leading to the facility. Suitable pedestrian access is not part of this design proposal and therefore not providing safe/low cost access for people unable to drive.
- **Response:** As referenced above, the submitted Transport Assessment assessed the surrounding road network in great detail, including traffic counts, speed surveys and

pedestrian access. Within the TA, anticipated trip generation was based on two similar crematoria developments at Friockheim, Angus and at 100 Acre Wood, Fife. Both very local and relevant comparators. In assessing the relevant submissions, the Councils Traffic Manager: Roads agreed and accepted that the anticipated aggregated traffic flows will be below a level that would be expected to cause capacity and queuing issues. The Traffic Manager: Roads therefore offered no objection in relation to anticipated impact on the local road network or in relation to pedestrian links. The position of no objection is of course caveated with the recommendation that any consent granted shall include conditions relating, amongst other matters, to visibility splays and a proposed scheme of improvements to local public roads. The applicant has confirmed agreement with the proposed conditions.

- **CC (4) Policy DS4 Amenity; Air Quality;** Concern with the carbon emissions of the proposed boilers for this development. For every gas cremation Approx 245kg of carbon is released into the atmosphere and there for releasing hundreds of tonnes each year. The NOx emissions produced by crematorium has raised concerns and such emissions are a danger to public health especially children. There is also a concern with potential mercury pollution, which again is linked to health issues.
- **Response:** In respect of air quality, whilst data obtained from other installations was submitted, the Councils Environmental Health Officer requested that a detailed assessment of the potential impact of emissions to air and odour from the operation of the cremator be undertaken. As referenced above, the appropriate information has now been submitted and suitably demonstrates no adverse issues.
- **CC: Levels of odour, fumes and dust;** Concerns with the potential impact on the residents living in close proximity of the development and the impact of odours, burnt particles and fumes on gardens, washing and property. Not only from the proposed development, but the significant concentration of vehicles attending the premises on a daily basis.
- **Response:** Technical information regarding emissions and the cremator itself have been submitted within the application pack and present no material planning issues of concern.
- **CC: The effect and timing of traffic movement to, car parking and impacts on highway safety;** Concerns with the provision of onsite parking for large mourner groups and the impact on the surrounding residents, safety of road users when mourners are parking on the verges and on the sides of an already narrow carriageway, creating difficulties for local farmers, businesses and residents. Lack of suitable footpaths may result in visitors attending funerals who have no option but to walk from the nearest bus stops, the added danger of walking on 60mph roads, putting them and other road users at danger.
- **Response:** There will be no requirement for mourners to park on verges and / or on the side of the road. The proposed parking arrangements were assessed in the TA and the Councils Traffic Manager: Roads assessed the proposed parking arrangements and has offered no objection subject to a proposed condition setting out minimum rates for cycles; motorcyles; cars and disabled bays. The applicant has accepted the proposed condition.
- **CC: Residential amenity in relation to overlooking and loss of privacy;** Concerns for the residents surrounding the development who have set up home in this quiet tranquil location, to obtain some form of peaceful lifestyle and who now are going to potentially have imposed on them, hundreds of people parking outside their properties, looking into their homes and daily experiencing the upset of people having endured a personal loss.

- Response: The proposal ensures adequate parking and residential amenity will be assured through appropriate planning conditions relating to the treatment and maintenance of the site boundaries.
- **CC (5) Policy TC8 Community Facilities and Services;** The ALDP aims to ensure that new facilities are accessible and of an appropriate scale and nature for their location. This Crematorium proposal does not fulfil this policy due to the access availability and we feel the access routes via the road network fall short in providing safe access and egress for the users of the facility and the impact of local residents and businesses surrounding the facility.
- **Response:** Detailed responses regarding accessibility are set out above and the conclusion from the Councils Traffic Manager: Roads is of course that there will be no adverse impact for users of the facility, local residents or businesses.
- ***CC: (6) Policy PV11 Energy Efficiency;*** Concerns this proposed development does not meet the ethos of reducing carbon output based on the methods of operating the facility, increase in car transport and as such will only increase the carbon output into the atmosphere. It is considered that the proposed development does not follow in line with Government reduction Green House gas targets.
- ***Response:*** This very generalised contention is simply not correct or accepted. The proposal will promote, enhance and add to biodiversity, it will include water and energy conservation measures such as waste heat recovery and passive solar gain and it will incorporate appropriate waste recycling, segregation and collection facilities and the applicant will seek to minimise waste by design and during construction. Regarding emissions, the requisite information has been submitted within the application pack and no materially detrimental position will be created.
- ***CC: 7. ALDP;*** We consider this application is in conflict with the approved development plan, land designation, carbon reduction targets, connectivity, impact on the amenity of local residents and the safety of road users.
- ***Response:*** It remains the applicants position that the proposals have been well thought through and are entirely appropriate.

5.0 Third Party Representations

5.1 The following table sets out the prominent matters raised by interested third parties through the consultation process. Is should be noted that some of the representations are commercial objections by competing operators although in a spirit of cooperation, very little reference is made to that fact below, with equal weighting of response given to each. Similarly, the statements of support are provided with equal weighting.

5.2 As noted above, the level of public interest from a well organised community is of course noted and appreciated, with both objections and statements of support lodged in response to the submission of the application.

5.3 Whilst it is impractical to respond to each individual point raised / respondent, the following table seeks to identify the main issues raised through the various third party consultation responses and provide the applicants comments on each.

COMMENT	RESPONSE
The Principle of Development / Location	
Object to the principle of any development on the site.	The site is promoted as a windfall site, i.e. a site which has become available for development unexpectedly during the life of the development plan and so is not identified individually in the plan.
The site is not allocated for the proposed use within the Angus LDP.	As above, the site is promoted as a windfall site, i.e. a site which has become available for development unexpectedly during the life of the development plan and so is not identified individually in the plan.
Support for the principle of development as an essential facility.	Noted and agreed.
The proposed site is well situated to serve the growing population in the Monifieth / Broughty Ferry / South Angus area.	Noted and agreed.
The site location is appropriately positioned close to Pitkerro Cemetery, which when built the plan recognised the potential for a crematoria to be built in the vicinity.	Noted and agreed.
Development Plan	
TAYplan Policy 1 Locational Priorities: Proposals for development in the countryside should be assessed against the need to avoid suburbanisation and unsustainable patterns of development. No landscape assessment has been submitted.	The position of the building nestles within the general fall of the site. This combined with the surrounding landscape, trees, etc screen the proposals completely from the west round to the east. Viewing from the adjacent road is screened by a new dry-stone wall and hedge / tree planning. The site is further screened by the mature trees to the south of the road. Additional native tree planting is incorporated into the proposals particularly to the east, screening the proposals further from this angle and further enhancing the sense of enclosure. The position of the crematorium building within the site has been carefully chosen, so that it nestles within a natural landscape. Its location within the site will mean that it is not visible from the west, north or east and is barely visible from the south. Views from the south will be from distant vantage points and will be mostly obscured by trees along public roads. The principal view into the site will be when passing on the adjacent road along the south side of the site, which will be glimpse views through the proposed planting and screened by a new drystone wall and hedging. The proposals are therefore considered acceptable from a landscape impact perspective and no further landscape assessment is required.

LDP Policy DS1 Development Boundaries and Priorities: Development of greenfield sites will only be supported where no suitable and available brownfield sites capable of accommodating the proposed development are available. The site is not allocated for the proposed development.	An appropriate assessment was carried out, the detail of which is included in the submitted Planning and Design Statement. The site is promoted as a windfall site, i.e. a site that has become available for development unexpectedly during the life of the development plan and so is not identified individually in the plan.
LDP DS4 Amenity: Development will not be permitted where there is an unacceptable adverse impact on the surrounding area or the environment or amenity of existing or future occupiers of adjoining or nearby residents, including traffic movements to and from the site.	There are only three dwellings within 300m of the crematorium building. With the nearest dwelling some 183 meters away and the intervening mature woodland means that the site will not be directly visible from any dwelling houses or the surrounding areas. Proposed traffic movements have been assessed by Angus Council Roads and found to be acceptable.
LDP TC8 Community Facilities and Services requires that these should be accessible and of an appropriate scale and nature for the location.	Detailed responses regarding TC8 criteria and accessibility are set out above and the conclusion from the Councils Traffic Manager: Roads is of course that there will be no adverse impact for users of the facility, local residents or businesses.
LDP TC9 Safeguard of land for Cemetery Use confirms locations reserved for cemetery purposes. The policy makes no requirement for a new crematorium therefore there is no need.	With respect, LDP Policy TC9 relates to safeguarding of land for cemetery use and has no relevance to a proposal for a crematorium. Regarding the requirement for a new crematorium, this is covered in detail in the submitted Planning, Design & Access Statement which demonstrates a need and demand for the facility and the significant reduction in journey times for local crematorium services compared to journey times to Friockheim, Dundee or even Perth & Kinross.
LDP TC15 Employment Development governs class 4, 5 or 6 development outwith development boundaries and will only support where the scale and nature of the development is in keeping with the character of the local landscape and pattern of development.	Policy TC15 does not apply in the consideration of a proposal for a crematorium.
LDP PV6 Development in the Landscape allows for development which has an adverse effect on landscape in selected contexts; and should minimise adverse impacts where appropriate through mitigation.	The position of the building nestles within the general fall of the site. This combined with the surrounding landscape, trees, etc screen the proposals completely from the west round to the east. Viewing from the adjacent road is screened by a new dry-stone wall and hedge / tree planning. The site is further screened by the mature trees to the south of the road. Additional native tree planting is

	incorporated into the proposals particularly to the east, screening the proposals further from this angle and further enhancing the sense of enclosure. The position of the crematorium building within the site has been carefully chosen, so that it nestles within a natural landscape. Its location within the site will mean that it is not visible from the west, north or east and is barely visible from the south. Views from the south will be from distant vantage points and will be mostly obscured by trees along public roads. The principal view into the site will be when passing on the adjacent road along the south side of the site, which will be glimpse views through the proposed planting and screened by a new drystone wall and hedging. The proposals are therefore considered acceptable from a landscape impact perspective.
Traffic / Sustainable and Safe Transport / Parking	
Traffic counts were not taken at appropriate times.	The Traffic Manager, Roads has no objection to the application subject to recommended conditions covering matters regarding access / visibility splays; improvements to public roads including passing places; and parking.
Lack of accessibility by walking, cycling and by public transport. No mitigtion is proposed for any of these elements. LDP Policy DS3 Design Quality and Placemaking states that proposals should be well connected, where development connects pedestrian, cyclists and vehicles with the surrounding area and public transport, the access and parking requirements of the Roads Authority are met and the principles set out in Designing Streets are addressed.	The Traffic Manager, Roads has no objection to the application subject to recommended conditions covering matters regarding access / visibility splays; improvements to public roads including passing places; and parking.
The surrounding roads are narrow and subject to use by farm vehicles.	The Traffic Manager, Roads has no objection to the application subject to recommended conditions covering matters regarding access / visibility splays; improvements to public roads including passing places; and parking.
Note that Angus Council have requested an increase in overspill parking and this should be provided.	This has been provided and the Traffic Manager, Roads has no objection to the application subject to recommended conditions covering matters regarding access / visibility splays; improvements to public roads including passing places; and parking.
Appropriate visibility splays should be conditioned.	The Traffic Manager, Roads has no objection to the application subject to recommended conditions covering matters regarding access / visibility splays; improvements to public roads including passing places; and parking.

LDP Policy DS2 Accessible Development requires development proposals to demonstrate that they are accessible to public transport; easy access for people with restricted mobility; safe and pleasant for walkers and cyclists; located where local road network capacity exists of can be made.	The Traffic Manager, Roads has no objection to the application subject to recommended conditions covering matters regarding access / visibility splays; improvements to public roads including passing places; and parking.
Residential Amenity	
Loss of residential amenity by virtue of traffic disruption, noise and general disturbance.	Please refer to the detailed responses provided above in response to the Community Councils queries regarding residential amenity.
Conflict with the 1902 Act	
To avoid conflict with the Act, the applicant should clearly evidence that there are no properties within 200 yards of the proposed development; or it has obtained express consent in writing from the owners of any such properties to the construction of the Proposed Development.	Please refer to the detail in the Planning and Design Statement.
Alternative Sites	
LDP Policy DS1 requires an assessment of alternative sites. The assessment undertaken is wholly inadequate. The assessment should apply beyond the south angus area and has only carried out a high level assessment of the housing land and employment land audits.	With all due respect, the professional respondent, either mistakenly or intentionally, misinterprets the policy. The policy requires an assessment of sites that are suitable and available, it does not require an assessment of all sites within Angus. Neither does it require an assessment of sites outwith an operating area. Acting on behalf of Dignity Funerals Limited, the competing operator makes accusations of alternative sites being available without carrying out any analysis to prove the case. It should be noted that the only reason that we reference the respondent for this comment is that they have the capacity to carry out an alternative analysis. The fact that they have not speaks for itself. This is an objection seeking to present unsubstantiated doubt rather than robust contradictory evidence.
Inappropriate rural location and an urban setting would be better.	The 'Federation of Burial and Cremation Authorities', which is the principal representative of burial and cremation authorities states the following in its guidance: A minimum of two hectares, approximately five acres, per estimated 1,000 cremations per annum is recommended to provide sufficient space for the crematorium, gardens of remembrance, traffic circulation, parking, and a modest amount of space around the building. Ideal sites are rarely to be located in urban areas and it is emphasised that suitability of setting is of

	greater importance than its location in close proximity to population centres. Site selection should be aimed at achieving quietness and seclusion. A woodland or parkland setting, or an area of undulating ground with good natural features and mature trees, would enable the establishment of a good natural setting with a minimum of horticultural treatment. Previously developed land can often prove unsuitable, due to land contamination, which is unacceptable for the interment of ashes, or due to the presence of residential property within 200 yards. There is a growing recognition that new crematoria will be built in a countryside location close to the urban fringe. With detailed reference to this guidance, the proposals are clearly entirely appropriate within their rural context.
Need Case	
The need case has no suitably been demonstrated.	This is disputed, the detail of which is included within the submitted Planning and Design Statement.
There is spare capacity at Dundee crematorium and Friockheim crematorium.	This is disputed, the detail of which is included within the submitted Planning and Design Statement.
Dundee crematorium is 85 years old with a chronic lack of parking and little opportunity to expand; this regularly causes parking queuing and overspill to adjacent neighbouring residential streets.	Noted and agreed.
Creating an additional crematoria towards the east of Dundee will much better serve the City and south angus as a whole and distribute access to this vital facility more evenly, reducing journey times and increasing sustainability.	Noted and agreed.
Economic Benefits	
The economic benefits have been overstated.	There is absolutely no justification provided for this statement, which is disputed and the detail of the applicants position is included within the submitted Planning and Design Statement.
The proposed crematoria is ideally positioned in close proximity to hotel and function room facilities within a 10 minute drive and to various accommodation providers, thereby benefiting the local economy and sustaining local employment	Noted and agreed.

and income.	
Direct employment will benefit through construction and the long-term operational jobs.	Agreed.
Ecology / Trees	
Loss of further habitat patronised by local wildlife such as red squirrels and birds of prey.	The site is limited to the agricultural field and as such does not provide a diverse wildlife habitat. The proposals will increase habitat diversity.
Impact on Trees	The existing trees out with the site will be unaffected by the proposals. Extensive additional tree planting has been included in the proposals.
Miscellaneous	
An increase in number of vehicles on local narrow roads has potential to cause problems for local horse owners and make it difficult for them to exercise their horses safely on the road.	The Traffic Manager, Roads has no objection to the application subject to recommended conditions covering matters regarding access / visibility splays; improvements to public roads including passing places; and parking.
Whilst planning consent for housing rightly considers and often stipulates the increase in schooling, health care and other amenities to support the growth of population in an area, so it must apply that a consistent attitude to funeral and crematoria provision which are equally essential requirements of any community.	Agreed.

Conclusion

6.1 In conclusion, this report demonstrates the support of statutory consultees and the various internal Angus Council Departments. There are no outstanding matters that cannot be covered by appropriate condition.

6.2 Responses are also provided above to the representations made by the Community Council and the prominent matters raised by third parties. In summary, it remains the applicants view that the concerns raised by the Community Council and third parties are not supported by any planning evidence and the relevant material considerations, subject to appropriate conditions, continue to support the approval of planning permission.

Funerals Market Investigation

Crematoria: background and market structure

30 January 2020

This is one of a series of consultative working papers which will be published during the course of the investigation. This paper should be read alongside the Issues Statement published on 8 April 2019 and other working papers published.

These papers do not form the inquiry group's provisional decision report. The group is carrying forward its information-gathering and analysis work and will proceed to prepare its provisional decision report, which is currently scheduled for publication in April/May 2020, taking into consideration responses to the consultation on the Issues Statement and

responses to the working papers as well as other submissions made to us.

Parties wishing to comment on this paper should send their comments to Funerals@cma.gov.uk by 27 February 2020.

The Competition and Markets Authority has excluded from this published version of the working paper information which the inquiry group considers should be excluded having regard to the three considerations set out in section 244 of the Enterprise Act 2002 (specified information: considerations relevant to disclosure). The omissions are indicated by [✂]. Non-sensitive wording is also indicated in square brackets.

Contents

Page

Executive summary

1. This paper discusses the evidence we have gathered in relation to industry background and market structure, in particular:

   (a) The number of cremation services conducted, revenue mix and uptake of optional services;

   (b) the number of crematoria, and how many rivals they face; and,

   (c) barriers to entry.

2. Our analysis shows that most crematoria face a limited number of rivals in their local areas. In particular, around half of crematoria face no rivals within a 30-minute cortege drive time, and only a small number of crematoria have three or more rivals within a 30-minute cortege drive time (we would typically expect that in a local market with four or more competitors, competition may be sufficient). Some crematoria may be capacity constrained and may therefore not act as a strong constraint on rival crematoria.

3. We have received evidence that barriers to entry exist in relation to the planning regime and the economics of operating a crematorium. The planning regime may reinforce the economic barriers to entry, as well as reducing the risk for existing operators of facing new entry. Crematoria providers have told us of only a small number of areas where entry would have likely occurred absent the needs test in the planning regime. Our analysis suggests that newer crematoria (which have been built predominately by private crematoria providers) have delivered additional capacity to help meet growing demand (on average, volumes at crematoria have remained stable over the last ten years, although this is variable, with crematoria experiencing nearby entry seeing reduced volumes).

Industry background

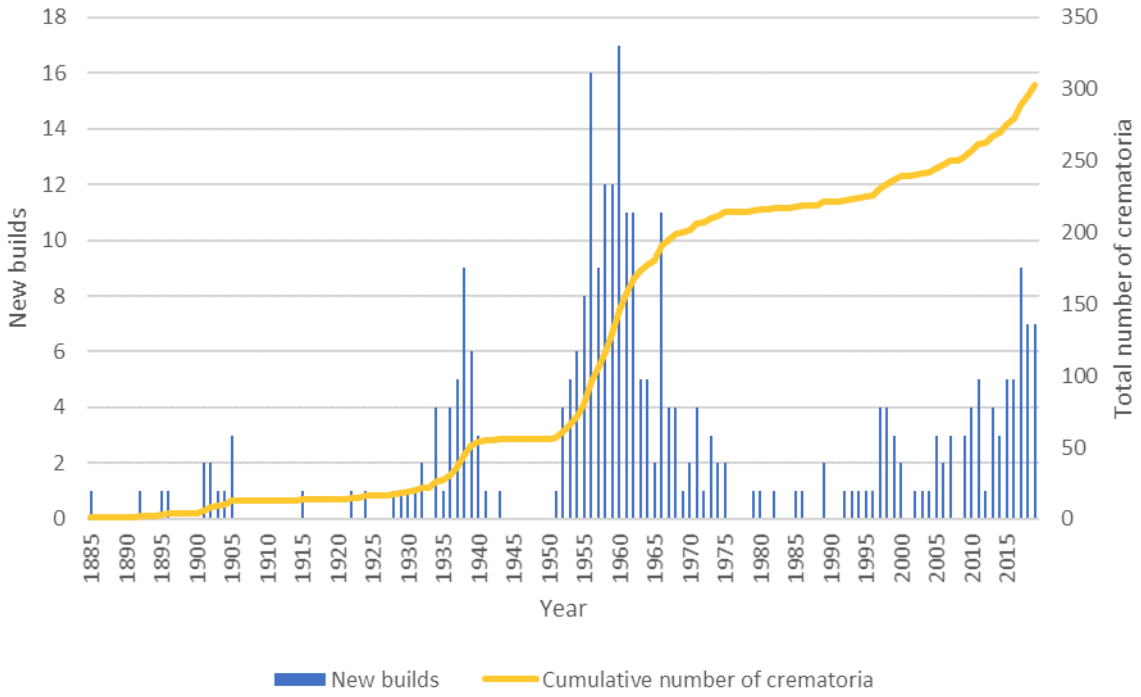
Number of cremations

4. The proportion of funerals involving a cremation has grown steadily in the past 60 years, from 35% in 1960 to 78% in 2018.[1]

[1] Cremation Society, Table of Cremations 2018.

5. The number of crematoria has also increased, with significant waves of construction taking place in the 1960s and in the last decade, as shown in Figure 1 below.

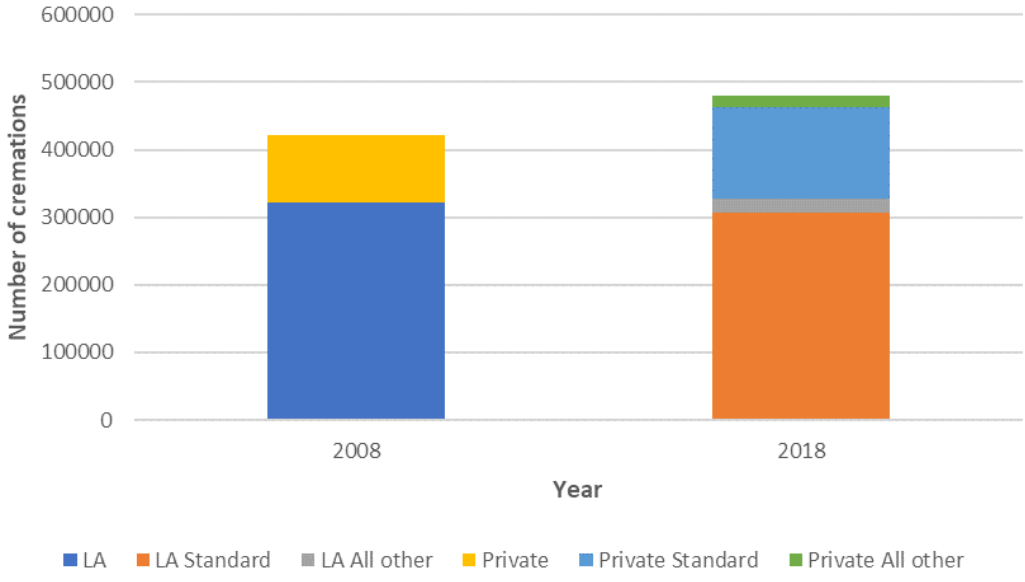
Figure 1: Number of crematoria in operation in the UK over time



Source: CMA analysis of ICCM information. 12 new crematoria directly replacing old crematoria not counted as new builds.

6. The total number of cremations conducted by private and local authority (LA) crematoria has increased from just over 420,000 to around 480,000 between 2008 and 2018 (a percentage increase of 14%), as shown by Figure 2 below.

Figure 2: Number of cremations performed by provider in 2008 and 2018

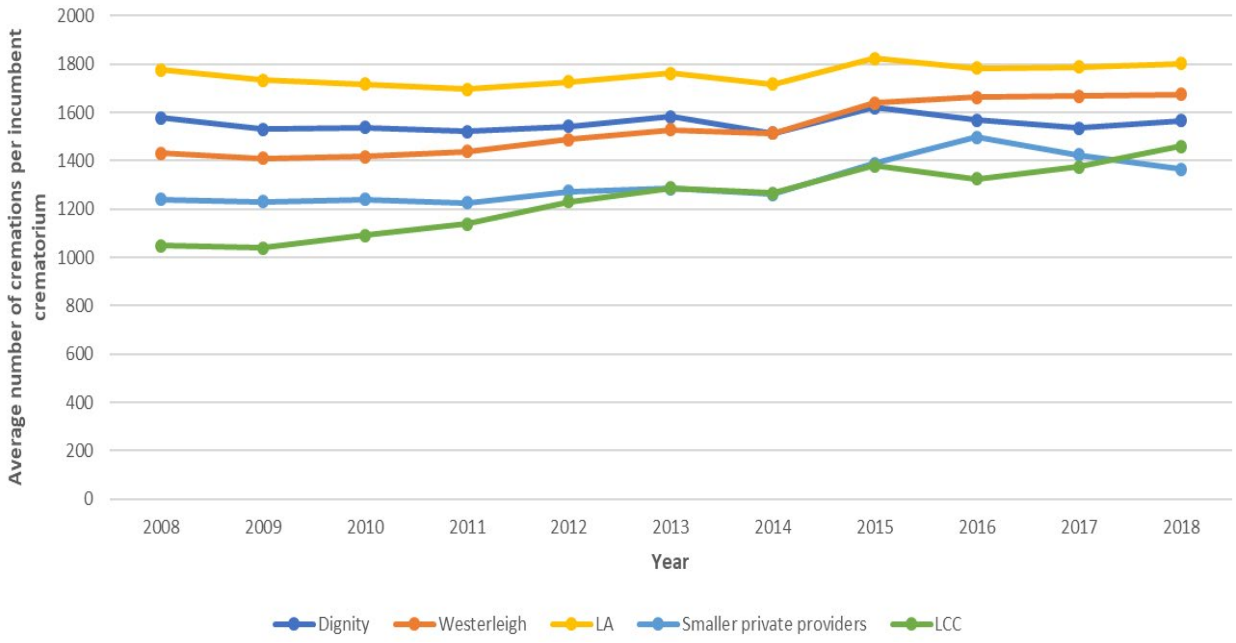


Source: CMA analysis of Cremation Society data and RFI responses from Dignity, Westerleigh, Westerleigh, Memoria, London Cremation Company and smaller private providers. All other services include unattended/direct cremation, reduced fee and all other types of cremation.

7. This graph shows that the increase in the number of cremations over the last ten years has primarily been met by private providers (who, during the time period between 2008 and 2018, opened 44 new crematoria, whilst local authorities opened only 2 new crematoria).[2] We have split 2018 volumes by standard and non-standard services. Standard fee services are those services charged at the full fee, normally during peak hours. Non-standard services include reduced fee services, which are services held in off-peak hours (eg 9am or 9.30am services) and unattended fee services, which are cremations without a service (also referred to as direct cremations). Non-standard cremations account for 8% of the services conducted in 2018.

8. We have also assessed how the average number of cremations per crematorium, across crematoria providers, has changed over time. We want to understand whether the opening of the new crematoria referred to in paragraph 7 means that existing crematoria are, on average, doing fewer cremations, or that new crematoria are meeting a growth in demand.

Figure 3: average number of cremations per crematorium (that opened during or before 2008), 2008 to 2018



Source: CMA analysis of Cremation Society data.

9. This graph shows that, for existing crematoria across any given provider category (ie those crematoria that opened during or before 2008), the average

[2] These figures do not include local authority crematoria that have been replaced over the stated period.

number of cremations at each crematorium has either increased slightly for Westerleigh, smaller private providers and the London Cremation Company (LCC) or remained relatively stable for the other providers. This suggests that newer crematoria have delivered additional capacity to help meet growing demand (as opposed to reducing average volumes at existing crematoria).

Mix of private providers' services over time

10. The following table shows the proportion of total revenue in 2018, for each of the three largest crematoria operators, generated by cremation services, memorial sales or burials. The largest private providers' revenue is predominately generated from cremation services. Burials are a very small part of the business for each of the main private, but we note that Dignity appears to have a significant proportion of revenue from memorials.

Table 1: proportion of total revenue in 2018, for each of Dignity, Westerleigh, and Memoria, generated by cremation services, memorials and burials

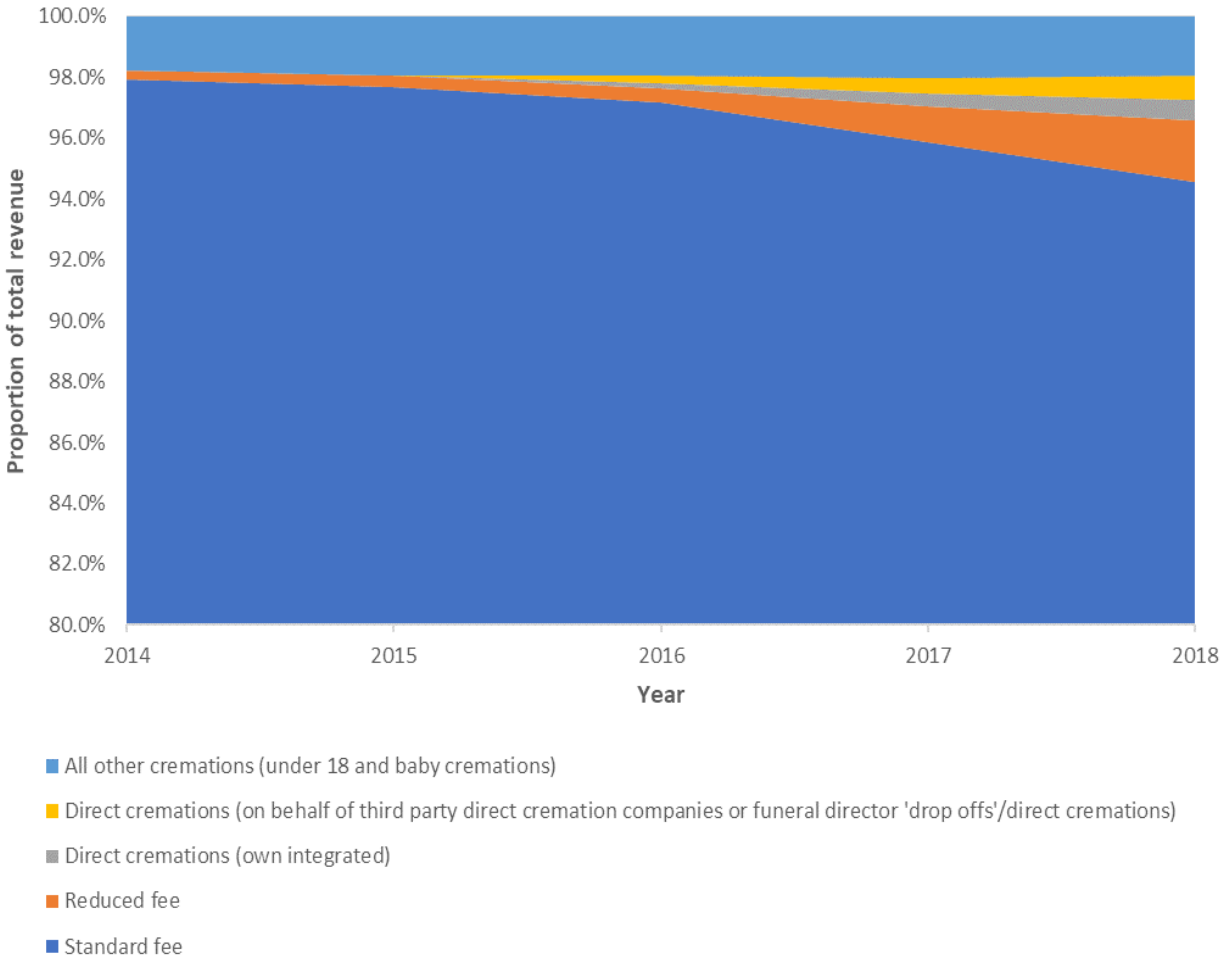
	Cremation services, %	*Memorials, %*	*Burials, %*
Dignity	[✂]	[✂]	[✂]
Westerleigh	[✂]	[✂]	[✂]
Memoria	[✂]	[✂]	[✂]

Source: CMA analysis of RFI response from Dignity. Westerleigh and Memoria submissions of January 2020. Proportions may sum to greater or less than 100% due to rounding.
Notes:
(1) Dignity's memorial revenue includes revenues generated from memorials sold in relation to both.
(2) Westerleigh's burial revenue includes revenues generated from memorials sold in relation to burials.

11. When focussing on revenue from cremation services, Figure 4 shows how the average revenue mix from conducting cremations of the four largest crematoria operators has changed since 2014. Standard cremations remain the most significant source of revenue, accounting for 95% of total revenue across Dignity, Westerleigh, Memoria and the London Cremation Company in 2018. There has been a growth in reduced fee services to 2% of total revenue. The proportion of revenue from direct cremations, either via their own integrated business (for example, Memoria has its own direct cremation business)[3] or on behalf of funeral directors/third party direct cremation companies (eg Pure Cremation or the Cooperative) remains low.

[3] See: Low Cost Funerals website

Figure 4: Revenue mix, across Dignity, Westerleigh, Memoria and London Cremation Company, from 2014 to 2018



Source: CMA analysis of RFI responses from Dignity, Westerleigh, Memoria and London Cremation Company. We did not have data for other providers.

Pricing and uptake of additional services

12. In addition to revenue from cremation fees (which are generated by providing time in the chapel for a service and the cremation itself), crematoria may also generate revenue from the sale of additional optional services related to the cremation service, such as bearers, organists and hospitality services. We have gathered data from Dignity, Westerleigh and Memoria as to the number and value of additional optional services purchased by their customers. The most common additional optional services purchased from Dignity, Westerleigh and Memoria crematoria are bearers, visual tributes, organists and extended time slots. We have conducted some analysis to establish whether these additional optional services are a significant expense to the customers of crematoria, and found:

    (a) The price of an extra optional service is relatively low compared with the price of a standard service (for example, an organist typically costs

around £25-£50 and bearers around £15-£25 each). The average spend per optional service at a Dignity and Memoria crematorium was around £[✂] (around [✂]% of the average standard Dignity and Memoria fee - £936 and £838 respectively)[4] and £[✂] at a Westerleigh crematorium (around [✂]% of the Westerleigh £860 average standard fee).[5,6]

(b) Around [✂]% of Memoria and Westerleigh customers purchased at least one additional optional service, and around [✂]% of Dignity customers purchase an extra. However, these figures may overestimate the proportion of customers who purchase an extra since multiple additional optional services may be purchased alongside the same cremation service and we cannot identify how often this occurs.

Market structure

Number of crematoria and crematoria operators

13. We have based the following analysis on:

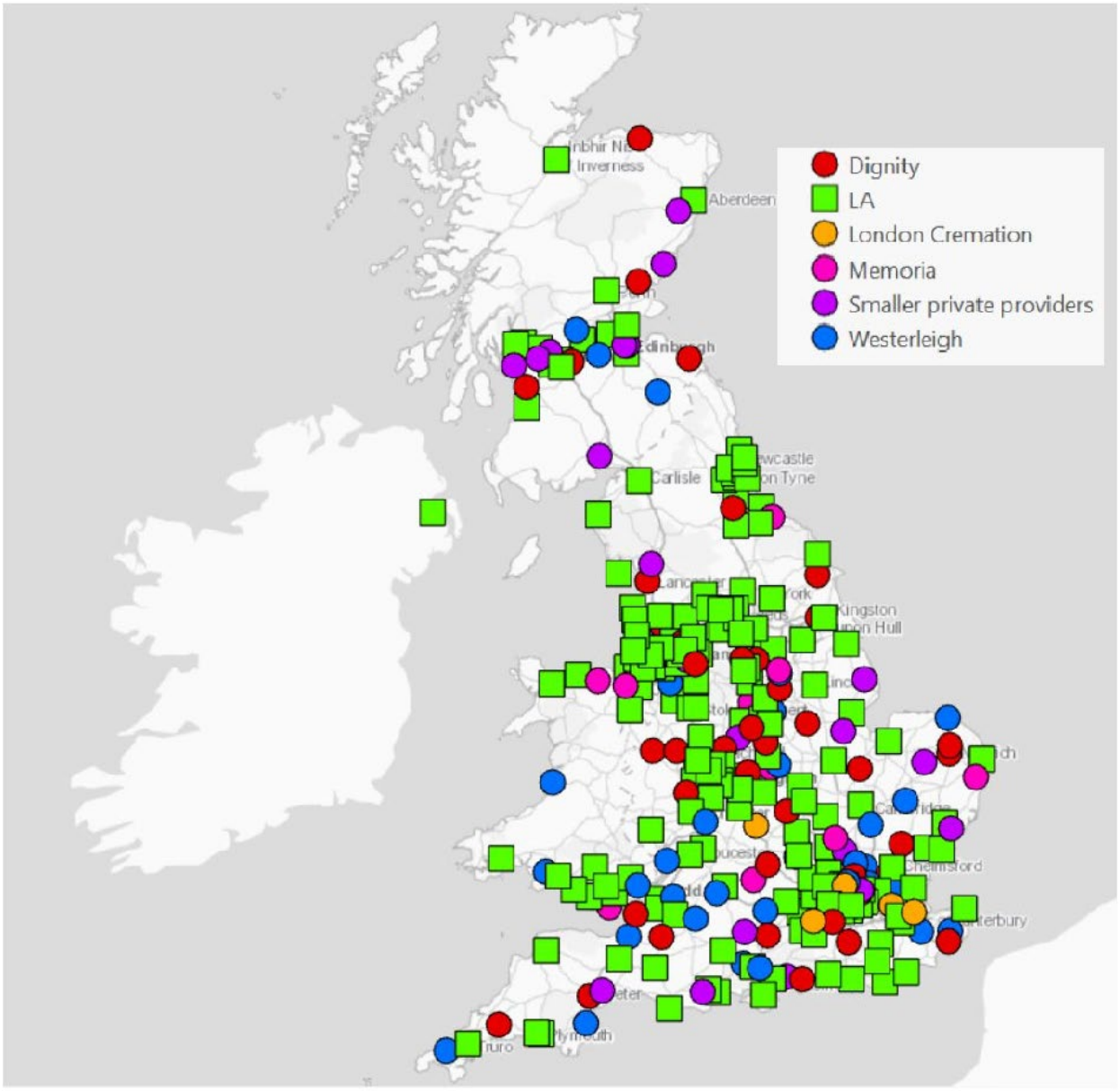
(a) A list of all crematoria in the UK as at 1 September 2019. We use data from the Institute of Cemetery and Crematorium Management (ICCM), who list the location of all crematoria currently operating in the UK;[7] and,

(b) an analysis of driving times between all crematoria in the UK.[8]

14. Our analysis is based on 303 crematoria in the UK. A map of these crematoria is included in Figure 5.

[4] Based on Cremation Society data for 2018 fees. See working paper Crematoria: outcomes for further details.
[5] [✂].
[6] Based on Cremation Society data for 2018 fees. See working paper Crematoria: outcomes for further details.
[7] http://www.iccm-uk.com/iccm/ We have based our analysis on crematoria in the UK as at 1 September 2019 but note that two crematoria have since opened.
[8] The CMA used ESRI UK Limited's Arc GIS Pro software. The drive-time network analysis is based on the StreetMap Premium network which uses speed profiles that are based on actual observed speeds.

Figure 5: Map of crematoria in the UK



Source: CMA analysis of ICCM data

15. As at 1 September 2019, there were 184 crematorium operators in the UK. The largest, Dignity, operates 46 crematoria (5 of which are managed on behalf of, or in conjunction with, local authorities).[9] Westerleigh operates 34 crematoria (3 of which are managed on behalf of, or in conjunction with, local authorities).[10] Other significant providers include Memoria (10 crematoria) and London Cremation Company (6 crematoria). There are 22 crematoria operated by smaller private providers (some of whom offer unattended

[9] Dignity stated it currently holds five local authority contracts: Emstrey Crematorium, Enfield Crematorium, Weston-Super-Mare Crematorium, Rotherham Crematorium, and Stockport Crematorium.
[10] Westerleigh stated that it has contracts with three local authorities to manage the operations of crematoria: Torbay Cemeteries and Crematoria, Forest Park Cemeteries and Crematoria, and Parndon Wood Cemetery and Crematorium.

cremations, for example, Fosters and Pure Cremation) and 160 local authorities operating 185 crematoria. Smaller private providers and local authorities tend to operate one crematorium each but there are a number of these providers operating up to three crematoria.

Measures of local concentration

16. Demand for attended cremation services is local. Our evidence suggests that customers have a strong preference for using a crematorium that is close to them (see working paper Crematoria: evidence on competition between crematoria). We consider a 30-minute cortege drive time to be an appropriate measure of local geographic markets based on various sources of evidence, including our analysis of crematoria catchment areas,[11] the CMA's Market Investigation consumer survey,[12] the CMA's Market Study consumer research,[13] internal documents and commentary from the main private crematoria operators; and planning applications.[14]

17. All else equal, the larger the number of crematoria and/or the closer crematoria are to one another in each local area, the stronger the competitive constraints between crematoria are likely to be.

18. We therefore assess local concentration by looking at:

    (a) The extent to which crematoria have a rival within a 30-minute cortege drive time, and the number of those alternatives within 30-minutes;

    (b) the extent to which crematoria have rivals within their 80% catchment area[15] and the distances between each other; and,

    (c) the extent to which capacity constrained rivals may indicate that crematoria face weaker constraints than our concentration analysis may suggest.

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[11] The average 80% catchment area across Dignity, Westerleigh, Memoria and a sample of local authority crematoria was 33 minutes at cortege driving speeds.
[12] Two-thirds of customers said the deceased lived within 25 minutes of the crematorium (CMA Market Investigation consumer survey, Tables 341-343, Question C10). The survey does not allow us to understand whether this was at normal or cortege driving speeds.
[13] CMA Consumer Research, paragraph 4.2.5.
[14] A needs statement prepared on behalf of Dignity describes a crematorium's catchment area as: "a reasonable maximum acceptable drive-time to a facility, usually 30 minutes. A 30-minute maximum drive-time for catchment areas was used in the need assessments for [lists various planning applications]. This drive time is to be assessed by reference to the slower travelling speed of a cortège. This is usually calculated at 60% of normal driving speed."
[15] 80% catchment areas are explained in paragraph 32.

19. We adjusted driving times to take account of the typically lower driving speed of a hearse/funeral cortege. We have done this by multiplying driving speeds by 0.6. This increases drive times by two-thirds.[16] The 0.6 factor has been cited and used in numerous planning appeals and is an industry standard.

20. We adopted this approach in our phase 1 analysis of local concentration and catchment areas and asked Dignity and Westerleigh for their views. We did not receive any comments either in support of the approach or against the approach.[17] We note our approach is consistent with how crematoria providers and planning authorities/planning inspectors think about drive times.

21. We consider that cortege drive times are particularly appropriate for attended services where the funeral is organised with the use of a hearse (and/or has a funeral cortege) given this is likely to travel at slower than normal speeds and as such, the area over which choice of crematoria is exercised may be smaller due to the slower speeds. Comments from funeral directors suggest that nearly all funerals use either a hearse and/or a limousine and/or a cortege. However, SAIF and Dignity have told us that the choice of crematorium is down to the customer, and the slower speeds of hearses/corteges should not limit the crematoria that the funeral director will serve. Given the widespread use of funeral corteges, and the use of the cortege drive times by crematoria providers in their internal documents and planning applications, we consider it an appropriate measure when considering local concentration.

Number of crematoria that have a rival nearby

22. We have looked at the distribution of crematoria based on cortege drive times to the nearest rival fascia.

23. Figure 6 shows the number of crematoria that have their nearest rival fascia within a given cortege drive time.

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[16] This is because time taken to travel is equal to distance divided by speed.

$$t = \frac{d}{s}$$

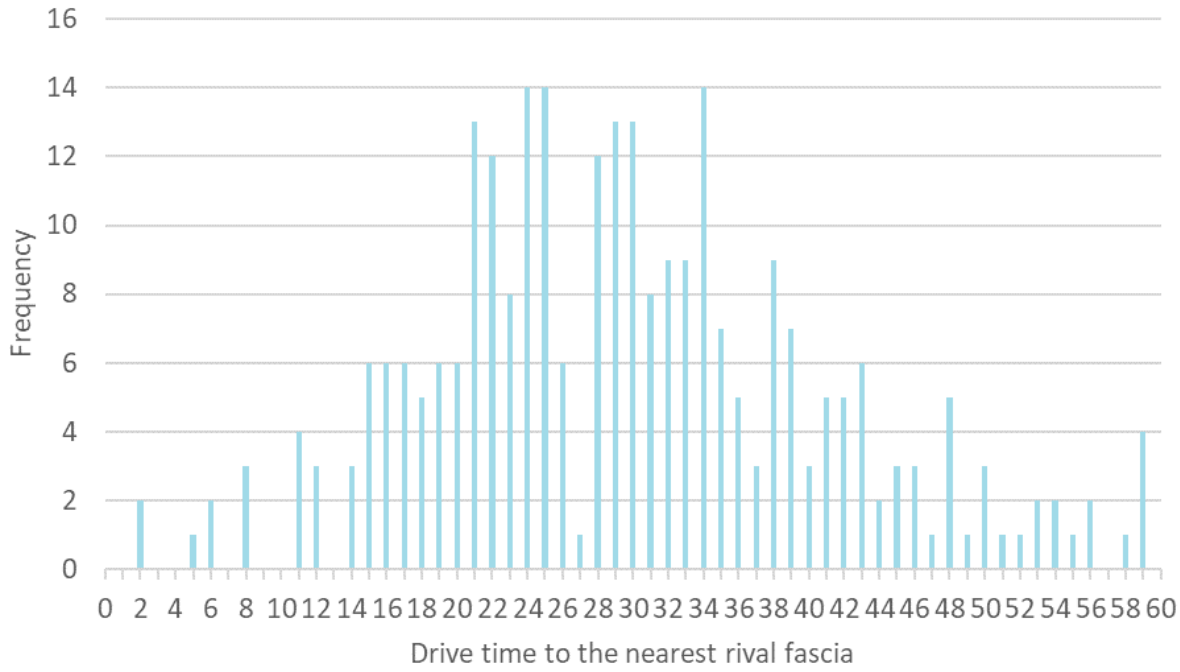
In this equation if speed is multiplied by 0.6, time needs to be divided by 0.6 such that the equation balances.

$$\frac{t}{\mathbf{0.6}} = \frac{d}{\mathbf{0.6}s}$$

Dividing a term by 0.6 is the same as multiplying it by 5/3 (or one and two-thirds).

[17] We asked Dignity and Westerleigh at phase 1 to provide some drive time information and asked, "Please also explain how much slower you consider a cortege drive time speed to be compared to a standard drive time (we note planning decisions where a factor of 0.6 is applied)." Dignity and Westerleigh did not respond to this question.

Figure 6: Frequency of crematoria with nearest rival within given cortege drive time



Source: CMA analysis of ICCM data. Crematoria without rivals within a one-hour drive time are not included on this graph.

24. The graph indicates that most crematoria appear to face little to no competitive constraint, since the nearest rival fascia is located relatively far away. The graph shows that:

    (a) Approximately 84% of all crematoria do not have a rival within a 20-minute cortege drive time;

    (b) approximately 50% of all crematoria do not have a rival within a 30-minute cortege drive time; and,

    (c) approximately 17% of all crematoria do not have a rival within a 45-minute cortege drive time.

Proportion of crematoria facing more or fewer rival fascia

25. The analysis described in Figure 6 does not account for the number of rival fascia that a given crematorium faces - it only considers the travel time to the closest rival. We have therefore sought to account for this, by providing a table which categorises crematoria over two parameters: the cortege drive time to the nearest rival fascia and number of rival fascia within a 30-minute cortege drive time.

Figure 7: Frequency of crematoria that have closest rival within given time band and number of rival fascia within 30-minutes

Number of rival fascia within a 30-minute cortege drive time	*Cortege drive time to the nearest rival fascia (mins)*			
	0 to 10	*10 to 20*	*20 to 30*	*30+*
0				150
1	2	19	71	
2	4	12	22	
3 or more	2	10	11	

Source: CMA analysis of ICCM data.

26. In considering the number of competitors within a given area, in addition to the cortege drive time to the nearest alternative crematorium, we have found that there are 150 crematoria which may face little or no constraint, given that they have no rivals within half an hour, plus a further 71 crematoria where we would expect constraints to be weak, given that they face only one rival that is over 20 minutes away. Other crematoria may also face weak constraints given the generally low numbers of rivals and relatively large distances between crematoria. There is a limited number of crematoria that have three or more rival fascia within a 30-minute cortege drive time.

27. The above analysis indicates that in a high proportion of local areas across the UK, there appears to be a high degree of local concentration. This lack of choice of crematoria may be further restricted for particular groups of consumers who are of a certain faith (or indeed, any group who needs certain facilities that are not available at all crematoria, for example, a large chapel). The evidence as to the extent to which this is the case is set out in the following paragraphs.

28. The Ministry of Housing, Communities and Local Government (MHCLG) consulted with a range of organisations and individuals, both crematoria providers and users, to better understand the extent to which the current size of crematoria in the UK are equipped to meet the needs of certain faith groups and the extent to which current crematoria facilities in the UK are able to accommodate the needs of certain faith groups.[18]

29. The MHCLG commissioned a survey which found that some respondents reported they had experienced problems with the size of crematoria and

[18] MHCLG, Crematoria Provision and Facilities, Government Response to the Review, 8th April 2019 p.4.

parking facilities,[19,20] and the amenities available at crematoria (including religious iconography),[21,22] in meeting the needs of their faith or community.

30. This suggests that there may be certain communities/people of certain religions/groups for which the choice of crematoria, within a local area, may be more restricted than as set out above, since existing alternatives may not have the facilities to adequately accommodate particular needs. Furthermore, we note that there may always be funeral services that are not typical, for example, they are very large, that some crematoria may not be able to accommodate adequately. We have been told by Dignity, Westerleigh and Memoria that they work with families and funeral directors to try to accommodate these services, for example, by offering extended time slots and displaying the service on screens outside the chapel. Furthermore, some crematoria have tried to meet local needs by adding facilities, such as Pooja rooms (including washing and other facilities) to accommodate specific needs.[23] Therefore, to some extent, existing providers attempt to accommodate these needs. We are not in a position to comment on the extent to which those groups of consumers who need certain facilities are accommodated, and, if they are not, the extent to which these groups have a more restricted choice of crematorium than that set out above.

Measures of concentration based on catchment area analysis

31. The analysis above has focussed on the closeness of rivals and the number of rivals within a 30-minute cortege drive time. We now describe our analysis in relation to catchment areas.

32. In a case involving local markets, a catchment area is defined as the area from which a supplier draws most of its customers.[24] The CMA has usually used catchment areas that capture 80% of a supplier's sales or customers - this is the '80% catchment area.'[25] Competition between suppliers is typically stronger the more their respective catchment areas overlap, as overlapping catchment areas may suggest that suppliers are alternatives for a significant proportion of their customers.[26]

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[19] MHCLG, Crematoria Provision and Facilities, Government Response to the Review, 8th April 2019 p.11.
[20] MHCLG, Crematoria Provision and Facilities, Government Response to the Review, 8th April 2019 p.21.
[21] MHCLG, Crematoria Provision and Facilities, Government Response to the Review, 8th April 2019 p.16.
[22] MHCLG, Crematoria Provision and Facilities, Government Response to the Review, 8th April 2019 p.19.
[23] For example: https://www.greatglencrem.co.uk/GreatGlen_Spring2019_WEB.pdf
[24] CMA Retail Mergers Commentary, paragraph 2.1
[25] For reasons of data availability, we have based catchments on the location of the supplier ('supplier centred catchments'). In this context, 80% catchment areas refer to the area around the crematorium, in which the crematorium derives 80% of its total revenue from local funeral directors.
[26] CMA Retail Mergers Commentary, paragraph 2.1 and 2.2.

33. In what follows, we therefore consider the extent to which crematoria face rivals within their 80% catchment areas and the distances to these rivals, the extent to which there are rivals located just outside the 80% catchment areas, and the extent to which rival crematoria are serving common population centres.

Number of rival fascia within a crematorium's 80% catchment area

34. We asked Dignity, Westerleigh, Memoria, and a random, representative sample of 22 local authority crematoria for information relating to funeral director revenue[27] from which we have calculated catchment areas. We have excluded any data related to unattended cremations (where it is apparent) as our analysis is on the travel times to attended services.

35. For the main private providers, ie Westerleigh, Dignity and Memoria, our analysis is based on 72 of their crematoria (data was either not available or significantly incomplete for the remaining 18 crematoria). Out of the representative sample of 22 local authority-operated crematoria from whom we asked for data, we have data on 21 crematoria.[28] Of those 93 crematoria for which we have data, the revenue and postcode data for some funeral directors was missing.[29] However, we note that, where we have dropped funeral director locations in such cases, the revenue from these locations is small (on average 7% of the total revenue of the crematorium). Just over half the crematoria for which we have calculated 80% catchment areas are in urban areas and just under half are in rural areas.[30] Looking at each crematorium in turn, we assessed the number of rivals that a crematorium faces in its 80% catchment area. We found that:

(a) Around 63% of crematoria (59) have no rival fascia within their catchment area;

(b) around 27% of crematoria (25) have one rival fascia within their catchment area;

(c) around 2% of crematoria (2) have two rival fascia within their catchment area; and,

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[27] Dignity and Westerleigh provided data on funeral director revenue and location at phase 1, and as such we collected data on funeral director revenues from Memoria and local authorities at phase 2. We consider that the location of funeral directors may be a good proxy for the location of the deceased.
[28] One local authority crematorium stated that they were unable to provide the information requested.
[29] For example, inaccurate postcodes may have been provided or missing altogether. Further, in some cases, we were unable to isolate revenue associated with each funeral director customer.
[30] 54 urban, 39 rural.

(d) around 8% of crematoria (7) have three or more rival fascia within their catchment area.[31]

36. We found the average 80% catchment area does not vary significantly depending on who is the relevant provider or whether the crematorium is in an urban or rural area. We found the average 80% catchment area to be 33-minutes at cortege driving speeds.[32] The average local authority catchment area is 29 minutes compared with private crematoria catchment areas of 34 minutes. Average rural catchment areas are 36 minutes compared with urban catchment areas of 30 minutes.

37. We applied the average catchment area to all crematoria to understand the proportion of crematoria that have no, one, two or three or more rivals within the average 80% catchment area. The results are summarised in Table 2. This shows that nearly three-quarters of crematoria have only one or no rival within 33-minutes at cortege speeds (the average 80% catchment area). Only 13% of crematoria have three or more rivals within the average 80% catchment area.

Table 2: Proportion of crematoria with rivals within the average 80% catchment area

	Proportion with no rival fascia, %	*Proportion with one rival fascia, %*	*Proportion with two rival fascia, %*	*Proportion with at least three rival fascia, %*
Average catchment (33 mins)	42	30	15	13

Source: CMA analysis of ICCM data and data provided by Dignity, Westerleigh, Memoria and local authorities.

38. We have also applied the average catchment area for local authority crematoria to all local authority crematoria and the average private catchment to all private crematoria. The results are summarised in Table 3. This shows that over 80% of local authority crematoria have only one or no rival within the average 80% catchment area (this is lower, at around three-quarters for private crematoria). Only 8% of local authority and private crematoria have three or more rivals in their average 80% catchment area.

Table 3: Proportion of local authority and private crematoria with rivals within the average local authority and private 80% catchment area

	Proportion with no rival fascia, %	*Proportion with one rival fascia, %*	*Proportion with two rival fascia, %*	*Proportion with at least three rival fascia, %*
Average local authority catchment (29 mins)	54	29	9	8
Average private catchment (34 mins)	39	35	18	8

Source: CMA analysis of ICCM data and data provided by Dignity, Westerleigh, Memoria and local authorities.

[31] Of those 7 crematoria that had at least two rival fascia within their catchment area, 4 have three rival fascia, 1 has five rival fascia and 2 have 7 rival fascia.
[32] 14 crematoria had a catchment smaller than 20 minutes, 30 crematoria had a catchment between 20 and 30 minutes and 49 crematoria had a catchment larger than 30 minutes.

39. Finally, we have applied the average catchment area for urban crematoria to all urban crematoria and the average rural catchment to all rural crematoria. The results are summarised in Table 4 which shows that nearly half of urban crematoria face no rivals in the average 80% catchment area. Only 12% of urban crematoria and 14% of rural crematoria have three or more rivals in their average 80% catchment area.

Table 4: Proportion of urban and rural crematoria with rivals within the average urban and rural 80% catchment area

	Proportion with no rival fascia, %	*Proportion with one rival fascia, %*	*Proportion with two rival fascia, %*	*Proportion with at least three rival fascia, %*
Average urban catchment (30 mins)	46	33	10	12
Average rural catchment (36 mins)	38	29	19	14

Source: CMA analysis of ICCM data and data provided by Dignity, Westerleigh, Memoria and local authorities.

The extent to which rivals inside a catchment area are geographically close

40. We tested, for the 34 crematoria[33] which have at least one rival fascia within their catchment area, whether their nearest rival is located either close to the catchment boundary or well within the catchment area (ie the two crematoria are close). As noted in paragraph 17, the closer the nearest rival is, the stronger the competitive constraints between the crematoria are likely to be.

41. We have compared the drive time to a crematorium's nearest rival fascia to the size of the crematorium's catchment area. This provides a measure of the relative degree of overlap[34] between a crematorium, and its nearest rival. For example, for a crematorium with a 20-minute catchment area:

(a) If the drive time to the nearest rival fascia is 5 minutes,[35] then the degree of overlap would be 0.25 (5 minutes/20 minutes), where this 0.25 degree of overlap represents the nearest rival fascia being located well within the catchment area, thus likely to be competing to a large degree for the same customers and thus likely to pose a relatively stronger constraint;

(b) if the drive time to the nearest rival fascia is 15 minutes, then the degree of overlap would be 0.75 (15 minutes/20 minutes). This degree of overlap represents the nearest rival fascia being located close to the catchment

[33] Where we note that 9 crematoria out of 34 have more than one rival fascia within their catchment area.
[34] A crematorium with a very large catchment, of say one hour, who has a rival within 30 minutes, will have a relative closeness of 0.5, the same as a crematorium with a small catchment of 10 minutes with the nearest rival 5 minutes away. The measure is likely to be more meaningful for larger catchments, given that at very short distances the constraint posed by a rival is likely to be stronger.
[35] We conducted this analysis at cortege speeds, such that the catchment area and drive time to nearest rival were comparable.

boundary, and therefore likely to be competing to a relatively limited extent for the same customers.

42. We found the average degree of overlap, across those 34 crematoria, to be around 0.7, where the maximum is 0.98 (ie the rival is right on the edge of the catchment) and the minimum is 0.05 (ie. the rival is very close). Most of the 34 crematoria have a degree of overlap of over 0.5 (ie the rival is over half way towards the boundary of the catchment).[36] These results suggest that, in those instances where there is at least one rival fascia located within a crematorium's catchment area, the nearest rival fascia is, on average, located towards the boundary of the catchment area.

The extent to which rivals outside of a catchment are geographically close

43. We now consider if, in areas where crematoria do not face a constraint from a rival fascia within their catchment area, their nearest rival is located close to the catchment boundary, as opposed to well outside the catchment area. We compare the drive time to a crematorium's nearest rival fascia to the size of the catchment area, to understand how far outside the catchment the rival is. We have conducted this analysis as a sensitivity to test whether, for those crematoria with no rival within their catchment, they face a rival on the outside edge of their 80% catchment.[37]

44. We provide a numerical example to demonstrate, where we take a crematorium to have a 20-minute catchment area:

(a) If the drive time to the nearest rival fascia is 25 minutes, then the degree of closeness would be 1.25 (25 minutes/20 minutes), where degree of closeness of 1.25 represents the nearest rival fascia being outside the catchment area but still being located relatively close to the catchment area boundary;

(b) if the drive time to the nearest rival fascia is 40 minutes, then the degree of overlap would be 2 (40 minutes/20 minutes), where this degree of closeness of 2 represents the nearest rival fascia being located outside the catchment and still far away from the catchment boundary.

45. We found that the average measure of how close the nearest rival fascia is to the catchment boundary, across those crematoria that have no rival fascia within their catchment, is around 1.5. This means that the rival outside the

[36] 28 crematoria had a degree of overlap greater than 0.5. Only one crematoria had a degree of overlap less than 0.25.
[37] And, as such, if catchment areas were to be flexed these rivals would then be within the catchment area.

catchment is on average half as far away again, ie not close to the catchment boundary. We found the maximum to be 3 and the minimum to be 1.[38]

Competition over common population centres

46. Crematoria that are not geographically close may still compete over a common population centre and pose a constraint on one another. We have considered the evidence which indicates the extent to which this may be the case. We have heard that, in the context of new crematoria opening, where a population is served by two crematoria, people will tend to choose the closest (with customers gravitating towards the closest one). For example, Derby City Council told us that although they "draw (customers) heavily within the Derby district", it was "primarily from the south (of Derby) where [they] have lost volumes" due to Dignity opening a new crematorium in Trent Valley, which is to the south of Derby, whilst they had retained customers from the north of the city. Furthermore, Derby City Council told us that, within the same funeral director chains (such as the Co-op), they were drawing custom from the Co-op branches located to the north whilst they were serving the Co-op branches from the south less frequently since the Dignity crematorium opened.[39] Another example of such an area is the City of Leicester. Leicester City Council told us that, in light of Memoria opening South Leicestershire crematorium and Westerleigh opening Great Glen crematorium,[40] their "loss (in volumes) has been mainly from… non-city residents" where they were "previously…serving…the rural areas to the south of Leicester." Maps from Westerleigh show that their Great Glen crematorium, south of Leicester, draws most of its customers from the south and east of Leicester (some of whom are closer to Leicester crematorium than Great Glen), but fewer from the north and West (and the vicinity of Leicester crematorium). Further analysis of the impact of entry on incumbent crematoria volumes is included in the working paper Crematoria: evidence on competition between crematoria.

47. Dignity and Westerleigh have provided maps of the address of the deceased for each of their crematoria. Generally these show that customers will gravitate towards the closest crematorium, even in areas where there may be multiple crematoria in the same population centre. [✂].

[38] 33 crematoria had a degree of overlap of between 1 and 1.5, 14 between 1.5 and 2, and 7 greater than 2. A degree of overlap greater than 2 means that the rival is further away than the catchment area twice over.
[39] Where Trent Valley crematorium is 13 minutes away at normal speed and 22 minutes away at cortege speed, from Derby City Council's crematorium.
[40] Where South Leicestershire crematorium is 20 minutes away at normal speed and 33 minutes away at cortege speed, from Leicester City Council's crematorium.

Figure 8: Addresses of the deceased using [✂] Crematorium, 2018

[✂]

Source: Dignity. Purple boxes highlight the crematoria ([✂] is the central purple box).

Capacity constraints

48. We next summarise evidence as to the extent to which there are areas where crematoria face rivals, but these rivals are capacity constrained. These rivals may pose a weaker constraint because they are unable to accommodate new customers.

Measures of capacity

49. We have considered whether measures of capacity should be based on the availability of chapel slots ('front of house capacity') or the ability to cremate bodies ('back of house capacity').

50. We do not consider that capacity is restricted by back of house activities, as it is possible to run cremators round the clock (unless planning restrictions prevent this).[41] In fact, it is more efficient to run cremators constantly. Services, however, cannot be held around the clock and as such we consider front of house capacity to be the binding constraint.

51. Turning to front of house capacity, Memoria and Dignity have described three different definitions of total capacity:

    (a) Theoretical capacity, which refers to the total number of booking slots available in a year;[42]

    (b) core or peak hour capacity (defined by planning appeal decisions), which refers to the number of booking slots available at *peak hours* in a year (typically defined as between 10am and 4pm), given that consumers generally prefer slots in the middle of the day and want to avoid early morning and late booking slots;

    (c) practical, or factored, capacity (defined by planning appeal decisions), which is an adjustment on the number of booking slots available, at peak hours. Memoria states that, based on planning appeal decisions, "crematoria cannot work at 100% of their annual core hour capacity…because deaths are not spread out uniformly across the year

[41] We understand that this is often not the case.
[42] Which is dependent on the slot length a crematorium offers and opening hours. In Dignity's internal documents ([✂]), they use an example where a crematorium operates from 9am-5pm at a 60-minute booking slot.

and in winter months can be as 40% higher than the average." Dignity notes that "crematoria operating above practical capacity places a crematorium under pressure to offer a cremation service that meets an acceptable qualitative standard."

52. We have gathered data across crematoria relating to the total number of booking slots that a crematorium has available (theoretical capacity), and capacity utilisation as the proportion of total booking slots that a crematorium actually uses. We have taken into account evidence from Dignity and Memoria in relation to core and practical capacity and our thinking about the extent to which a crematorium is capacity constrained is based on the following information:

(a) Core hour capacity is around 75% of theoretical capacity. A crematorium operating between 9am and 5pm with 8 slots will have 75% of those slots during peak times (10am-4pm, 6 out of 8 slots).

(b) Planning documents prepared on behalf of Dignity, and a Memoria submission to the CMA, state that practical capacity is 80% of core hour capacity (Memoria notes that this recognised by planning inspectors in "multiple decisions").

53. Using theoretical capacity as our measure, and given the above, we consider that a crematorium operating around **60-75% utilisation of theoretical capacity may be considered capacity constrained** (we consider 60% of theoretical capacity to be relevant if we consider capacity on a practical basis,[43] and 75% of theoretical capacity to be relevant if we consider capacity based on core hours).[44] We will consider both thresholds in the following analysis.

54. We gathered data from crematoria as to their theoretical capacity utilisation in 2018. On average, 54% of available booking slots were used.[45] Local authority crematoria had less spare capacity compared with private crematoria, with an average of 58% of slots used (compared with 49% for private crematoria).[46] Some newer crematoria had a low proportion of their slots used, whilst a small number of crematoria (12 out of 272) had 80% or more of their slots used. The majority of crematoria (slightly over two-thirds) used between 40% and 70% of their slots.

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[43] As 80% of 75% is 60%
[44] As 75% of theoretical capacity is approximately core hour capacity.
[45] Based on data from 272 crematoria.
[46] Based on data from 169 local authority crematoria and 103 private crematoria.

Capacity utilisation and concentration

55. We now focus on areas where a crematorium has only one rival within a 30-minute cortege drive time in order to see how many areas have no 'effective' rivals (ie those with sufficient capacity to act as a constraint) within 30-minutes. There are 92 crematoria with only one rival within 30 minutes. Some of these 92 crematoria have a capacity constrained rival, and as such, these crematoria are likely to face no effective constraints within 30 minutes.

56. If we take capacity constraints into account, we find that the proportion of crematoria with no effective rival within a 30-minute cortege drive time increases from 50% to:

    (a) Around 52% (159 crematoria), if we include those crematoria that have their only competitor, within a 30-minute cortege drive time, operating at above 75% capacity utilisation;

    (b) around 54% (163 crematoria), if we include those crematoria that have their only competitor, within a 30-minute cortege drive time, operating at above 70% capacity utilisation; and,

    (c) around 60% (183 crematoria), if we include those crematoria that have their only competitor, within a 30-minute cortege drive time, operating at above 60% capacity utilisation.

Barriers to entry

57. This section describes the evidence that we have received in relation to barriers to entry.

Planning process

58. There are two specific aspects to the planning regime which can act as a barrier to entry: the Cremation Act 1902 (the 1902 Act) which constrains the potential location of new sites and the fact that crematoria providers generally support their planning applications with evidence of a local 'need' for new crematorium provision.

59. Section 5 of the 1902 Act states that "No crematorium shall be constructed nearer to any dwelling-house than two hundred yards, except with the consent, in writing of the owner, lessee and occupier of such house, nor within fifty yards of any public highway, nor in the consecrated part of the burial

ground of any burial authority."[47] This reduces the potential areas in which a crematorium development will be permitted and rules out many urban areas, and thus can push new crematoria into rural or Green Belt areas.[48] In London this limit is reduced to 100 yards and in Scotland there is no minimum distance and it is a matter for the planning system to consider development applications for new crematoria in the general context of a given location.[49]

60. The requirement to prove a 'need' for a new crematorium to planning authorities can also act as a barrier to entry. Crematoria providers generally try to demonstrate both a 'quantitative' and a 'qualitative' need for new crematoria:

(a) 'Quantitative' need is considered to be the number of people who will be closer to the new crematorium compared with any other. Recent appeal decisions have defined an area to have a quantitative need where there will be 136,000-171,000 people for whom the new crematorium will be the closest crematorium.[50]

(b) 'Qualitative' need is typically the number of people who will now have less than a 30-minute cortege drive time to the crematorium, who used to have greater than a 30-minute cortege drive time, although other factors such as waiting times have also been considered by planning authorities. Recent decisions have considered a qualitative need exists where there will be 59,000-95,000 people who will, for the first time, have a crematorium within a 30-minute cortege drive time.[51]

61. The requirement to demonstrate a 'need' can raise a number of specific barriers:

(a) Firstly, entry can only occur where a 'need' exists;

(b) secondly, demonstrating a need involves sunk costs and engaging in a planning process where the outcome is uncertain. We are gathering evidence on the cost of gaining planning approval. Dignity has noted that "the majority of applications for planning consent of new private sector crematoria tend to go through a rejection first and then approval on

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[47] The 1902 Act, section 5.
[48] We note that even if these restrictions did not apply, this would not be likely to significantly increase the types of area over which crematorium operators would consider building a crematorium as areas close to highways or housing may not provide the secluded and private settings that a crematorium requires.
[49] Market Study report, Annex A, paragraphs 34 and 35.
[50] Market Study report, Annex A, paragraph 37.
[51] Market Study report, Annex A, paragraph 37.

appeal" and that many of their recent planned openings have been subject to an appeal, and,

(c) private providers have argued that local authority planning departments may have an incentive to prevent entry by private providers to protect their own crematoria.[52] However, we note that if this were to occur, it could likely be challenged or resolved through the appeals process. Westerleigh has made this point noting that "a local authority cannot refuse an application on the grounds that it has a crematorium of its own in the local area."

62. Despite the barriers mentioned above, crematoria providers do not tend to consider the planning regime to be a significant barrier to entry. Westerleigh notes that "whilst there are barriers to the development of a new crematorium, recent experience has shown that these can be overcome." Memoria notes that "although… the time and costs associated with the planning process for crematoria is an important factor in the analysis, Memoria does not believe the planning process is the main reason impeding the development of new crematoria."[53] Plymouth City Council has stated that, in the construction of new crematoria facilities, there are "significant planning constraints"[54] but they "do not consider the planning regime as such… the barrier."[55]

63. The following market participants have argued that the planning regime is appropriate. Memoria noted that: "it is difficult to open crematoria. However, we would argue that is how it should be given the significance and responsibility of operating such important public service facilities… it is our view that neither the planning barriers nor the financial ones are too high. The planning process has been self-regulating and overall has ensured that crematoria have only been built in the UK where they are needed." Leicester City Council noted that: "I think the planning regime is probably appropriate… what you do not want is an oversupply, because I think if there was an oversupply of crematoria, it would lead to perhaps not necessarily an improvement in quality, but maybe potentially the adverse effect of a reduction in quality, because there is less income to go around." The Cremation Society has argued: "it is important to maintain the current restrictions on the positioning of crematoria to ensure suitability of location for purpose. In addition, it has been estimated that there is little need to develop new

[52] Horizon response to Issues Statement, paragraph 35. Dignity response to Issues Statement, paragraph 4.19.
[53] Memoria response to Issues Statement, page 3.
[54] Plymouth City Council response to Issues Statement, paragraph 4.4.
[55] Plymouth City Council response to Issues Statement, paragraph 5.

crematoria to service the needs of the bereaved in the UK as very few crematoria are actually at capacity."[56]

64. We have been told by the following crematoria providers that consistency in the planning process could be improved to make the regime more effective at allowing new build crematoria to meet demand. Westerleigh told us that there is potentially "some confusion as to the needs argument, and when that should be applied, so consistency in that approach would be good." The London Cremation Company has noted that there is an "inconsistent application of planning regulations."[57]

65. We note that the planning regime is not focussed on competition but serves a purpose to ensure that wider societal needs are met (for example, considering the possible impact new build crematoria may have both on the local environment and residents living within a local area).

Economic barriers to entry

66. The main economic barriers to entry relate to the high initial sunk costs required to enter in a given local area and the need to find a suitable area where the new crematorium will be able to conduct sufficient volumes to cover their fixed costs.

67. A new crematorium will incur high sunk costs in gaining planning approval and in construction:

    (a) We are currently gathering evidence on the cost of obtaining planning approval.

    (b) The cost of recent new build crematoria have ranged between £3.4m and £8.5m.

68. Dignity, Westerleigh and Memoria have identified these high sunk costs as a barrier to entry/significant factor impeding the development of new crematoria. However, Horizon Crematoria, a new entrant, has noted that once planning permission is in place, raising capital is not intrinsically difficult as "banks will loan money for construction at normal commercial rates and venture capitalists are prepared to supply funding to help obtain planning permission and buy land. They are attracted by the intrinsic security of the sector with its actuarially measurable income streams."[58]

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[56] Cremation Society of Great Britain response to Issues Statement.
[57] London Cremation Company response to interim market study report.
[58] Horizon response to Issues Statement, paragraph 41.

69. Crematoria, given their high fixed costs, need to conduct a sufficient volume of services (at a particular fee) for entry to be profitable. Dignity, Westerleigh and Memoria have all told us that a certain level of demand is required to enter, with Westerleigh stating: "a crematorium would need to be situated where a population requires additional provision. Crematoria can only be downsized to a small degree to reflect reduced level of expected demand. All new crematoria will require a minimum level of infrastructure, as even a crematorium expecting a small number of funerals in a year would need to be able to accommodate large sized services and have the appropriate site size, chapel size, car parking and other facilities necessary."[59] We have a range of evidence on the number of cremations that a crematorium needs to conduct in order to be viable/profitable:

(a) Dignity stated that a typical new crematorium would need to conduct 800 cremations per year in order to break even.

(b) Memoria stated that a crematorium would need to conduct 800 cremations per year (at £800 per cremation) in order to service its debt.[60]

(c) The London Cremation Company stated that its model is [✂].

(d) A former bereavement services manager states that the baseline for a profitable crematorium is 800 cremations per year.[61]

(e) The Federation of Burial and Cremation Authorities (FBCA) has stated that, in the past, a crematorium would need to conduct between 900-1,000 cremations per year to be financially viable, although this has fallen to around 600 cremations given the current level of cremation fees.

(f) Westerleigh provided slightly different evidence arguing that crematoria carrying out 1,000 cremations per year would not be busy enough to be efficient.

70. Dignity, Westerleigh and Memoria all note that identifying economically viable sites, that is areas where there is a sufficient level of demand to enter, is difficult. Westerleigh told us that "whilst a number of new crematoria have been developed in recent years, overall, the crematorium market is mature" where "as a result the market opportunity is limited" since the "stock of crematoria in the UK are well established in their local markets." Memoria stated that "identifying new build crematoria opportunities is… challenging." Dignity told us that "at current death rates large areas of the UK are not

[59] Dignity notes the need for a 'clear market opportunity' in its response to the Issues Statement.
[60] Memoria response to Interim Report, p13.
[61] Ken West response to Issues Statement.

suitable for such an investment," and it noted that there is probably scope for around a dozen new crematoria. We note also that the FBCA has stated that "that there were potentially around ten opportunities left in England, Scotland and Wales to introduce new crematoria that are viable to carry out sufficient numbers of cremations a year."[62]

71. We have considered the extent to which the planning regime, which requires a 'need' assessment, and the economic need to conduct a certain volume of cremations interact. In particular, we have considered whether there are areas where entry is economically viable but has not occurred because it is difficult to prove a 'need.' We have asked Dignity, Westerleigh and Memoria to identify areas where they may have entered but did not so because they could not prove a 'need' for the purposes of the planning regime. Dignity provided two examples of areas where they did not enter because the planning regime deterred entry, once in [✂] (the site could not pass the '200 yard rule') and once in [✂] (the site was too close to existing crematoria). Memoria provided one instance (noting that it tries to avoid the expense of progressing a development that through experience it considers unlikely to gain planning permission). More frequently, Dignity and Memoria did not proceed with developments because an alternative crematorium operator gained planning permission first (making the proposed development uneconomic). Westerleigh stated that "frequently as part of the site searching process, specific site locations are not pursued, despite considering that a 'need' existed… [given that] the significant cost and scale of risk involved limits the number of site applications that can be pursued at any time and results in the careful selection and prioritisation of those sites that are pursued and a large number are not pursued at that point in time as the risk/reward is not considered acceptable."

Resomation (water cremation)

72. We have received evidence from a supplier of water cremation equipment, Resomation Ltd, in relation to potential barriers to entry faced by suppliers of resomation (water cremation) equipment and their potential customers.

73. Barriers to entry do not appear to be related to operational issues. Resomation Ltd notes that, "the system can be installed wherever there are the appropriate space and utilities available… [it is] safe and simple to operate. To perform a disposition, it requires very little technical knowledge." Resomation Ltd met with Water UK[63] in 2008, to discuss whether the effluent

[62] MHCLG Crematoria Provision and Facilities: Government Response to the Review, page 8.
[63] Water UK engages with companies and regulators to ensure customers receive high quality tap water, and that the environment is protected and improved. https://www.water.org.uk/about-water-uk/our-team/

generated by a water cremation can be safely disposed of. Resomation Ltd told us that Water UK agreed with them that there was "no technical reason why" water cremation could not happen in practice. Resomation Ltd is currently working with [✂] to develop evidence that supports the safe disposal of effluent generated by the resomation process, in order to gain consents from water companies across the UK.

74. To the extent that barriers to entry exist in relation to water cremation, we have been told that they are predominantly due to the legal uncertainty around whether water cremation is permitted in the UK. There is uncertainty amongst local planners as to how to evaluate proposals in the context of the planning regime. Resomation Ltd told us that "various enquirers who are keen to install resomation are already in communications with local planners and are finding a varied response from very positive to stalling due to lack of clarity."

75. Furthermore, we note the uncertainty as to how existing industry guidelines apply to water cremations. Resomation Ltd highlights that they "have been requesting to work with the sector to develop a Code of Practice similar to that for cremation only to find it difficult to get either engagement or agreement across the sector." Many potential customers "have expressed concern over the lack of clarity provided from government and other associated regulators to give them the confidence…that the process can be introduced."

76. Finally, we note that given this uncertainty, the Law Commission is currently considering the extent to which this new model can be integrated within the existing legal framework around standard cremation. It is unclear when this work will be complete.[64]

Summary

77. Our analysis shows that most crematoria face a limited number of rivals in their local areas. In particular, around half of crematoria face no rivals within a 30-minute cortege drive time, and only a small number of crematoria have three or more rivals within a 30-minute cortege drive time (we would typically expect that in a local market with four or more competitors, competition may be sufficient). Some crematoria may be capacity constrained and may therefore not act as a strong constraint on rival crematoria.

78. We have received evidence that barriers to entry exist in relation to the planning regime and the economics of operating a crematorium. The planning

[64] https://www.lawcom.gov.uk/project/a-modern-framework-for-disposing-of-the-dead/

regime may reinforce the economic barriers to entry, as well as reducing the risk for existing operators of facing new entry. Crematoria providers have told us of only a small number of areas where entry would have likely occurred absent the needs test in the planning regime. Our analysis suggests that newer crematoria (which have been built predominately by private crematoria providers) have delivered additional capacity to help meet growing demand (on average, volumes at crematoria have remained stable over the last ten years, although this is variable, with crematoria experiencing nearby entry seeing reduced volumes).

Cremation Fee League Table As at 1st January 2021

1	Friockheim	£1,100.00
2	Chichester	£1,077.00
3	Beckenham	£1,070.00
4	Northampton	£1,070.00
5	Oxford	£1,070.00
6	Leatherhead	£1,070.00
7	Crawley (Surrey & Sussex)	£1,070.00
8	Nuneaton	£1,070.00
9	Dundee	£1,070.00
10	Moray	£1,070.00
11	Norwich (Earlham Road)	£1,060.00
12	Norwich (Horsham St Faith)	£1,060.00
13	Lancaster & Morecambe	£1,055.00
14	Abingdon (S Oxfordshire)	£1,040.00
15	Kidlington (N Oxfordshire)	£1,040.00
16	Loughborough	£1,035.00
17	Basingstoke	£1,025.00
18	Harwood Park	£1,025.00
19	Peterborough	£1,002.00
20	Bodmin	£999.00
21	Exeter & Devon	£999.00
22	Braintree	£999.00
23	Folkestone	£999.00
24	Chorley	£999.00
25	Grantham	£999.00
26	London (South)	£999.00
27	Bury	£999.00
28	Sherwood Forest	£999.00
29	West Berkshire (Thatcham)	£995.00
30	Torquay	£995.00
31	Basildon	£995.00
32	Worthing	£995.00
33	East Riding	£995.00
34	March (Fenland)	£988.00
35	Westerleigh	£985.00
36	Bury St Edmunds	£985.00
37	West Wiltshire	£985.00
38	Stourport (Wyre Forest)	£984.00
39	Irvine	£981.00
40	Cromer	£980.00
41	Weston-Super-Mare	£978.00
42	Beetham Hall	£975.00
43	Barham	£975.00
44	Charing	£975.00
45	Brentwood	£973.00
46	Harlow	£970.00
47	Redbridge (Forest Park)	£970.00
48	Countesthorpe (S Leicester)	£965.00
49	Milton Keynes	£960.00
50	Hoddesdon (Woollensbrook)	£960.00
51	Inverness	£959.00
52	Garnock Valley	£958.00
53	South Essex	£955.00
54	Bath	£953.00
55	Hitchin	£951.00
56	Enfield	£949.00
57	Romsey	£945.00
58	Southampton (Wessex Vale)	£945.00
59	Rotherham	£943.00
60	Bristol (Canford)	£940.00
61	Bristol (South)	£940.00
62	Leeds (Cottingley Hall)	£939.00
63	Leeds (Lawnswood)	£939.00
64	Rawdon	£939.00
65	Pontefract	£937.00
66	Wakefield	£937.00
67	Gloucester (Forest of Dean)	£930.00
68	Dudley	£930.00
69	Stourbridge	£930.00
70	Aldershot	£926.00
71	New Southgate	£925.00
72	Guildford	£925.00
73	Royal Wooton Bassett	£925.00
74	Telford	£924.00
75	Birmingham (Perry Barr)	£924.00
76	Leamington Spa	£920.00
77	York	£920.00
78	Plymouth (Efford)	£915.00
79	Plymouth (Weston Mill)	£915.00
80	Cheltenham	£915.00
81	Great Glen	£915.00
82	Banbury	£915.00
83	Gloucester (Coney Hill)	£912.00
84	Mendip	£909.00
85	Haltemprice	£909.00
86	Barrow-in-Furness	£906.00
87	Walsall	£905.00
88	Bracknell	£900.00
89	Darlington	£900.00
90	Andover	£900.00
91	Waveney	£900.00
92	Salisbury	£900.00
93	Sheffield (City Road)	£900.00
94	Sheffield (Hutcliffe Wood)	£900.00
95	Northop	£900.00
96	St Asaph	£900.00
97	Wellingborough (Nene Valley)	£899.00
98	Whimple (East Devon)	£895.00
99	Havant	£895.00
100	Swindon	£895.00
101	Bannockburn	£895.00
102	Melrose (Borders)	£895.00
103	West Lothian	£895.00
104	Distington (Whitehaven)	£892.00
105	Kirkleatham	£890.00
106	Camborne	£890.00
107	Leicester	£890.00
108	Barry (Cardiff & Glamorgan)	£890.00
109	Holytown	£887.00
110	Harrogate	£886.00
111	Margate	£885.00
112	Croydon	£885.00
113	Atherton (Howe Bridge)	£885.00
114	Wealden (Horam)	£885.00
115	Coventry	£885.00
116	Wear Valley	£884.00
117	Ayr	£882.00
118	Wolverhampton	£880.00
119	Kettering	£878.00
120	Lach Dennis (Birches)	£875.00
121	Northwich	£875.00
122	Truro	£875.00
123	Alfreton (Amber Valley)	£875.00
124	Manor Park	£875.00
125	Bolton	£875.00
126	Sedgemoor	£875.00

127	Birmingham (Lodge Hill)	£875.00
128	Birmingham (Sutton Coldfield)	£875.00
129	Birmingham (Yardley)	£875.00
130	Newcastle upon Tyne	£872.00
131	Liverpool (Anfield)	£871.00
132	Liverpool (Springwood)	£871.00
133	Carlisle	£870.00
134	Ormskirk (West Lancs)	£870.00
135	Chester	£869.25
136	Sunderland	£865.00
137	Aberystwyth	£865.00
138	Whippingham	£863.00
139	Southampton	£860.00
140	Southport	£860.00
141	Thornton (Crosby)	£860.00
142	Cannock Chase	£860.00
143	Halifax	£860.00
144	Dumfries (Roucan Loch)	£855.00
145	Saffron Walden (Cam Valley)	£850.00
146	Pershore (The Vale)	£850.00
147	Bedford	£849.95
148	Paisley	£849.00
149	Woking	£848.50
150	London (East)	£844.00
151	Breckland	£840.00
152	Great Yarmouth	£840.00
153	Newport	£840.00
154	Slough	£835.00
155	Rugby (Rainsbrook)	£835.00
156	Reading	£830.00
157	Cambridge	£830.00
159	Weymouth	£830.00
160	Scarborough	£830.00
161	Gwent	£828.00
161	Barnsley	£827.00
162	Worcester	£822.00
163	Tunbridge Wells	£820.00
164	Blyth	£820.00
165	Bassetlaw (Babworth)	£820.00
166	Taunton	£820.00
167	Doncaster	£820.00
168	Mansfield	£817.00
169	South Shields	£816.00
170	Retford (Barnby Moor)	£815.00
171	Douglas	£814.00
172	Warrington	£810.00
173	Edinburgh (Seafield)	£810.00
174	Edinburgh (Warriston)	£810.00
175	Llanelli	£810.00
176	Colchester	£809.00
177	Edinburgh (Mortonhall)	£806.00
178	Bournemouth	£805.00
179	Poole	£805.00
180	Blackburn	£805.00
181	Gainsborough	£805.00
182	Birkenhead	£800.00
183	King's Lynn	£799.00
184	Hull	£799.00
185	Houndwood	£799.00
186	Burnley	£797.00
187	Lincoln	£795.00
188	South Lincolnshire	£795.00
189	Manchester (Chorlton-cum-Hardy)	£795.00
190	Crathes	£795.00
191	Chelmsford	£793.00
192	Hastings	£791.00
193	Middlesbrough	£790.00
194	Coleshill (Woodlands)	£790.00
195	Solihull	£790.00
196	Blackwood (Sirhowy Valley)	£790.00
197	Tynemouth	£789.00
198	Whitley Bay	£789.00
199	Cardross	£788.00
200	Perth	£788.00
201	Southend-on-Sea	£785.00
202	Derby	£782.00
203	Luton	£780.00
204	Yeovil	£780.00
205	Peel Green	£778.00
206	Salford	£778.00
207	Weeley	£775.00
208	Nacton (Seven Hills)	£775.00
209	Rowley Regis	£775.00
210	West Bromwich	£775.00
211	Ipswich	£773.00
212	Honor Oak	£772.00
213	Chesterfield	£770.00
214	Gedling	£770.00
215	Sheffield (Grenoside)	£769.00
216	Newcastle-under-Lyme	£767.00
217	Shrewsbury	£766.00
218	Widnes	£765.00
219	Stockton-on-Tees	£765.00
220	Gravesend	£765.00
221	Sittingbourne	£765.00
222	Blackpool	£765.00
223	Dunfermline	£762.00
224	Kirkcaldy	£762.00
225	Hartlepool	£761.00
226	Jersey	£760.65
227	Boston	£760.00
228	Stafford	£755.00
229	Middleton	£754.00
230	Rochdale	£754.00
231	Lytham St Annes	£753.00
232	Preston	£753.00
233	Crewe	£750.00
234	Macclesfield	£750.00
235	Altrincham	£750.00
236	Stoke-on-Trent	£750.00
237	Bradford	£750.00
238	Keighley	£750.00
239	Shipley	£750.00
240	Redditch	£746.00
241	Dukinfield	£745.00
242	Colwyn Bay	£745.00
243	Hereford	£744.00
244	Skipton	£742.00
245	Wrexham (Pentrebychan)	£742.00
246	Birtley	£739.00
247	Gateshead	£739.00
248	Oldham	£732.00
249	Wigan	£731.00
250	Golders Green	£730.00
251	Bramcote	£730.00
252	Bretby	£730.00
253	Swansea	£730.00
254	Aston-on-Trent (Trent Valley)	£729.00
255	Manchester (Blackley)	£729.00
256	Glasgow (Craigton)	£729.00
257	Dewsbury Moor	£727.00
258	Huddersfield	£727.00
259	Clydebank	£723.00
260	Greenock	£722.55
261	Eltham	£722.00
262	Aberdare	£721.00
263	Pontypridd	£721.00
264	Durham	£720.00
265	Mountsett	£720.00
266	Accrington	£720.00
267	Alford	£720.00
268	Barnstaple	£715.00
269	Scunthorpe	£715.00
270	Lichfield	£715.00
271	Eastbourne	£715.00
272	Maidstone	£710.00
273	Medway	£710.00
274	Falkirk	£709.70
275	Great Grimsby	£705.00
276	Aberdeen	£704.00
277	West Hertfordshire	£700.00
278	Nottingham	£700.00
279	Cardiff	£700.00
280	Narberth	£700.00
281	Bridgend	£696.40
282	Lambeth	£695.00
283	West Norwood	£695.00
284	Brighton & Hove (Woodvale)	£691.00
285	London (West)	£685.00
286	Stockport	£675.00
287	Kingston-upon-Thames	£670.00
288	Glasgow (Daldowie)	£670.00
289	Glasgow (The Linn)	£670.00
290	Brighton (The Downs)	£658.00
291	Bangor	£658.00
292	Hendon	£655.00
293	Amersham (Chilterns)	£650.00
294	Bierton	£650.00
295	Portchester	£650.00
296	Islington	£650.00
297	Lewisham	£650.00
298	Ruislip	£649.00
299	Aylesbury Vale	£645.00
300	St Marylebone	£645.00
301	Glasgow (Maryhill)	£640.00
302	St Helens	£638.00
303	South Lanarkshire	£635.90
304	Putney Vale	£625.00
305	Mortlake	£620.00
306	Margam	£617.00
307	Guernsey	£607.00
308	North East Surrey	£605.00
309	Purbeck	£538.00
310	South West Middlesex	£535.00
311	London (City of)	£465.00
312	Belfast	£392.00

RECOMMENDATIONS ON THE ESTABLISHMENT OF CREMATORIA

INTRODUCTION

The Federation of Burial and Cremation Authorities is approached frequently by persons, companies and local authorities requesting information that will assist them in the task of establishing a crematorium. Many problems must be addressed and carefully considered when conducting a feasibility study or preparing a scheme for submission to the Planning Authority.

The information summarised in the following pages provides advice on the whole field of policy, siting, planning and operating a crematorium. Further information concerning these, and all technical subjects may be obtained by members on application to the Federation's Executive Officer. Adequate advice on problems of a local nature can only be given after consultation has taken place between representatives of the prospective cremation authority and the Federation's Technical Officers.

PLANNING

It is assumed that before any organisation proceeds with the formulation of plans and the submission of a planning application, the local authority and residents would have been consulted first to help establish the business case for a new facility.

The length and duration of journey and the availability of service times at existing neighbouring crematoria can influence the strength of local support. In addition, the application of higher non-resident cremation fees at neighbouring crematoria can have an adverse effect on the local community and may support the need for a new local facility.

Broadly speaking, crematoria undertaking 1000 or more cremations per annum are most likely to be viable, although there are a number of crematoria, mainly serving rural or island communities, undertaking fewer than this.

It will be necessary to assess how many cremations may be expected if a crematorium is to be established, based upon local population size and growth projections from the Office for National Statistics. Plans should take account of the proximity and capacity of neighbouring crematoria and where relevant, the future capacity of local cemeteries. It would be helpful, therefore, if information is obtained to establish the number of deaths in the area during the preceding five years which resulted in cremation being undertaken at existing crematoria, including any trends in terms of growth or decline in numbers.

FINANCE

Single Authority. Local authorities with populations of approximately 120,000 or more would be in a position to provide and manage a crematorium with a reasonable expectation of operating on a sound financial basis after the initial years of capital repayment and associated loan charges.

Combined Authorities. In a situation where the population is below 120,000, capital funding can be provided and running costs shared by several local authorities forming a joint management committee under the provisions of the appropriate Local Government Acts. Private companies may also decide to invest in these circumstances.

Joint Crematorium Board. Individual local authorities are empowered to appoint joint crematorium boards under the Public Health Act 1936 to provide and maintain one or more crematoria for the areas of the respective authorities. The constituent authorities each have representation on the Board, which is deemed a corporate body in its own right, having perpetual succession, a common seal and the power to hold land for the purposes of its constitution.

Joint Crematorium Committee. Authorities can combine under the Local Government Acts 1972 and 2000 to form a joint crematorium committee. Financial responsibility and member representation need to be agreed in advance. The Joint Committee will ultimately be deemed to be the Cremation Authority under the appropriate Cremation Acts.

Private Company. A private company and/or consortium of companies may provide the necessary capital to enable the establishment and/or the management of a crematorium.

Joint Venture. A local authority may wish to consider a joint venture with a private company to establish and operate a crematorium.

APPOINTMENT OF ARCHITECT

The appointed architect should preferably have previous experience in the design and development of crematoria and should be in consultation with an expert in crematoria management and operation from the outset. It is also advisable that the officer responsible for the eventual management of the crematorium should be involved as early as possible in the planning and development of the facility.

SITING OF CREMATORIA

The process of site selection should be aimed at achieving quietness and seclusion. A woodland or parkland setting, or an area of undulating ground with good natural features and mature trees, would enable the establishment of a good natural setting with a minimum of horticultural treatment. A visual impact assessment will help to identify any attractive views beyond the boundaries of the site that could be usefully preserved as part of the overall landscape design.

A proposed crematorium will require approval under the Town and Country Planning Act 1990 and current Building Regulations. Therefore, the co-operation and sympathetic support of the local Planning Officer in the selection and layout of the site and buildings is highly desirable. Pre-application discussions with local authorities are highly recommended and are encouraged by Government.

Government policy, set out in the National Planning Policy Framework (NPPF) advocates sustainable development using previously developed land, bringing it back into beneficial use. However, previously developed land can often prove unsuitable, due to land contamination, which is unacceptable for the interment of ashes, or due to the presence of residential property within 200 yards. There is a growing recognition that new crematoria will be built in a countryside location close to the urban fringe.

Ideal sites are rarely to be located in urban areas and it is emphasised that suitability of setting is of greater importance than its location in close proximity to population centres. Often, this will involve the consideration of sites within the Green Belt, which is the subject of restrictive planning controls. Government guidance contained in the National Planning Policy Framework (NPPF) confirms a general presumption against inappropriate development within the Green Belt "except in very special circumstances".

All proposals in the Green Belt should provide evidence of a comprehensive site search along with demonstration of local need at the planning application stage to support special circumstances.

Community support from funeral directors, amenity societies and the general public will help demonstrate the local need. The bulk and height of buildings within the Green Belt is also a sensitive issue that may require a sympathetic and considered approach to their design.

A careful survey of any proposed site will help identify the presence of any underground services/utilities and other constraints on development such as ground contamination or mine shafts. It is also important to ensure that the presence of protected species or trees covered by tree preservation orders is identified so that provision can be made to avoid their disturbance. The aim should be to enhance wildlife habitats, wherever possible, as a part of any new development.

The site should be reasonably accessible by public transport and should have adequate water, electricity and drainage services. A mains gas supply would be an advantage as the supply, storage and cost of liquid petroleum gas (LPG) may be more expensive.

Where local circumstances indicate that the most convenient site for a crematorium would be within or attached to an existing cemetery, the adequate planting of trees and shrubs is recommended to screen the crematorium building from the roads, car park and the Gardens of Remembrance. Experience has shown that some crematoria have been sited very satisfactorily in conjunction with cemeteries, and the resultant saving of land, capital and reduced administrative costs can be of great benefit.

A minimum of two hectares (approximately five acres) per estimated 1,000 cremations per annum is recommended to provide sufficient space for the crematorium, gardens of remembrance, traffic circulation, parking, and a modest amount of space around the building. The long-term needs of the area should be carefully assessed at the initial design stage and sufficient land acquired initially to allow for future expansion to accommodate any increased demand for service provision.

Section 5 of the Cremation Act 1902 states that: “No crematorium shall be constructed nearer to any dwelling house than two hundred yards, except with the consent, in writing, of the owner, lessee, and occupier of such house, nor within fifty yards of any public highway, nor in the consecrated part of the burial ground of any burial authority.”

In the case of crematoria established in Greater London subject to London County Council (General Powers) Act 1935 Section 64, and 1971 Section 7, the 200 yards limit from any dwelling house is reduced to 100 yards.

One of the most intrusive elements of any new crematorium is the chimney stack, which must be designed to comply with the requirements of the Secretary of State's Process Guidance Note 5/2(12) Statutory Guidance for Crematoria issued in support of the Environmental Protection Act 1990.

All new crematoria (not existing processes on 1 October 2006) are required to fit abatement plant to remove mercury and dioxins, and the stack height is calculated at a suitable height for the release of abated gases (normally shorter than the optimum height for unabated gases) which require sufficient dispersion and dilution in the atmosphere to ensure that they ground at harmless concentrations.

The methodology for calculating the stack height is contained in HMIP Technical Guidance Note (Dispersion) D1 for Part B Processes “Guidelines on Discharge Stack Heights for Polluting Emissions.”

Prospective cremator manufacturers will normally be able to carry out these calculations on behalf of the client, taking into account building size and shape, location, topography, meteorological data and background pollution levels. Generally, for new crematoria with abatement plant, it is unlikely that the calculated stack height would need to be more than 2 metres higher than the building height.

All UK crematoria must operate under the Secretary of State's Process Guidance for Crematoria 5/2(12) which gives guidance on the Best Available Techniques aimed at providing a strong framework for consistent regulation under the statutory Local Air Pollution Prevention and Control (LAPPC) regime in England and Wales, Scotland and Northern Ireland. This requires an application to the local authority regulator for a permit to operate, which is then issued under the Environmental Permitting (England and Wales) Regulations 2010 or Pollution Prevention and Control (Scotland) Regulations 2000.

It is recommended that as part of the feasibility study to provide a new facility, the appropriate Regulatory Authority is consulted when interpretation of the regulations can be discussed prior to the making of a formal permit application. This consultation is particularly important in Scotland where SEPA may vary the permit conditions recommended in the Process Guidance Note. Applications must be advertised and will be placed upon a public register. The public and statutory consultees are given the opportunity to comment and have their views considered.

SITE ACCESS

Entrances and exits from crematorium grounds must be carefully considered.

Careful consideration should be given to the siting or subsequent development of crematorium facilities in close proximity to any schools, factories, trading estates, sports grounds or other facility which may be deemed incompatible within the vicinity of a crematorium. The immediate approach to a crematorium through a residential road, resulting in the constant passage of funeral processions or traffic congestion, would almost certainly attract objection on road safety grounds and may require the commissioning of a traffic impact survey, and upon completion, a Road Safety Audit.

Entrance and exit gates should be set back from the road and should incorporate a pedestrian gateway and path. Entrances that would require funeral corteges and accompanying private cars to cross the flow of traffic should not be sited on main trunk roads. However, if this is unavoidable, then there may be a need for a roundabout, or space in the central reservation of a dual carriageway, or a central turn right lane on a single carriageway, to allow the hearse and accompanying private cars to wait in a safe and dignified manner.

The successful operation of a crematorium is dependent on the adequate separation of funeral corteges in both time and space, with each funeral party being provided with as much privacy as possible. The flow of traffic to and from the car park and the building should ideally be in one direction only and should be simple, dignified and uninterrupted. Where possible, entrance and exit routes should be screened and separated to avoid funeral corteges passing each other. This discipline also applies to the movement of mourners within the building. Therefore, the positioning of the entrance and exit to the chapel and waiting room, public toilets and floral tribute areas should ensure that funeral groups progress through the building in sequence.

An adequate car park is essential and should be placed as near to the chapel as possible but having regard to the necessity to avoid disturbance by noise. The size can be estimated by equating it to approximately two thirds of the total seating capacity of the chapel. A proportion of parking spaces should be allocated close to the chapel for use by disabled people to accord with the requirements of Part M of the Building Regulations - “Access to and Use of Buildings” and the guidance contained within BS8300:2009 “Design of buildings and their approaches to meet the needs of disabled people” or the Department for Transport “Inclusive Mobility - A Guide to Best Practice on Access to Pedestrian and Transport Infrastructure”.

Only the hearse and principal mourners’ vehicles should be allowed beyond the parking area to the porte-cochere.

A minimum of two hectares (approximately five acres) per estimated 1,000 cremations per annum is recommended. This area includes the space needed for traffic circulation, parking, a modest amount of space around the crematorium building and the gardens of remembrance. The long-term needs of the area should be carefully assessed at the outset and sufficient land acquired initially to allow for future expansion due to increased demand for service provision.

BUILDINGS

Main Entrance

Buildings should be designed to allow staff to circulate easily to any part, e.g. taking wreaths from a coffin after committal to the floral tribute viewing area, without disturbing any funeral service that may be in progress. Any part of the establishment that will be used by the public must be designed to allow access for disabled persons and ideal planning will place all floors on one level. The provision of a fire alarm and emergency lighting will be required to enable safe evacuation of the building in an emergency.

In the uncertain climate of this country a porte-cochere is very desirable, enabling the coffin to be removed from the hearse and mourners to pass from the vehicles under cover. The length should be at least 8 metres to enable the end of the hearse and one car to be under cover. Care should be taken that ample width (not less than 4.5 metres) is provided to allow doors on both sides of cars to be opened fully. The minimum height should be at least 3.3 metres to allow room for taller vehicles e.g. the occasional horse drawn carriage.

Entrance Hall or Vestibule

A spacious entrance hall between the porte-cochere and the chapel is an asset in many ways, allowing mourners to congregate under cover and in full view of the main drive, conserving the heat in the chapel by providing a buffer from the colder outside atmosphere, and reducing the risk of noise intrusion from outside.

Waiting Room

This should be large enough to provide seating for approximately ten per cent of the total seating capacity of the chapel and should have windows or glass doors which allow the arrival of the cortege to be seen by those waiting. It is desirable that mourners do not enter the entrance hall to access the waiting room or toilets, to avoid disturbing a preceding service already in progress, therefore entry to the waiting room should be from outside, possibly from under the porte-cochere.

Toilet Facilities

Toilets, which must include facilities for disabled persons in accordance with current building regulations, should be easily accessible before the service, and immediately after the service at the point where mourners disperse after the ceremony. Importantly, toilets that are adjacent to the chapel entrance should be accessible without the need to enter the Entrance Hall which may disturb a preceding or following ceremony, and care must be taken to avoid plumbing noises being audible in the chapel. Separate male and female toilets are normally desirable; however unisex toilets and disabled facilities have become more acceptable and may be appropriate at smaller crematoria.

Vestry

It is desirable for the officiant to meet the cortege at the door of the chapel; therefore, the vestry should be located in the front of the building adjacent to the entrance hall. Windows should be sited to allow the officiant to see the cortege arriving, and access to toilet facilities should be provided.

Chapel

Chapels should take into account Christian, non-Christian and secular usage and must not be consecrated for the exclusive use of any particular denomination. A system of easily changed religious symbols should be installed, and where a cross is hung on a wall, it should be capable of being easily concealed or removed.

It is estimated that no more than thirty mourners will attend in 50% of cremation services, and only on exceptional occasions does the number exceed eighty. It seems, therefore, that seating accommodation should be provided for some 80-100 people. A chapel of this size will accommodate most services without destroying that intimate atmosphere so desirable with a smaller congregation. Where cremation numbers are likely to exceed 2,000 per annum then the ideal is to provide two chapels, one being for the more intimate service (approximately 20 seats) and the other large enough for at least 80-100 people.

Care should be taken to respect community needs such as, for example, the provision of additional standing room where there is a local tradition for large funerals.

The architect should incorporate seating to harmonise with the building. Fixed pews with incorporated kneelers have been widely used but require particular attention to the comfort of people using them. Upholstered chairs offer greater flexibility in terms of layout, particularly if relatives require a more informal arrangement.

If chairs are used, they should have book scoops attached and be clipped together with links to minimise movement and noise during the service and thus preserving alignment. Whatever system of seating is adopted, provision should be made to accommodate wheelchairs within the main seating area to avoid their undue prominence and prevent obstruction of the aisles.

It should be remembered that the building will have to serve the Authority for many years and therefore all furnishing and fittings should be of the finest quality.

A minister's desk or lectern should be available, and equipped with a lectern light, a microphone connected to the public address and loop system, and controls to operate or signal the closure of catafalque curtains at the committal.

As a general observation on chapel interior design and furnishing it is strongly recommended that eccentric or purely secular features should be avoided. Experience has shown that mourners derive much comfort from a traditionally spiritual atmosphere engendered by the visual arrangements in the chapel. The décor should be simple, using natural materials and muted colours.

Entrance doors through which the bearers pass with the coffin should be at least 1.8 metres wide, with a minimum height of 2.5 metres.

Separate exit doors from the chapel should be provided to avoid mourners arriving at the chapel meeting those leaving the previous service. All doors should be free of projections, be able to be held open, and should operate silently. Depending on the layout of the crematorium, it may be appropriate to consider acoustic insulation of the chapel to minimise disturbance from mourners assembling in or departing from other parts of the building.

Windows should be provided where possible, at a number of levels to provide natural daylight and enable mourners to view a restful and attractive external landscape or enclosed garden; the designer should avoid a totally introspective environment. However, the windows should also be positioned in such a way as to ensure the privacy of mourners during the funeral service. Tinted anti-sun glass will help to preserve privacy and will assist in reducing glare and heat gain from south facing windows.

Music

This aspect of the crematorium facilities is of considerable importance and to overlook it in the initial planning of the building can produce bad acoustical conditions and other musical difficulties that may not easily be overcome at a later date.

With the rapid advancement of technology and the internet, there is now an extensive range of facilities that can be incorporated into a crematorium, including realistic digital organs, internet-based music systems, and remotely viewed web casting, etc.

An organ is considered to be essential and an organ supplier, as well as an acoustics expert, and a music system provider, should all be consulted at the initial design stage of the chapel. The general public expect new crematoria to have the facility to play recorded music and be able to provide a catalogue of music to select from. There are numerous companies who provide high quality bespoke systems which enable specific requests to be downloaded over the internet, and who will install all the necessary equipment, including loop systems, speakers, microphones and web cams, etc. Additional speakers should be installed in the entrance hall, and outside under the porte-cochere, for those occasions when excessive numbers of people attend.

It is essential for the apparatus provided for recorded music should be of very high quality, especially designed for the chapel and expertly installed, as the quality of the musical arrangements can affect the quality and value of the funeral service and, in consequence, the reputation of the crematorium.

Closed Circuit Television

The use of closed-circuit television, to allow staff to monitor traffic, chapel and crematory arrangements and the security of the facility and grounds, can be of great benefit to the smooth operation of the facilities. Crematoria incorporating two chapels would find such

equipment invaluable. Display screens could also be made available in the waiting room, vestry and bearers' room, for example, but only displaying the view from the chapel camera.

Catafalque

There are three main types of catafalque in use at the present time:

a. Lowering the coffin into the catafalque during the committal by using a hydraulic or mechanical lift. A canopy may be provided upon which the wreaths may be placed;
b. Passing the coffin through the end or side wall of the chapel during the committal;
c. Where the catafalque and coffin remain stationery and curtains or screens are drawn across the recess.

A system of electrical signalling (in duplicate) should be installed to enable the Minister, person conducting the service or Chapel Attendant to signal that the apparatus is to be set in motion.

Type a. There are so many divergences of opinion over the catafalque and method of committal that it would be unwise to be dogmatic over any one method. In the early days of cremation, the lowering of the catafalque was considered symbolic of the earth burial and therefore to be avoided, but it was later considered by many to be an association with tradition. Should the building be designed with a basement crematory, then this type will be essential. The lift section of a descending catafalque should not be less than 3.25 metres long by 1.20 metres wide, the top of which should be no more than 1.2 metres above the surrounding floor level.

A basement, however, cannot be recommended owing to the lack of ventilation, difficulties with access to replace equipment, costliness of any future extension and the likelihood of noise rising to the chapel.

Type b. Unless movement is to be affected by a built-in manually operated conveyor belt, it has little to recommend its adoption in a new building, and if it is to be used in an adaptation of an existing chapel, care should be taken in its design and maintenance to ensure its silence in operation and in the avoidance of uneven movement of the coffin.

Type c. This is perhaps the method to be recommended at the present time with the catafalque or bier, on which the coffin rests during the funeral ceremony, being placed in the centre of the chapel or offset from a central position, so that it can be seen by the congregation from all parts of the chapel. This arrangement would also enable an altar table with the cross to be placed in a central recess or small chancel which, when not desired in certain ceremonies, could be removed, screened off, leaving the appearance of the chapel symmetrical and complete. At the committal, curtains may be drawn in front of, or around the catafalque, which will remain closed for the remainder of the ceremony and until the coffin is removed, when the curtains are then re-opened ready for the next service.

A fixed catafalque should be at least 2.6 metres long and 1 metre wide, but the height can vary considerably depending on the local method adopted by funeral directors. Where a coffin is carried in on shoulders, 1 metre to 1.2 metres is advised, but where the coffin is transported on putlogs or a trolley bier, then the height would need to be much lower. Liaison with local funeral directors would be advisable before any design is finalised.

It is highly recommended that there should be no steps of any kind from the chapel entrance to the catafalque.

Committal Hall and Crematory

A committal hall is desirable in order to provide soundproofing chamber between the chapel and the various unavoidable noises of the crematory. The hall should measure at least 4 metres between the opening from the catafalque and the doors to the crematory.

When planning finishes for the crematory walls, floors and fronts of cremators, it should be remembered that occasionally committals are witnessed by some of the relatives, so finishes should be impervious and easily maintained. It is essential that initial provision should be made, at the design stage, for the chosen number of cremators with abatement equipment and with additional space allowed for a possible addition should the annual number of cremations exceed original forecasts. Adequate space should be provided in front of the cremators for raking and charging, and normally 4.5 metres is ideal. Space should also be considered for a coffin storage rack to temporarily hold coffins until a cremator becomes available, and possibly a refrigerated unit in case overnight storage becomes necessary. An effective thermostatically controlled ventilation system will be required to ensure satisfactory working conditions for operatives, particularly with the additional heat gain experienced from abatement plant.

Viewing Room

Ideally a viewing room should be provided to enable the bereaved to view the coffin being charged into the cremator. This is particularly important to Hindus and Sikhs. Access to the viewing room should be arranged so that witnesses are able to leave without disturbing a following service.

Cremators

Careful consideration should be given to the make and type of cremator to be installed and enquiries should be made from a number of other authorities regarding their experiences with the type of units that they are operating. Cremator manufacturers will be able to facilitate visits to other crematoria where their cremation equipment can be seen in use and will be able to provide a list of reference sites where their cremators are installed. Cremators and other ancillary equipment should conform to the specifications and performance criteria included in the Secretary of State's Process Guidance Note 5/2(12) Statutory Guidance for Crematoria issued in support of the Environmental Protection Act 1990.

Combustion air fans, gas meters, heating systems, mercury abatement plant and other necessary apparatus should be situated adjoining the cremators and as far from the chapel as possible to avoid noise and vibration. Due to the possibility of mains power failure or low voltage, it is advisable to consider the provision of a standby generator.

The following facilities may be considered for inclusion in the planning of a crematorium depending on the size, situation and projected numbers of cremations per annum.

ANCILLARY ACCOMMODATION

A. Bearers' Room

May be provided for the use of the bearers whilst the service is in progress, and could be equipped with seating, refreshments, and a display screen showing the CCTV view of the chapel.

B. Chapel of Rest

Where the coffined body may repose during the interim period between death and the cremation service, as might occasionally be required. This building should be easily accessed externally by funeral directors bringing coffins to the crematorium and should be out of view of visitors and mourners arriving for funeral services.

C. Coffin Storage Facilities

Necessary accommodation should be provided adjoining the committal hall for coffins to rest after the funeral service to await cremation.

D. Treatment Room for Ashes

Essential and should include equipment for cooling and reduction of ashes for final disposal. Dust extraction and arrestment facilities must be provided where ashes are transferred between containers or equipment. Separate and secure facilities should be provided for the storage of ashes awaiting disposal.

E. Staff Room

Should include mess room and toilet facilities.

F. Storage Room

Should provide adequate cupboard space for stores and equipment.

G. Office

Where the administrative staff are housed will depend entirely on the site and whether a cemetery is incorporated. It is essential that the public should not have to walk a long distance from the entrance to the office, which should also be situated in a position so that mourners are not disturbed during services.

H. Chapel of Remembrance

Used for the storing and display of the Books of Remembrance, in suitable cabinets. Ideally this chapel should be separate from the main building and close to the Garden of Remembrance. Visitors, who wish to view the Books of Remembrance, or quietly meditate in the chapel, should not be disturbed by mourners attending services and vice versa. The display cabinet should be designed to facilitate viewing by disabled visitors.

I. Floral Tributes

Ample provision should be made for the display of floral tributes. The initial reception point for displaying them would best be sited near the exit which the mourners will use from the chapel, but care should be taken to avoid noise from this point being heard in the chapel. A covered area will provide shelter for mourners during inclement weather. Provision should also be made for the accommodation of cut flowers that will be brought by visitors to the crematorium and Chapel of Remembrance at any time.

J. Staff Housing

Where staff housing is to be provided careful consideration should be given to siting, if this is to be within the grounds. Adjacent to the entrance gates is not necessarily the best site and it should be borne in mind that staff who work together each day do not always wish to live near each other or directly on their job.

METHODS OF DISPOSAL

General. The increase in the number of cremations taking place annually compels Cremation Authorities to give careful consideration to the whole question of commemoration. The following summary indicates the practice in the disposal of ashes for 2017:

Strewn in Grounds:	16.94%
Interred in Grounds:	5.01%
Placed above ground at Crematorium:	0.25%
Removed from the Crematorium:	76.76%
No collectable cremated remains/ashes obtained:	0.01%
Retained Pending Instructions:	1.03%
	100.00%

Interment

Ashes are often conveyed to cemeteries for interment in an existing family grave.

The desire to save land, which was a primary object of the cremation movement, has discouraged many authorities from developing new grave facilities exclusively to contain ashes. The interment of ashes in various areas of the Crematorium's Garden of Remembrance is often carried out as an alternative to surface strewing although the use of caskets in these circumstances should be precluded.

Strewing of ashes

Ashes may be strewn in the Garden of Remembrance either on the surface of formal or informal lawn areas, in the shrubberies or in natural woodland. Where possible, it is desirable for the location of the strewn remains to be recorded within defined periodic strewing areas, situated well beyond the site of any future building developments or extensions. Many authorities have been disappointed with the appearance of lawns following surface strewing of ashes. If this procedure is followed, a range of alternative sites for strewing should be provided to provide time for the turf to recover. A widespread or light covering of fine soil or compost after strewing is also advisable.

Commemoration

Experience has shown that when ashes are dispersed in the grounds attached to the crematorium, many relatives require some form of memorial. A choice of at least two types should be provided, but for limited periods only. Considerable practical and legal difficulties have been encountered in respect of perpetuity arrangements that were made many years ago and which cannot now be altered. Wherever possible, provision should be made for

commemorative floral tributes to be accommodated within the general vicinity of the memorials. Visitors to memorials will appreciate a dedicated car parking area, set apart from that for normal funeral traffic. Informal seating and the provision of one or more shelters should also be considered.

Recordia

Methods vary at individual crematoria. The erection of stone or bronze tablets on well-designed cloisters or specially constructed walls became the accepted practice until about 1940. This commemorative facility, with minor variations, has recently been revived and is available at some crematoria.

Memorial Roses, Trees and Shrubs

Some crematoria have facilities in their gardens for the planting of memorial roses, trees and shrubs to which may be attached a suitably inscribed plaque. Additionally, many cremation authorities operate schemes that allow for the planting of bulbs (crocus, daffodil, etc.) in certain areas of the Garden of Remembrance.

Garden Seats, etc.

The provision of garden seats and architectural features offer another form of commemoration in harmony with the garden.

Bronze Memorial Plates

Authorities have adopted the method of fixing bronze memorial plates to specially constructed, chamfered terra-cotta brick or stone edging to the walks in the Garden of Remembrance, or a similar edging of stone or green slate directly inscribed on the chamfer. Relatives appreciate this form of commemoration when it allows the inscription to be placed in close proximity to where the ashes were strewn. This method enables many thousands of memorials to be provided without detracting from the beauty of the garden.

Books of Remembrance

These are regarded as being the ideal form of commemoration because of their unlimited capacity, the simplicity of the inscription, and comparative inexpensiveness.

The Book of Remembrance provides a lasting form of memorial to those cremated. It may be in four quarterly volumes, handmade, covered in natural calf vellum and richly tooled in gold. Lettering executed by hand by modern craftsmen provides a permanent record comparable with the carrying on of the tradition of the best-illuminated manuscripts of mediaeval times. An opening is provided for each day of the year and the Book, housed in a protective case, remains open each day at the appropriate page, so that entries may be seen on each anniversary of the date of death and at other times by arrangement.

Digital Books of Remembrance are also available where visitors can select the inscription they wish to see via a touch screen display facility at the Crematorium or which may be accessed on-line via the world-wide-web.

Columbaria

This type of commemoration is probably one of the oldest recorded. Niches can be leased in columbaria for a period of time, a memorial plate with a suitable inscription is used to enclose the niche.

GARDEN OF REMEMBRANCE

An essential part of any scheme will be the Garden of Remembrance and landscape architects of experience should be retained to make it a place of quietness and beauty.

When the site chosen for the crematorium has an attractive, natural landscape, as recommended previously, this should be disturbed as little as possible and any necessary development should only be complementary to the existing natural features. A formal layout is not desirable, excepting as might be necessary adjacent to the buildings to harmonise with the style of architecture. Wherever possible, the grounds should be accessible by wheelchair and the layout of the grounds should incorporate a minimum number of steps.

The main purpose of the Garden must not be overlooked and most of the area should be available for the strewing or burial of ashes.

On a flat bare site, it is important to get quick-growing trees and shrubs planted at once with a long-term planting scheme for forest trees for the ultimate screening and maturing of the site. Memorial areas should be screened and separated from those parts of the grounds used by mourners attending funerals or viewing floral tributes. The main avenues of traffic should be screened as much as possible to retain areas for quiet thought and meditation.

ADAPTATION OF CEMETERY CHAPELS

It is reasonable to suppose that small urban and rural areas with populations of say 20,000 to 50,000 and isolated from other centres of population could be provided with cremation facilities by the adaptation of an existing chapel on the unconsecrated portion of a cemetery. This has been achieved satisfactorily on a number of occasions. Also, under certain conditions, chapels and other buildings surrounded by, and situated on, consecrated ground can be deconsecrated to make a conversion possible.

The observations made in the preceding pages under various headings would, in the main, apply to adaptation schemes, but possibly on a less ambitious scale and modifications would have to be made accordingly within existing limitations.

REQUIREMENTS BEFORE OPENING

Prior to the opening of a crematorium, the cremation authority is required to certify to the Secretary of State that the crematorium has been completed and is properly equipped for the disposal of human remains by burning (Cremation Act 1952, s.1(1), as amended by the Local Authority Planning and Land Act 1980. Furthermore, no cremations may take place unless and until the Secretary of State has been notified of the opening of the crematorium (Cremation Regulations, 1930, r.3)

The requirements for the opening of a crematorium in Scotland are contained in the Cremation Act 1952, s.1(3), as amended by the Town and Country Planning (Scotland) Act 1997 and the Cremation (Scotland) Regulations 1935, r. 3.

Issued January 2019


Motorcycle Tyres
Scorpion
Route 66 Driving School
Fithie Burn
Kellas Rd
Kellas Rd
Kellas Rd
B97
30 MPH
60 MPH
40 MPH

Vivien Bruce (Brodies Solicitors)

From: [redacted]
Sent: 02 February 2022 16:20
To: Paul Fretwell
Subject: Re: Planning
Attachments: image001.jpg; image002.jpg; image003.jpg; image001.jpg

Follow Up Flag: Follow up
Flag Status: Flagged

No. Its no where near where I live at all. The name at the top isn't anyone I know either , very confusing as to why I've got embroiled in it
[redacted]

On Wed, 2 Feb 2022, 16:17 Paul Fretwell, <paul@rchitects.org.uk> wrote:

[redacted]

Sorry for the further query, but before I speak to planning. Did you submit any comment to the planning department previously about the application, for instance an objection.

Regards

Paul Fretwell

for @rchitects Scotland Ltd.

50 Castle Street, Forfar, DD8 3AB

Mob. [redacted]

Tel. 01307 466480

www.scotland-architects.co.uk

From: [redacted]
Sent: 02 February 2022 16:05
To: Paul Fretwell <paul@rchitects.org.uk>
Subject: Re: Planning

No. I've lived here for over 20 years ,

On Wed, 2 Feb 2022, 16:04 Paul Fretwell, <paul@rchitects.org.uk> wrote:

Hi [redacted]

Hope you don't mind me asking but have you recently moved into the property (in the last year)?

Regards

Paul Fretwell

for @rchitects Scotland Ltd.

50 Castle Street, Forfar, DD8 3AB

Mob. [redacted]

Tel. 01307 466480

www.scotland-architects.co.uk

From: [redacted]>
Sent: 02 February 2022 15:49
To: Paul Fretwell <paul@rchitects.org.uk>
Subject:

As discussed on telephone.

[redacted]

Our Ref 20/00830/FULL

31 January 2022

[redacted]

Angus Council

CHIEF EXECUTIVE
Margo Williamson

Dear Sir/Madam

Planning Application Reference : 20/00830/FULL

I refer to our previous correspondence in connection with the application by Duntrune Ltd for the Erection of Crematorium Building and associated Parking, Access, Turning Space, Landscaping and Boundary Enclosures at Land North East Of Duntrune House Duntrune .

The application has now been determined under Angus Council's Scheme of Delegation to Officers. A copy of the Decision Notice is attached for your interest and approved or refused drawings can be viewed at http://planning.angus.gov.uk/online-applications/ using the reference number provided above. A copy of the Report of Handling that explains how the application has been considered can also be viewed at that location.

If calling or telephoning please ask for Fraser MacKenzie on 01307 492198 or e-mail mackenzief@angus.gov.uk

Yours faithfully,

Planning Service

Encl.

ANGUS COUNCIL

TOWN AND COUNTRY PLANNING (SCOTLAND) ACT 1997
(AS AMENDED)
TOWN AND COUNTRY PLANNING (DEVELOPMENT MANAGEMENT PROCEDURE)
(SCOTLAND)
REGULATIONS 2013

PLANNING PERMISSION REFUSAL
REFERENCE : 20/00830/FULL

To **Duntrune Ltd**
c/o @rchitects Scotland Ltd
Paul Fretwell
15 West High Street
Forfar
DD8 1BE

With reference to your application dated 14 December 2020 for planning permission under the above mentioned Acts and Regulations for the following development, viz.:-

Erection of Crematorium Building and associated Parking, Access, Turning Space, Landscaping and Boundary Enclosures at **Land North East Of Duntrune House Duntrune** for **Duntrune Ltd**

The Angus Council in exercise of their powers under the above mentioned Acts and Regulations hereby **Refuse Planning Permission (Delegated Decision)** for the said development in accordance with the particulars given in the application and plans docqueted as relative hereto in paper or identified as refused on the Public Access portal.

The reasons for the Council's decision are:-

1. The development would result in an unsustainable pattern of travel and development and would not be accessible by a choice of transport modes, increasing reliance on the private car in a situation where access to walking, cycling and public transport is poor. The proposal is therefore contrary to TAYplan policies 1 and 2, Angus Local Development Plan policies DS2, DS3 and TC8, and Scottish Planning Policy in so far as it relates to locating development in accessible locations.

2. The application is contrary to Policy DS1 of the Angus Local Development Plan 2016 because the scale and nature of the development is not appropriate for its location because it does not enjoy good accessibility, particularly for pedestrians, cyclists and public transport; and because the proposal is not in accordance with other relevant policies, namely policies DS2, DS3 and TC8.

Amendments:

1. Building and External Works Plan drawing no. 1226 / PD / 01 Revision C dated May 2020 amends and supersedes all previous Building and External Works Plan drawings and includes overflow car parking resulting in total of 124 car parking spaces (72 plus 52 overflow spaces).

2. Site Plan drawing no. 1266 / PD / 02 Revision C dated May 2020 amends and supersedes all previous Site Plan drawings and includes overflow car parking resulting in total of 124 car parking spaces (72 plus 52 overflow spaces).

3. Road Access drawing no. 1266 / SK / 06 Revision C dated May 2020 amends and supersedes all previous Road Access drawings and includes overflow car parking and annotates 'Existing Road to be widened as per Engineers drawings' on the public road.

Dated this **24 January 2022**
Jill Paterson
Service Lead
Planning and Sustainable Growth
Angus Council
Angus House
Orchardbank Business Park
Forfar
DD8 1AN

Dated this **24 January 2022**

20/00830/FULL

COMMUNITIES

Your experience with Planning

Please indicate whether you agree or disagree with the following statements about your most recent experience of the Council's handling of the planning application in which you had an interest.

Q.1 I was given the advice and help I needed to submit my application/representation:-

Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	It does not apply
☐	☐	☐	☐	☐	☐

Q.2 The Council kept me informed about the progress of the application that I had an interest in:-

Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	It does not apply
☐	☐	☐	☐	☐	☐

Q.3 The Council dealt promptly with my queries:-

Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	It does not apply
☐	☐	☐	☐	☐	☐

Q.4 The Council dealt helpfully with my queries:-

Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	It does not apply
☐	☐	☐	☐	☐	☐

Q.5 I understand the reasons for the decision made on the application that I had an interest in:-

Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	It does not apply
☐	☐	☐	☐	☐	☐

Q.6 I feel that I was treated fairly and that my view point was listened to:-

Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	It does not apply
☐	☐	☐	☐	☐	☐

OVERALL SATISFACTION: Overall satisfaction with the service: .....

Q.7 Setting aside whether your application was successful or not, and taking everything into account, how satisfied or dissatisfied are you with the service provided by the council in processing your application?

Very satisfied	Fairly satisfied	Neither Satisfied nor Dissatisfied	Fairly Dissatisfied	Very Dissatisfied
☐	☐	☐	☐	☐

OUTCOME: Outcome of the application:

Q.8 Was the application that you had an interest in:-

Granted Permission/Consent ☐ Refused Permission/Consent ☐

Q.9 Were you the:- Applicant ☐ Agent ☐ Third Party objector who made a representation ☐

Please complete the form and return in the pre-paid envelope provided.
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City of Edinburgh Council v Secretary of State for Scotland and Others

Positive/Neutral Judicial Consideration

Court
House of Lords (Scotland)

Judgment Date
16 October 1997

House of Lords

[1997] UKHL 38, 1997 WL 1105752

Lord Browne-Wilkinson Lord Mackay of Clashfern Lord Steyn Lord Hope of Craighead Lord Clyde

(16th October, 1997)

Opinions of the Lords of Appeal for Judgment in the Cause

Judgment

Lord Browne-Wilkinson

My Lords,

I have had the advantage of reading in draft the speech to be delivered by my noble and learned friend, Lord Clyde. For the reasons he gives I would make the order which he proposes.

Lord Mackay of Clashfern

My Lords,

I have had the advantage of reading in draft the speech to be delivered by my noble and learned friend, Lord Clyde. For the reasons he has given I would also make the order which he proposes.

Lord Steyn

My Lords,

I have had the advantage of reading in draft the speech to be delivered by my noble and learned friend Lord Clyde. For the reasons he has given I would also make the order which he proposes.

Lord Hope of Craighead

My Lords,

I have had the advantage of reading in draft the speech which has been prepared by my noble and learned friend, Lord Clyde. I agree with it, and for the reasons which he gives I also would allow the appeal on the planning law issue and dismiss the appeal on the issue about listed building consent.

I should like however to add a few observations about the meaning and effect of section 18A of the Town and Country Planning (Scotland) Act 1972 , and to say rather more about the listed building consent issue which has revealed some practical problems about the way buildings are listed for the purposes of the statute - as to which I am unable, with respect, to agree with the approach taken by the learned judges in the Second Division.

The planning issue

Section 18A of the Town and Country Planning (Scotland) Act of 1972 , which was introduced by section 58 of the Planning and Compensation Act 1991 , creates a presumption in favour of the development plan. That section has to be read together with section 26(1) of the Act of 1972. Under the previous law, prior to the introduction of section 18A into that Act, the presumption was in favour of development. The development plan, so far as material to the application, was something to which the planning authority had to have regard, along with other material considerations. The weight to be attached to it was a matter for the judgment of the planning authority. That judgment was to be exercised in the light of all the material considerations for and against the application for planning permission. It is not in doubt that the purpose of the amendment introduced by section 18A was to enhance the status, in this exercise of judgment, of the development plan.

It requires to be emphasised, however, that the matter is nevertheless still one of judgment, and that this judgment is to be exercised by the decision taker. The development plan does not, even with the benefit of section 18A , have absolute authority. The planning authority is not obliged, to adopt Lord Guest's words in *Simpson v. Edinburgh Corporation, 1960 S.C. 313* , 318, "slavishly to adhere to" it. It is at liberty to depart from the development plan if material considerations indicate otherwise. No doubt the enhanced status of the development plan will ensure that in most cases decisions about the control of development will be taken in accordance with what it has laid down. But some of its provisions may become outdated as national policies change, or circumstances may have occurred which show that they are no longer relevant. In such a case the decision where the balance lies between its provisions on the one hand and other material considerations on the other which favour the development, or which may provide more up to date guidance as to the tests which must be satisfied, will continue, as before, to be a matter for the planning authority.

The presumption which section 18A lays down is a statutory requirement. It has the force of law behind it. But it is, in essence, a presumption of fact, and it is with regard to the facts that the judgment has to be exercised. The primary responsibility thus lies with the decision taker. The function of the court is, as before, a limited one. All the court can do is review the decision, as the only grounds on which it may be challenged in terms of the statute are those which section 233(1) of the Act lays down. I do not think that it is helpful in this context, therefore, to regard the presumption in favour of the development plan as a governing or paramount one. The only questions for the court are whether the decision taker had regard to the presumption, whether the other considerations which he regarded as material were relevant considerations to which he was entitled to have

regard and whether, looked at as a whole, his decision was irrational. It would be a mistake to think that the effect of section 18A was to increase the power of the court to intervene in decisions about planning control. That section, like section 26(1) , is addressed primarily to the decision taker. The function of the court is to see that the decision taker had regard to the presumption, not to assess whether he gave enough weight to it where there were other material considerations indicating that the determination should not be made in accordance with the development plan.

As for the circumstances of the present case, I agree that the Reporter was entitled in the light of the material which was before him to give priority to the more recent planning guidance in preference to the development plan, and that the reasons which he gave for his decision in the light of that guidance to grant planning permission were sufficient to explain the conclusions which he had reached.

The listed buildings issue

The appellants' argument was that the list of buildings of special or historic interest which the Secretary of State for Scotland has compiled under section 52 of the Town and Country Planning (Scotland) Act 1972 did not include the former riding school at Redford Barracks and that the reporter was entitled to make a finding to this effect. Their approach was that the question whether the building was a listed building was a question of fact which the reporter was entitled to decide as part of the case which was before him in the appeal against the refusal of listed building consent. Yet it became clear in the course of counsel's argument that the issue which the appellants regard as one of fact depends upon the proper construction of the entries in the list. So it seems to me that the underlying question - if it is truly one of construction - is one of law.

The structure of the legislation which is contained in sections 52 to 54 of the Act is to this effect. It is the responsibility of the Secretary of State to compile or approve of the list. He may take account, in deciding whether or not to include a building in the list, of the building itself and its setting. Any respect in which its exterior contributes to the architectural or historic interest of any group of buildings of which it forms part may be taken into account. So also may be the desirability of preserving any feature of the building fixed to it or comprised within its curtilage on the ground of its architectural or historic interest. The building itself must be identified in the list, but section 52(7) also provides that, for the purposes of the Act, any object or structure fixed to the building or forming part of the land and comprised within the curtilage of the building shall be treated as part of it. Thus it is not necessary to do more than to identify the building - or, in cases such as the present, the principal buildings - in order to extend the statutory protection to these additional elements. The details of the procedure are set out in the Town and Country Planning (Listed Buildings and Buildings in Conservation Areas) (Scotland) Regulations 1975 (S.I. 1975 No. 2069) as amended by the Town and Country Planning (Listed Buildings and Buildings in Conservation Areas) (Scotland) Amendment Regulations 1977 (S.I. 1977 No. 255).

The control which the Act lays down of works for the demolition of a listed building, or its alteration or extension in a manner which would affect its character as a building of special architectural or historic interest, is the prohibition of any such works which have not been authorised. The question whether works of alteration or extension should be authorised can be dealt with as part of an application for planning permission. Section 54(2) provides that, where planning permission is granted for such works, that permission shall operate as listed building consent in respect of those works. But in this case what the appellants wish to do is to demolish the building, so a separate application for listed building consent under Schedule 10 to the Act of 1972 was required. Paragraph 7(2) of that Schedule provides that a person appealing against a decision to refuse consent by the local planning authority may include in his notice as the ground or one of the grounds of his appeal a claim that the building is not of special architectural or historic interest and ought to be removed from the list. But there is no provision in that Schedule or elsewhere in the Act which enables a person aggrieved to include as one of his grounds of appeal that the building to which his application for consent relates is not included in the list as a listed building. The Act assumes, in regard to the statutory procedures, that the question whether or not a building is a listed building can be determined simply by inspecting the list which the Secretary of State has prepared.

The list itself is not the subject of any prescribed form. The only prescribed form for which the Act of 1972 provides is that for the form of notice which is to be served on every owner, lessee and occupier of the building under section 52(5) stating that the building has been included in, or excluded from, the list as the case may be. The prescribed form of notice is set out in Schedule 5 to the 1975 Regulations . It is in these terms:

> "NOTICE IS HEREBY GIVEN that the building known as ……situated in the ……has been included in the list of buildings of special architectural or historic interest in that area compiled by the Secretary of State under section 52 of the Town and Country Planning (Scotland) Act 1972 on ……. 19 …..
>
> Dated ……. 19 …
>
> (Signature of Authorised Officer)."

It can be seen from this form of notice that the only information which is communicated to the owner, lessee and occupier to indicate the identity of the listed building is the name by which the building is known and the place where it is situated. The effect of section 52(7) , as I have said, is to require any object or structure fixed to that building or forming part of the land and comprised within the curtilage of the building to be treated as part of the building for the purposes of the provisions in the Act relating to listed buildings. But the form of notice does not require a description of the building to be given. The assumption is that the name of the building will be sufficient to identify what is in the list.

The list which is available for public inspection under section 52(6) is a more elaborate document, and it is this aspect of the matter which appears to have given rise to some confusion in the present case. It comprises six columns, headed respectively "Map reference," "Name of Building," "Description," "References," "Category" and "Notes." In the column headed "Name of Building" there appears this entry:

> "REDFORD BARRACKS Colinton Road and Colinton Mains Road (original buildings of 1909-15 only)."

The column headed "Description" contains a very detailed description of the premises. It begins by naming the architect, who is said to have been Harry B. Measures, Director of Barrack Construction, 1909-15. There then follows a comprehensive description of the barracks and the various buildings comprised therein, together with references to various features of architectural or historic interest. In the middle of this description, which occupies nearly four pages on the list, there appears this passage:

> "other buildings to S. with large riding school at extreme S.E., all tall single-storey, simple treatment."

The column headed "References" contains this entry:

"Information courtesy Buildings of Scotland Research Unit."

My impression is that the list which I have been attempting to describe was intended to serve several functions. First, it was intended to identify the listed building. It did this by stating its name and its location. That was all it needed to do in order to record the information which had been given in the prescribed notice to the owner, lessee and occupier. Then it was intended to provide a description of the building. There is no requirement for this - nor is there space - in the prescribed form of notice. But a description is a useful thing to include in the list, as decisions may have to be taken from time to time as to whether authorisation should be given under section 53(2)(a) of the Act of 1972 to a proposal to demolish, alter or extend the listed building. Both the decision taker and the developer will, no doubt, find it helpful to know what the features were which persuaded the Secretary of State that the building should be listed as being of special architectural or historic interest. Lastly, it was intended to provide a list of references to the sources of information, if any, which had been used in compiling the description. On this analysis I would regard the columns headed "Description" and "References," while informative, as subservient to the column headed "Name of Building." In my opinion it is the latter column which serves the statutory function of identifying the listed building in the list which the Secretary of State is required to keep available for public inspection under section 52(6) of the Act of 1972. In their printed case Revival state that the inclusion of the words of limitation in this column reflects a practice of compiling the list so that the "Name of Building" column is the official entry which defines the scope of the listing. That observation is consistent with my understanding of the list.

The Lord Justice-Clerk mentioned in his opinion that counsel for the Secretary of State had pointed out in the course of the hearing before the Second Division that it has been the practice for some time now for the list of buildings of special architectural or historic interest to be set forth in a different form from that which has been used in this case. A specimen form was produced in the course of that hearing from which it appeared that the list now contained eight columns. The first, which was entitled "Name of Building and/or Address," was headed as being the "Statutory List." The remaining seven columns contained information under various headings not dissimilar to those used in the present case, including "Description," "Reference" and "Notes." They were the subject of a separate heading which read: "The information (cols. 2-8) has no legal significance, nor do errors or omissions nullify or otherwise affect statutory listing." We were not shown a copy of this form, as the Secretary of State did not appeal against the decision of the Second Division on this point. But Revival refer to this passage in the Lord Justice-Clerk's opinion in their printed case, in order to make the point that the modern form of list has merely formalised the practice that it is the "Name of Building" column which defines the scope of the listing. The description which we have been given is sufficient to indicate that the more modern form is an improvement on the previous form, as it removes the possibility of a misunderstanding about the function which the columns headed "Description" and "References" were intended to serve.

It is plain from the way in which the learned judges of the Second Division approached this issue that they regarded all the columns on the list which was before them in this case as forming part of the statutory listing. For my part - although counsel for Revival was content to adopt this approach in presenting his argument - I think that they were in error in taking this view. It does not seem to me that there is any real difficulty in understanding the functions of each of the columns, if the list is read in the context of the legislation which it was designed to serve. But my conclusion that the only column which sets out the statutory listing is that which is headed "Name of Building" does not solve all the problems which have arisen in this case.

The listing of Redford Barracks was in itself sufficient, with the benefit of section 52(7) of the Act of 1972, to include within the statutory listing all objects or structures forming part of the land and comprised within the curtilage. Unless some words of limitation were included every building within the curtilage, however modest or unimportant, would be the subject of the statutory controls. It was no doubt for this reason that the words "(original buildings 1909-15 only)" were included in the column headed "Name of Building." But this was not an entirely satisfactory method of distinguishing between those

buildings which were intended to be included in the statutory listing and those which were not. The words which were selected were ambiguous. The dates 1909-15 are the same as those mentioned in the next column as being those between which Harry B. Measures was the Director of Barrack Construction. But it is not clear whether they were intended to refer to the period of design of the buildings or the period of their construction, and if the latter whether the buildings had to be completed by 1915 in order to qualify or it was sufficient that they were commenced before or during that year. In this situation I think that it is permissible to examine the contents of the column headed "Description" in order to see whether it can help to resolve the ambiguity. Phrases are used in various parts of the description such as "some lesser buildings" and "other buildings" which suggest that this was not intended to be a definitive description of the entire premises comprised within the curtilage. But the fact that the riding school is mentioned in the description is sufficient, in view of the ambiguity, to put in issue the question whether that building was included in the statutory listing.

The reporter concluded, on the evidence which was before him, that the riding school was one of the last buildings to be erected, and that this took place after 1915. It was for this reason that he held that the riding school was not covered by the statutory listing and that listed building consent was not required for its demolition. He noted that the view of all the experts who gave evidence at the inquiry was that, if the riding school was built after 1915, it was not covered by the barracks listing. It seems to me however that this evidence was insufficient to resolve the difficulty which had been created by the ambiguity in the list. That evidence did not address the possibility that the riding school was part of the original design for which Harry B. Measures was responsible. Unless it could be asserted that this structure had no part to play in the original design it would not be safe to assume that it was not included in the statutory listing. I would therefore hold, albeit for different reasons, that the result at which the Second Division arrived was the right one, as the reporter had insufficient information before him in the evidence to entitle him to resolve this issue in favour of the developer.

I should like, finally, to add this further observation in regard to the ambiguity in the list. The problem which has arisen in this case suggests that the list, even in its new form, may require some reconsideration in order to remove such ambiguities. It is important that words of limitation which are used to exclude parts of a building from the statutory listing are sufficiently clear to enable those who are interested to identify what parts of the building are subject to the statutory controls and what are not. The fact that the controls are the subject of criminal sanctions provides an added reason for seeking greater clarity in the composition of the list than has been exhibited in this case.

Lord Clyde

My Lords,

In 1993 Revival Properties Limited ("Revival") who are the second appellants in this appeal sought outline planning permission for the development of a food store, petrol filling station and ancillary works at a site in Colinton Mains Drive in Edinburgh. They also sought listed building consent for the demolition of a former riding school building which was on the site. The City of Edinburgh District Council refused planning permission and also refused listed building consent. Revival then appealed to the Secretary of State. A Senior Reporter was appointed to determine the appeal. He held a public local inquiry and thereafter issued a decision letter dated 7 March 1995. He decided that listed building consent was not required for the demolition of the former riding school building. On the matter of planning permission he allowed the appeal and granted outline planning permission subject to certain conditions. The Council then appealed to the Court of Session both on the matter of the listed building consent and on the matter of planning permission. After hearing the appeal the Second Division of the Court of Session by a majority allowed the appeal on both of those matters. The Secretary of State and Revival have now appealed to this House.

The matter of listed building consent can conveniently be dealt with at the outset. It has been seen and treated as a distinct and separate issue from that of the planning permission. The Reporter considered a preliminary question whether listed building

consent was required for the demolition of the former riding school building. It has not been suggested that he was not entitled to explore that question and I express no view on the propriety of his doing so. Section 52 of the Town and Country Planning (Scotland) Act 1972 provided for the compilation of lists of buildings of special architectural or historic interest. The provisions of that Act have now been superseded by the recent consolidating statute, the Town and Country Planning (Scotland) Act 1997 , but it will be convenient for the purposes of the present case to refer to the legislation in force at the time of the appeal processes. In terms of section 52(1) the lists may be compiled by the Secretary of State or by others with his approval. Section 52(5) provides for notice to be given to the owner, lessee and occupier of a building of its inclusion in or exclusion from the list. That notice is to be given in a prescribed form. But there does not appear to have been any prescribed form for the lists themselves.

There was produced to the Reporter a document relating to the City of Edinburgh District headed "List of Buildings of Architectural or Historic Interest." The list was set out in six columns. The first and the last three are not of importance. The second was headed "Name of Building" and the third was headed "Description." In the second column there was entered the following:

"REDFORD BARRACKS

Colinton Road and

Colinton Mains Road

(original buildings of

1909-15 only)."

The third column commenced with the words "Harry B. Measures, Director of Barrack Construction, 1909-15. Two large complexes of building on exceptionally spacious layout … comprising chiefly … " There then followed descriptions of a variety of buildings with some architectural detail. Included here, under the subheading Farriers' Shops and Riding School were the words "other buildings to S. with large riding school at extreme S.E… ." The view taken by the Reporter was that in the light of the evidence the building in question had probably been erected after 1915, that precedence should be given to the entry in the second column, and that on account of the reference to "original buildings of 1909-15 only" the riding school building was excluded from the list notwithstanding its specific mention in the third column. Having taken the view that listed building consent was unnecessary the Reporter did not address the question whether the demolition of a listed building should be permitted.

The judges of the Second Division unanimously held that the Reporter was not entitled to hold as he had done that the building was not covered by the entry for Redford Barracks in the List. An appeal against that decision was taken only by Revival, the second appellant. Counsel for the Secretary of State did not address the issue. It should be observed that it would have been useful to have had more evidence about the form used for the compiling of such lists and the relative significance of the respective columns. Plainly it is desirable to compile the List with sufficient clarity and precision to avoid the kind of question which has arisen here. The insertion of a complex of buildings as one entry in a List may well give rise to problems. Even the provision of section 52(7) of the Act which extends the identification to buildings within the curtilage of a building may not produce sufficient clarity, particularly in a case such as the present where the building in question had passed into the separate ownership and occupation of the local authority and had in some way at least became separated from the barracks and other buildings still in military occupation. The argument, however, which was presented in the appeal was essentially that the matter was one of fact for the Reporter, or at least was not one which could be open to review. But the critical question here

is one of the interpretation of the List and if the Reporter has misconstrued it and so misdirected himself that is undoubtedly a matter on which he may be corrected on appeal to a court of law.

On the face of the List there is no evident problem. It was agreed by counsel for Revival that the whole document with its six columns comprised the "List" and his argument was presented on that basis. The building in issue is specifically mentioned in the document and can readily be taken to be entered on the list. The dates in the second column can be seen to echo the dates in the third column, indicating that it is the work of Harry Measures which is to be listed, and the riding school is noted in the description of the buildings for which he was presumably responsible.

A problem may be thought to arise when it is found that the riding school was built after 1915. But it also appears that the barracks were not completed until the end of 1916. Ambiguity only arises if the words in the brackets are read, as the Reporter read them, as if they were intended to refer to buildings built during the specified years. But that is not what is stated and that is not the only possible construction. Even if there was a conflict between the two parts of the list it would be proper to find a construction which would make sense of the whole and that can be readily done by accepting that the period of years to which the passage in brackets refers is a period not of the completion of the building but of the processes of planning, conception, design and, at least to an extent, the realisation of Harry Measures' work. In that way there is no difficulty in recognising that the riding school may consistently with the text in the second column be entered in the third column as a listed building. In my view the judges of the Second Division reached the correct view on this matter and I would refuse the appeal on the matter of the listed building consent.

I turn next to the appeal on the matter of the planning permission. The first point raised on behalf of the Secretary of State in opening his appeal concerned the meaning and effect of section 18A of the Act of 1972. It was stated on his behalf that this was the principal purpose of his appeal. The section had excited some controversy and guidance was required. Neither of the other parties however was concerned to challenge the submission advanced by counsel for the Secretary of State. The views which I would adopt on this part of the appeal accord with his submission and at least in the absence of any contradiction seem to me to be sound.

Ever since the introduction of a comprehensive system for the control of land development in Scotland by the Town and Country Planning (Scotland) Act 1947 planning authorities have been required to prepare a plan which was to serve as a guide for the development of their respective areas. These plans required to be submitted to the Secretary of State for his approval. Following on the reorganisation of local government introduced by the Local Government (Scotland) Act 1973 planning functions became divided between the regions, who were required to prepare "structure plans," and the districts, who were required to prepare "local plans." For the purposes of the present case the structure plan was the Lothian Regional Structure Plan of 1985 and the local plan was the South West Edinburgh Local Plan ("S.W.E.L.P."). But the old terminology was also preserved. Section 17 of the Town and Country Planning (Scotland) Act 1972 provided that for the purposes of the planning statutes the development plan shall be taken to consist of the structure plan approved by the Secretary of State with any approved alterations and the provisions of the approved local plan with any adopted or approved alterations. In and after the 1947 Act provision was made for the recognition of the development plan in relation to determinations of applications for planning permission. Section 26(1) of the 1972 Act, echoing the language of section 12(1) of the Act of 1947, required a planning authority in dealing with the application to "have regard to the provisions of the development plan, so far as material to the application, and to any other material considerations." The meaning of this formulation in the context of section 12(1) of the Act of 1947 was set out in a decision in the Outer House of the Court of Session by Lord Guest in *Simpson v. Edinburgh Corporation, 1960 S.C. 313* . His Lordship stated (at pp. 318-319):

> "It was argued for the pursuer that this section required the planning authority to adhere strictly to the development plan. I do not so read this section. 'To have regard to' does not, in my view, mean 'slavishly to adhere to.' It requires the planning authority to consider the development plan, but does not oblige them to follow it … If Parliament had intended the planning authority to adhere

> to the development plan, it would have been simple so to express it … .In my opinion, the meaning of section 12(1) is plain. The planning authority are to consider all the material considerations, of which the development plan is one."

Section 18A was introduced into the Act of 1972 by section 58 of the Planning and Compensation Act 1991 . A corresponding provision was introduced into the English legislation by section 26 of the Act of 1991, in the form of a new section 54A to the Town and Country Planning Act 1990 . The provisions of section 18A , and of the equivalent section 54A of the English Act, were as follows:

> "Status of development plans Where, in making any determination under the planning Acts, regard is to be had to the development plan, the determination shall be made in accordance with the plan unless material considerations indicate otherwise."

Section 18A has introduced a priority to be given to the development plan in the determination of planning matters. It applies where regard has to be had to the development plan. So the cases to which section 26(1) of the Act of 1972 apply are affected. By virtue of section 33(5) of the Act of 1972 section 26(1) is to apply in relation to an appeal to the Secretary of State. Thus it comes to apply to the present case.

By virtue of section 18A the development plan is no longer simply one of the material considerations. Its provisions, provided that they are relevant to the particular application, are to govern the decision unless there are material considerations which indicate that in the particular case the provisions of the plan should not be followed. If it is thought to be useful to talk of presumptions in this field, it can be said that there is now a presumption that the development plan is to govern the decision on an application for planning permission. It is distinct from what has been referred to in some of the planning guidance, such as for example in paragraph 15 of PPG1 of 1988, as a presumption but what is truly an indication of a policy to be taken into account in decision-making. By virtue of section 18A if the application accords with the development plan and there are no material considerations indicating that it should be refused, permission should be granted. If the application does not accord with the development plan it will be refused unless there are material considerations indicating that it should be granted. One example of such a case may be where a particular policy in the plan can be seen to be outdated and superseded by more recent guidance. Thus the priority given to the development plan is not a mere mechanical preference for it. There remains a valuable element of flexibility. If there are material considerations indicating that it should not be followed then a decision contrary to its provisions can properly be given.

Moreover the section has not touched the well-established distinction in principle between those matters which are properly within the jurisdiction of the decision-maker and those matters in which the court can properly intervene. It has introduced a requirement with which the decision-maker must comply, namely the recognition of the priority to be given to the development plan. It has thus introduced a potential ground on which the decision-maker could be faulted were he to fail to give effect to that requirement. But beyond that it still leaves the assessment of the facts and the weighing of the considerations in the hands of the decision-maker. It is for him to assess the relative weight to be given to all the material considerations. It is for him to decide what weight is to be given to the development plan, recognising the priority to be given to it. As Glidewell L.J. observed in *Loup v. Secretary of State for the Environment and Another (1995) 71 P. & C.R. 175* at p. 186 "What section 54A does not do is to tell the decision-maker what weight to accord either to the development plan or to other

material considerations." Those matters are left to the decision-maker to determine in the light of the whole material before him both in the factual circumstances and in any guidance in policy which is relevant to the particular issues.

Correspondingly the power of the court to intervene remains in principle the same as ever. That power is a power to challenge the validity of the decision. The grounds in the context of planning decisions are contained in section 233 of the Act of 1972, namely that the action is not within the powers of the Act , or that there has been a failure to comply with some relevant requirement. The substance of the former of these grounds is too well established to require repetition here. Reference may be made to the often quoted formulation by Lord President Emslie in *Wordie Property Co. Ltd. v. Secretary of State for Scotland, 1984 S.L.T. 345* at 347-348. Section 18A has not innovated upon the principle that the court is concerned only with the legality of the decision-making process. As Lord Hoffmann observed in *Tesco Stores v. Secretary of State for the Environment [1995] 1 WLR 759* at p. 780. "If there is one principle of planning law more firmly settled than any other, it is that matters of planning judgment are within the exclusive province of the local planning authority or the Secretary of State."

In the practical application of section 18A it will obviously be necessary for the decision-maker to consider the development plan, identify any provisions in it which are relevant to the question before him and make a proper interpretation of them. His decision will be open to challenge if he fails to have regard to a policy in the development plan which is relevant to the application or fails properly to interpret it. He will also have to consider whether the development proposed in the application before him does or does not accord with the development plan. There may be some points in the plan which support the proposal but there may be some considerations pointing in the opposite direction. He will require to assess all of these and then decide whether in light of the whole plan the proposal does or does not accord with it. He will also have to identify all the other material considerations which are relevant to the application and to which he should have regard. He will then have to note which of them support the application and which of them do not, and he will have to assess the weight to be given to all of these considerations. He will have to decide whether there are considerations of such weight as to indicate that the development plan should not be accorded the priority which the statute has given to it. And having weighed these considerations and determined these matters he will require to form his opinion on the disposal of the application. If he fails to take account of some material consideration or takes account of some consideration which is irrelevant to the application his decision will be open to challenge. But the assessment of the considerations can only be challenged on the ground that it is irrational or perverse.

Counsel for the Secretary of State suggested in the course of his submissions that in the practical application of the section two distinct stages should be identified. In the first the decision-maker should decide whether the development plan should or should not be accorded its statutory priority; and in the second, if he decides that it should not be given that priority it should be put aside and attention concentrated upon the material factors which remain for consideration. But in my view it is undesirable to devise any universal prescription for the method to be adopted by the decision-maker, provided always of course that he does not act outwith his powers. Different cases will invite different methods in the detail of the approach to be taken and it should be left to the good sense of the decision-maker, acting within his powers, to decide how to go about the task before him in the particular circumstances of each case. In the particular circumstances of the present case the ground on which the Reporter decided to make an exception to the development plan was the existence of more recent policy statements which he considered had overtaken the policy in the plan. In such a case as that it may well be appropriate to adopt the two-stage approach suggested by counsel. But even there that should not be taken to be the only proper course. In many cases it would be perfectly proper for the decision-maker to assemble all the relevant material including the provisions of the development plan and proceed at once to the process of assessment, paying of course all due regard to the priority of the latter, but reaching his decision after a general study of all the material before him. The precise procedure followed by any decision-maker is so much a matter of personal preference or inclination in light of the nature and detail of the particular case that neither universal prescription nor even general guidance are useful or appropriate.

This chapter in the appeal was presented as a criticism of the approach adopted by the majority of the judges in the court below. But that criticism comes at the most to criticism of particular expressions rather than any allegation of error in principle. Lord McCluskey criticised the description given by the Reporter in paragraph 181 of his decision letter of the effect of the section. His Lordship stated:

> "But Section 18A did not simply 'enhance the status' of development plans; it made the development plan the governing or paramount consideration; and it was to remain so unless material considerations indicated otherwise."

But while the expression used by the reporter may have been somewhat imprecise in not stressing the priority inherent in the enhanced status it does not appear that the reporter fell into error in any misunderstanding of the effect of the section. The submission made by counsel for the Secretary of State on the construction of Section 18A was correctly seen by the respondents as not constituting any serious attack on the decision which they sought to defend. The judges in the Second Division correctly recognised that it was competent for the Reporter in principle to decide that the more recent material should overcome the priority given to the development plan. The issue was whether he was entitled to take that course on the material before him. The reference to paragraph 181 of the decision letter leads immediately to the substantial dispute in the appeal regarding the reporter's treatment of the problem of retail trade and impact.

In paragraph 181 the Reporter begins to set out his conclusions on the chapter of the decision letter which concerns the issue of retail trade and impact. It should be observed at the outset that the structure plan of 1985 indicated a prohibition of developments such as that proposed by Revival except in existing or new shopping centres, and that S.W.E.L.P. expressed at least a presumption against out-of-centre shopping development. The Reporter however stated:

> "Dealing first with the question of policy, I should say that, although there is no dispute that the statutory development plan consists of the 1985 structure plan and the S.W.E.L.P., and although recent legislation enhances the status of development plans, I believe that in this case it is appropriate to attach greater weight to other material considerations."

That he was entitled in principle to decide that the presumption in favour of the development plan had been overcome by other material considerations was recognised in the court below. The criticism of the majority of the court was directed rather at his entitlement to take that course in the circumstances of this case. The other material considerations to which the Reporter looked consisted of expressions of policy and planning guidance more recent in date than the structure plan of 1985. He noted that while the S.W.E.L.P. was only adopted as recently as 1993 it was required to conform generally with the provisions of the 1985 structure plan. The more recent material of which the Reporter considered account should be taken consisted of the National Planning Guidelines 1986, Planning Policy Guidance of 1993 ("PPG6), and the latest version of the structure plan which had been finalised and sent to the Secretary of State but had not yet been approved. A view was expressed in the court below that it was not appropriate to have considered PPG6 because it applied to England and Wales and not Scotland. No question was raised in that regard in the present appeal and I refrain from expressing any view about it. The new version of the structure plan represented in the view of the Reporter the Regional Council's most recent thinking on the subject of retailing and it was to the policies set out in that document that he applied his mind.

Chapter 7 of the new structure plan deals with shopping. In paragraph 7.37 it was stated that free-standing developments, such as large convenience stores, could generate unacceptable traffic levels and affect residential amenity. The paragraph later states that:

> "… new stores can only be justified to provide consumer choice or where there will be significant local population increase… . new developments outside existing or proposed centres should be permitted only if they meet strict criteria."

The plan then sets out a policy identified as S17 . That policy related to proposals for major retail developments not in or adjacent to existing or proposed strategic shopping centres. It is understood that the proposed development at Colinton Mains Drive is such a proposal. The policy provides that in considering such proposals "District Councils should be satisfied that all of the following criteria are met… ." There are then set out seven criteria of which only two need be quoted:

> "A. Local shopping facilities are deficient in either quantitative or qualitative terms; …
>
> "C. They would not, individually or cumulatively, prejudice the vitality and viability of any strategic shopping centre."

The strategic shopping centres are listed earlier in the document, but it is unnecessary to refer to that in detail.

The Reporter was satisfied that all of the seven criteria were met and it was on that basis that he granted the planning permission. It is with criterion A that the present dispute is concerned. The Reporter dealt with the matter of quantitative deficiency in paragraph 184 of his letter as follows:

> "184 The *first* matter relates to quantitative or qualitative deficiencies in the area. It appears that there may be a slight increase in both population and expenditure per head on convenience goods in the near future in the study area, but the most obvious indicator of an expenditure surplus is the calculation that certain stores (notably Safeway at Cameron Toll, Morningside and Hunter's Tryst) are performing at levels significantly higher than company averages. Even allowing for the opening of stores at e.g. Straiton (which may be in doubt) and for turnover levels at Colinton Mains substantially higher than would probably be achieved by Tesco in a relatively small store, there would appear to be a quantitative case."

In paragraph 185 he considered the matter of qualitative deficiency and took the view that the argument for such a deficiency was not strong. The case would accordingly have to rest on the basis of a quantitative deficiency. Finally in this part of his letter he added in paragraph 186:

> "186. Many local residents and organisations claim that there is no need for either the proposed foodstore or the pfs. I accept that there is not a significant shortage of either, such as might establish

> a strong presumption in their favour in the public interest which might outweigh relevant objections, However, planning approval does not have to be based on a case of need. I have explained why I consider the policies in the more recent version of the structure plan are to be preferred, and there remains a general presumption in favour of development unless demonstrable harm is shown to interests of acknowledged importance."

The majority of the judges in the Second Division held that the Reporter had erred in this part of his decision. The Lord Justice-Clerk was satisfied that the Reporter was entitled to regard the NPG and the draft structure plan as justifying a departure from the development plan but considered that the Reporter had not had a proper factual basis for overcoming the presumption in Section 18A . In particular he considered that:

> "… merely to say that certain stores within the area are trading at exceptionally high levels does not justify the conclusion that there is a deficiency in local shopping facilities in the area in question."

He noted that of the three stores mentioned in paragraph 184 only one, Hunter's Tryst, was, as the Reporter had recognised in paragraph 185, within the study area. He also noted that the Reporter had accepted in paragraph 186 that there was not a significant shortage of food stores or petrol filling stations. Lord McCluskey questioned whether the Reporter had properly addressed the problem of quantitative deficiency at all. "If he has then he has not even begun to explain how a quantitative deficiency coexists with no significant shortage and a failure to make out any case of need." He considered that even if a finding of a quantitative deficiency was justified the Reporter had given no indication as to why that circumstance should overcome the presumption in favour of the terms of the development plan. Both the Lord Justice-Clerk and Lord McCluskey suggested that the final words of paragraph 184 lacked the conviction of a positive finding.

In my view it is critical to an understanding of the Reporter's decision to have a clear understanding of the concept of "quantitative deficiency." This is a matter of the interpretation of the policy S17 . It may well be that the point was not made sufficiently clear in the presentation of the appeal before the Second Division. Certainly it appears that, as the Lord Justice-Clerk records, counsel were not at one as to what was meant by the reference to quantitative terms and it was on his own initiative that reference was made to paragraph 7.9 of the draft structure plan for a clue to its meaning. That paragraph starts with the sentence "In quantitative terms, demand is determined by trends in consumer expenditure… ." This is far from providing a definition but it does, as Lord Morison appreciated, point to the fact that it is consumer expenditure which is being considered as reflected in the turnover in the available shopping facilities. As I understand it from the helpful explanations given to us by counsel for the Secretary of State quantitative deficiency has to do with a comparison between the amount of shopping facility and the amount of customers. It seeks to express a situation where there is a shortage of shopping floorspace as compared with the number of customers in the locality. It is measured by reference to consumer expenditure. Quantitative deficiency is a concept different from that of need, where what is meant is the kind of necessity which would, for example, justify the sacrifice of some amenity for the purpose of the development. There can be a quantitative deficiency even although there is no "need" for the development in so far as everyone in the area is able to do their shopping albeit with the delay and inconvenience of a possibly overcrowded shop or of travelling some distance to get there. Once the definition is understood there is no discrepancy between paragraph s 184 and 186 of the decision letter.

The next question is how a quantitative deficiency should be established. Where the approach is one of considering consumer expenditure a quantitative deficiency is most readily established by the discovery that other stores are trading at a level which is above what would be expected of them, the inference being that there is room to accommodate a further shopping facility.

As Lord Morison observed: "No other way of demonstrating a quantitative deficiency in a particular area, determined only by consumer expenditure, was suggested to us, and none occurs to me." That was the kind of evidence which was led in the present case and it appears that while there was dispute about the reliability of the inferences to be drawn from the figures adduced there was no objection taken to the use of that material in principle as a method of establishing the alleged deficiency.

It was suggested that the Reporter was not entitled to find some deficiency without going on to quantify the extent of the deficiency. I see no obligation on him to do that. The policy S17A does not require the finding of any particular extent of the deficiency. If the deficiency is too slight to enable the whole of the proposed new shopping facility to be accommodated then the matter will be covered by criterion C. If the development is greater than can be absorbed by the deficiency then the result may well be to cause prejudice to the vitality and viability of the existing strategic shopping centres. In that respect criterion C secures the adequacy of the extent of the deficiency identified for the purpose of criterion A. In the present case the Reporter indeed went further in his assessment of the deficiency than he strictly needed to go. In the final sentence of paragraph 184 he takes into account not only the possible further store at Straiton but also higher levels at the development site at Colinton Mains than were likely to be achieved by the proposed Tesco store. Even taking these into account he finds that "there would appear to be a quantitative case." It is evident from that passage that the deficiency was such as to enable the proposed store to be wholly accommodated within it and when account is taken of the hypothesis on which he is proceeding the passage indicates a very positive finding of a quantitative deficiency. What was suggested to be only a tentative finding is in reality clear and certain.

It was argued that the Reporter was not entitled to draw the conclusion which he did from the evidence before him. Counsel for the Respondents suggested a variety of reasons which might account for the expenditure surplus. He also sought to criticise the quality of the evidence on which the Reporter had relied. But it was not suggested that there was no evidence before the Reporter which could entitle him to discount such other explanations and to hold that there was an expenditure surplus which pointed to a quantitative deficiency. Whether the evidence did or did not so point was a matter wholly for him to determine. Provided that the evidence was there it was for him to assess it and draw his own conclusions from it. It is no part of the function of a reviewing court to re-examine the factual conclusions which he drew from the evidence in the absence of any suggestion that he acted improperly or irrationally. Nor is it the duty of a reviewing court to engage in a detailed analytic study of the precise words and phrases which have been used. That kind of exercise is quite inappropriate to an understanding of a planning decision.

Counsel for the Respondents also sought to argue that the Reporter had not given proper or adequate reasons for his decision. In part this point was related to matters to which I have already referred, such as a specification of the extent of the deficiency, the allegedly "tentative" nature of the conclusion on the critical issue, the finding of the quantitative deficiency in the face of the absence of need, and the link between the expenditure surplus and the quantitative deficiency. But in any event the pursuit of a full and detailed exposition of the Reporter's whole process of reasoning is wholly inappropriate. It involves a misconception of the standard to be expected of a decision letter in a planning appeal of this kind. As Lord President Emslie observed in *Wordie Property Co. Ltd.* (p. 348):

> "The decision must, in short, leave the informed reader and the court in no real and substantial doubt as to what the reasons for it were and what were the material considerations which were taken into account in reaching it."

It is worth re-iterating the observations made by Lord Lloyd of Berwick in *Bolton Metropolitan District Council v. Secretary of State for the Environment (1995) 71 P.Q.C.R. 309* in the context of the requirement on the Secretary of State to notify the reasons for his decision. His Lordship said (p. 313):

> "There is nothing in the statutory language which requires him, in stating his reasons, to deal specifically with every material consideration … He has to have *regard* to every material consideration; but he need not mention them all."

As to what should be mentioned his Lordship gave two quotations. In *In re Poyser and Mills' Arbitration [1964] 2 Q.B. 467* at p. 478 Megaw J. said:

> "Parliament provided that reasons shall be given, and in my view that must be read as meaning that proper, adequate reasons must be given. The reasons that are set out must be reasons which will not only be intelligible, but which deal with the substantial points that have been raised."

In *Hope v. Secretary of State for the Environment (1975) 31 P. & C.R. 120* at 123 Phillips J. said:

> "It seems to me that the decision must be such that it enables the appellant to understand on what grounds the appeal has been decided and be in sufficient detail to enable him to know what conclusions the inspector has reached on the principal important controversial issues."

It is necessary that an account should be given of the reasoning on the main issues which were in dispute sufficient to enable the parties and the court to understand that reasoning. If that degree of explanation was not achieved the parties might well be prejudiced. But elaboration is not to be looked for and a detailed consideration of every point which was raised is not to be expected. In the present case the Reporter dealt concisely but clearly with the critical issues. Nothing more was to be expected of him.

The Reporter satisfied himself as he was entitled to do that there was quantitative deficiency and that criterion A was met. He then went on to consider the other criteria. He gave careful consideration to criterion C, including in that an assessment of the effect of the development on Hunter's Tryst and at some length its effect on the shopping centre at Wester Hailes. He was satisfied that criterion C was met and no challenge is made to that conclusion. His unchallenged finding on that matter affirms the adequacy of the deficiency which he found for the purpose of criterion A. He had already decided that the statutory presumption should be overcome by the more recent expressions of policy and in particular the draft structure plan. It was the existence of that recent guidance, not his finding of a quantitative deficiency, which justified the overcoming of the presumption. It is not in dispute that if the seven criteria were met the Reporter was then entitled to grant planning permission.

For the foregoing reasons I would refuse the appeal by the appellant Revival Properties Limited on the matter of the listed building consent and I would allow the appeal by both appellants on the matter of the planning permission.

The Secretary of State should be entitled to his costs from the District Council both here and one half of his expenses in the court below. Revival Properties Limited should be entitled to one half of their costs from the District Council here and one half of their expenses in the court below.

Tesco Stores Limited v Dundee City Council

Positive/Neutral Judicial Consideration

Court
Supreme Court (Scotland)

Judgment Date
21 March 2012

On appeal from: [2011] CSIH 9

SC

[2012] UKSC 13, 2012 WL 609184

before Lord Hope , Deputy President Lord Brown Lord Kerr Lord Dyson Lord Reed

Judgment Given on 21 March 2012

Heard on 15 and 16 February 2012

Representation

Appellants Martin Kingston QC Jane Munro (Instructed by Semple Fraser LLP).
Respondents Douglas Armstrong QC James Findlay QC (Instructed by Gillespie Macandrew LLP).
Interveners (Asda Stores Limited and MacDonald Estates Group PLC) Malcolm Thomson QC Kenny McBrearty (Instructed by Brodies LLP).

Judgment

Lord Reed (with whom Lord Brown, Lord Kerr and Lord Dyson agree)

1. If you drive into Dundee from the west along the A90 (T), you will pass on your left a large industrial site. It was formerly occupied by NCR, one of Dundee's largest employers, but its factory complex closed some years ago and the site has lain derelict ever since. In 2009 Asda Stores Ltd and MacDonald Estates Group plc, the interveners in the present appeal, applied for planning permission to develop a superstore there. Dundee City Council, the respondents, concluded that a decision to grant planning permission would not be in accordance with the development plan, but was nevertheless justified by other material considerations. Their decision to grant the application is challenged in these proceedings by Tesco Stores Ltd, the appellants, on the basis that the respondents proceeded on a misunderstanding of one of the policies in the development plan: a misunderstanding which, it is argued, vitiated their assessment of whether a departure from the plan was justified. In particular, it is argued that the respondents misunderstood a requirement, in the policies concerned with out of centre retailing, that it must be established that no suitable site is available, in the first instance, within and thereafter on the edge of city, town or district centres.

The legislation

2. Section 37(2) of the Town and Country Planning (Scotland) Act 1997 , as in force at the time of the relevant decision, provides:

> "In dealing with [an application for planning permission] the authority shall have regard to the provisions of the development plan, so far as material to the application, and to any other material considerations."

Section 25 provides:

> "Where, in making any determination under the planning Acts, regard is to be had to the development plan, the determination is, unless material considerations indicate otherwise –
>
> (a) to be made in accordance with that plan … "

The development plan

3. The development plan in the present case is an "old development plan" within the meaning of paragraph 1 of Schedule 1 to the 1997 Act. As such, it is defined by section 24 of the 1997 Act, as that section applied before the coming into force of section 2 of the Planning Etc. (Scotland) Act 2006 , as including the approved structure plan and the adopted or approved local plan. The relevant structure plan in the present case is the Dundee and Angus Structure Plan, which became operative in 2002, at a time when the NCR plant remained in operation. As is explained in the introduction to the structure plan, its purpose is to provide a long term vision for the area and to set out the broad land use planning strategy guiding development and change. It includes a number of strategic planning policies. It sets the context for local plans, which translate the strategy into greater detail. Its preparation took account of national planning policy guidelines.

4. The structure plan includes a chapter on town centres and retailing. The introduction explains that the relevant Government guidance is contained in National Planning Policy Guidance 8, *Town Centres and Retailing* (revised 1998). I note that that document (NPPG 8) was replaced in 2006 by *Scottish Planning Policy: Town Centres and Retailing* (SPP 8), which was in force at the time of the decision under challenge, and which was itself replaced in 2010 by *Scottish Planning Policy* (SPP). The relevant sections of all three documents are in generally similar terms. The structure plan continues, at para 5.2:

> "A fundamental principle of NPPG 8 is that of the sequential approach to site selection for new retail developments … On this basis, town centres should be the first choice for such developments, followed by edge of centre sites and, only after this, out of centre sites which are currently or potentially accessible by different means of transport."

In relation to out of centre developments, that approach is reflected in Town Centres and Retailing Policy 4: Out of Centre Retailing:

> "In keeping with the sequential approach to site selection for new retail developments, proposals for new or expanded out of centre retail developments in excess of 1000 sq m gross will only be acceptable where it can be established that:

> • no suitable site is available, in the first instance, within and thereafter on the edge of city, town or district centres;
>
> • individually or cumulatively it would not prejudice the vitality and viability of existing city, town or district centres;
>
> • the proposal would address a deficiency in shopping provision which cannot be met within or on the edge of the above centres;
>
> • the site is readily accessible by modes of transport other than the car;
>
> • the proposal is consistent with other Structure Plan policies."

5. The relevant local plan is the Dundee Local Plan, which came into operation in 2005, prior to the closure of the NCR plant. Like the structure plan, it notes that national planning policy guidance emphasises the need to protect and enhance the vitality and viability of town centres. It continues, at para 52.2:

> "As part of this approach planning authorities should adopt a sequential approach to new shopping developments with first preference being town centres, which in Dundee's case are the City centre and the District Centres."

That approach is reflected in Policy 45: Location of New Retail Developments:

> "The City Centre and District Centres will be the locations of first choice for new or expanded retail developments not already identified in the Local Plan. Proposals for retail developments outwith these locations will only be acceptable where it can be established that:
>
> a) no suitable site is available, in the first instance, within and thereafter on the edge of the City Centre or District Centres; and
>
> b) individually or cumulatively it would not prejudice the vitality and viability of the City Centre or District Centres; and
>
> c) the proposal would address a deficiency in shopping provision which cannot be met within or on the edge of these centres; and
>
> d) the site is readily accessible by modes of transport other than the car; and
>
> e) the proposal is consistent with other Local Plan policies."

6. It is also relevant to note the guidance given in NPPG 8, as revised in 1998, to which the retailing sections of the structure plan and the local plan referred. Under the heading "Sequential Approach", the guidance stated:

> "12. Planning authorities and developers should adopt a sequential approach to selecting sites for new retail, commercial leisure developments and other key town centre uses … First preference should be for town centre sites, where sites or buildings suitable for conversion are available, followed by edge-of-centre sites, and only then by out-of-centre sites in locations that are, or can be made easily accessible by a choice of means of transport …
>
> 13. In support of town centres as the first choice, the Government recognises that the application of the sequential approach requires flexibility and realism from developers and retailers as well as planning authorities. In preparing their proposals developers and retailers should have regard to the format, design, scale of the development, and the amount of car parking in relation to the circumstances of the particular town centre. In addition they should also address the need to identify and assemble sites which can meet not only their requirements, but in a manner sympathetic to the town setting. As part of such an approach, they should consider the scope for accommodating the proposed development in a different built form, and where appropriate adjusting or sub-dividing large proposals, in order that their scale might offer a better fit with existing development in the town centre …
>
> 14. Planning authorities should also be responsive to the needs of retailers and other town centre businesses. In consultation with the private sector, they should assist in identifying sites in the town centre which could be suitable and viable, for example, in terms of size and siting for the proposed use, and are likely to become available in a reasonable time …
>
> 15. Only if it can be demonstrated that all town centre options have been thoroughly addressed and a view taken on availability, should less central sites in out-of-centre locations be considered for key town centre uses. Where development proposals in such locations fall outwith the development plan framework, it is for developers to demonstrate that town centre and edge-of-centre options have been thoroughly assessed. Even where a developer, as part of a sequential approach, demonstrates an out-of-centre location to be the most appropriate, the impact on the vitality and viability of existing centres still has to be shown to be acceptable …"

The consideration of the application

7. The interveners' application was for planning permission to develop a foodstore, café and petrol filling station, with associated car parking, landscaping and infrastructure, including access roads. The proposals also involved improvements to the junction with the A90 (T), the upgrading of a pedestrian underpass, the provision of footpaths and cycle ways, and improvements to adjacent roadways. A significant proportion of the former NCR site lay outside the application site. It was envisaged that vehicular access to this land could be achieved using one of the proposed access roads.

8. In his report to the respondents, the Director of City Development advised that the application was contrary to certain aspects of the employment and retailing policies of the development plan. In relation to the employment policies, in particular, the proposal was contrary to policies which required the respondents to safeguard the NCR site for business use. The Director

considered however that the application site was unlikely to be re-developed for business uses in the short term, and that its re-development as proposed would improve the development prospects of the remainder of the NCR site. In addition, the infrastructure improvements would provide improved access which would benefit all businesses in an adjacent industrial estate.

9. In relation to the retailing policies, the Director considered the application in the light of the criteria in Retailing Policy 4 of the structure plan. In relation to the first criterion he stated:

> "It must be demonstrated, in the first instance, that no suitable site is available for the development either within the city/district centres or, thereafter on the edge of these centres … While noting that the Lochee District Centre lies within the primary catchment area for the proposal, [the retail statement submitted on behalf of the interveners] examines the potential site opportunities in and on the edge of that centre and also at the Hilltown and Perth Road District Centres. The applicants conclude that there are no sites or premises available in or on the edge of existing centres capable of accommodating the development under consideration. Taking account of the applicant's argument it is accepted that at present there is no suitable site available to accommodate the proposed development."

In relation to the remaining criteria, the Director concluded that the proposed development was likely to have a detrimental effect on the vitality and viability of Lochee District Centre, and was therefore in conflict with the second criterion. The potential impact on Lochee could however be minimised by attaching conditions to any permission granted so as to restrict the size of the store, limit the type of goods for sale and prohibit the provision of concessionary units. The proposal was also considered to be in conflict with the third criterion: there was no deficiency in shopping provision which the proposal would address. The fourth criterion, concerned with accessibility by modes of transport other than the car, was considered to be met. Similar conclusions were reached in relation to the corresponding criteria in Policy 45 of the local plan.

10. In view of the conflict with the employment and retailing policies, the Director considered that the proposal did not fully comply with the provisions of the development plan. He identified however two other material considerations of particular significance. First, the proposed development would bring economic benefits to the city. The closure of the NCR factory had been a major blow to the economy, but the re-development of the application site would create more jobs than had been lost when the factory finally closed. The creation of additional employment opportunities within the city was considered to be a strong material consideration. Secondly, the development would also provide a number of planning benefits. There would be improvements to the strategic road network which would assist in the free flow of traffic along the A90 (T). The development would also assist in the re-development of the whole of the former NCR site through the provision of enhanced road access and the clearance of buildings from the site. The access improvements would also assist in the development of an economic development area to the west. These benefits were considered to be another strong material consideration.

11. The Director concluded that the proposal was not in accordance with the development plan, particularly with regard to the employment and retailing policies. There were however other material considerations of sufficient weight to justify setting aside those policies and offering support for the development, subject to suitable conditions. He accordingly recommended that consent should be granted, subject to specified conditions.

12. The application was considered by the respondents' entire council sitting as the respondents' Development Quality Committee. After hearing submissions on behalf of the interveners and also on behalf of the appellants, the respondents decided to follow the Director's recommendation. The reasons which they gave for their decision repeated the Director's conclusions:

> "It is concluded that the proposal does not undermine the core land use and environmental strategies of the development plan. The planning and economic benefits that would accrue from the proposed development would be important to the future development and viability of the city as a regional centre. These benefits are considered to be of a significant weight and sufficient to set aside the relevant provisions of the development plan."

The present proceedings

13. The submissions on behalf of the appellants focused primarily upon an alleged error of interpretation of the first criterion in Retailing Policy 4 of the structure plan, and of the equivalent criterion in Policy 45 of the local plan. If there was a dispute about the meaning of a development plan policy which the planning authority was bound to take into account, it was for the court to determine what the words were capable of meaning. If the planning authority attached a meaning to the words which they were not properly capable of bearing, then it made an error of law, and failed properly to understand the policy. In the present case, the Director had interpreted "suitable" as meaning "suitable for the development proposed by the applicant"; and the respondents had proceeded on the same basis. That was not however a tenable meaning. Properly interpreted, "suitable" meant "suitable for meeting identified deficiencies in retail provision in the area". Since no such deficiency had been identified, it followed on a proper interpretation of the plan that the first criterion did not require to be considered: it was inappropriate to undertake the sequential approach. The Director's report had however implied that the first criterion was satisfied, and that the proposal was to that extent in conformity with the sequential approach. The respondents had proceeded on that erroneous basis. They had thus failed to identify correctly the extent of the conflict between the proposal and the development plan. In consequence, their assessment of whether other material considerations justified a departure from the plan was inherently flawed.

14. The respondents had compounded their error, it was submitted, by treating the proposed development as definitive when assessing whether a "suitable" site was available. That approach permitted developers to drive a coach and horses through the sequential approach: they could render the policy nugatory by the simple expedient of putting forward proposals which were so large that they could only be accommodated outside town and district centres. In the present case, there was a site available in Lochee which was suitable for food retailing and which was sequentially preferable to the application site. The Lochee site had been considered as part of the assessment of the proposal, but had been found to be unsuitable because it could not accommodate the scale of development to which the interveners aspired.

15. In response, counsel for the respondents submitted that it was for the planning authority to interpret the relevant policy, exercising its planning judgment. Counsel accepted that, if there was a dispute about the meaning of the words in a policy document, it was for the court to determine as a matter of law what the words were capable of meaning. The planning authority would only make an error of law if it attached a meaning to the words which they were not capable of bearing. In the present case, the relevant policies required all the specified criteria to be satisfied. The respondents had proceeded on the basis that the proposal failed to accord with the second and third criteria. In those circumstances, the respondents had correctly concluded that the proposal was contrary to the policies in question. How the proposal had been assessed against the first criterion was immaterial.

16. So far as concerned the assessment of "suitable" sites, the interveners' retail statement reflected a degree of flexibility. There had been a consideration of all sites of at least 2.5 ha, whereas the application site extended to 6.68 ha. The interveners had also examined sites which could accommodate only food retailing, whereas their application had been for both food and non-food retailing. The Lochee site extended to only 1.45 ha, and could accommodate a store of only half the size proposed.

It also had inadequate car parking. The Director, and the respondents, had accepted that it was not a suitable site for these reasons.

Discussion

17. It has long been established that a planning authority must proceed upon a proper understanding of the development plan: see, for example, *Gransden & Co Ltd v Secretary of State for the Environment (1985) 54 P & CR 86, 94 per Woolf J, affd (1986) 54 P & CR 361* ; *Horsham DC v Secretary of State for the Environment (1991) 63 P & CR 219* , 225–226 per Nolan LJ. The need for a proper understanding follows, in the first place, from the fact that the planning authority is required by statute to have regard to the provisions of the development plan: it cannot have regard to the provisions of the plan if it fails to understand them. It also follows from the legal status given to the development plan by section 25 of the 1997 Act. The effect of the predecessor of section 25 , namely section 18A of the Town and Country (Planning) Scotland Act 1972 (as inserted by section 58 of the Planning and Compensation Act 1991), was considered by the House of Lords in the case of *City of Edinburgh Council v Secretary of State for Scotland 1998 SC (HL) 33, [1997] 1 WLR 1447* . It is sufficient for present purposes to cite a passage from the speech of Lord Clyde, with which the other members of the House expressed their agreement. At p 44, 1459, his Lordship observed:

> "In the practical application of sec 18A it will obviously be necessary for the decision-maker to consider the development plan, identify any provisions in it which are relevant to the question before him and make a proper interpretation of them. His decision will be open to challenge if he fails to have regard to a policy in the development plan which is relevant to the application or fails properly to interpret it."

18. In the present case, the planning authority was required by section 25 to consider whether the proposed development was in accordance with the development plan and, if not, whether material considerations justified departing from the plan. In order to carry out that exercise, the planning authority required to proceed on the basis of what Lord Clyde described as "a proper interpretation" of the relevant provisions of the plan. We were however referred by counsel to a number of judicial dicta which were said to support the proposition that the meaning of the development plan was a matter to be determined by the planning authority: the court, it was submitted, had no role in determining the meaning of the plan unless the view taken by the planning authority could be characterised as perverse or irrational. That submission, if correct, would deprive sections 25 and 37(2) of the 1997 Act of much of their effect, and would drain the need for a "proper interpretation" of the plan of much of its meaning and purpose. It would also make little practical sense. The development plan is a carefully drafted and considered statement of policy, published in order to inform the public of the approach which will be followed by planning authorities in decision-making unless there is good reason to depart from it. It is intended to guide the behaviour of developers and planning authorities. As in other areas of administrative law, the policies which it sets out are designed to secure consistency and direction in the exercise of discretionary powers, while allowing a measure of flexibility to be retained. Those considerations point away from the view that the meaning of the plan is in principle a matter which each planning authority is entitled to determine from time to time as it pleases, within the limits of rationality. On the contrary, these considerations suggest that in principle, in this area of public administration as in others (as discussed, for example, in *R (Raissi) v Secretary of State for the Home Department [2008] QB 836*), policy statements should be interpreted objectively in accordance with the language used, read as always in its proper context.

19. That is not to say that such statements should be construed as if they were statutory or contractual provisions. Although a development plan has a legal status and legal effects, it is not analogous in its nature or purpose to a statute or a contract. As has often been observed, development plans are full of broad statements of policy, many of which may be mutually irreconcilable, so that in a particular case one must give way to another. In addition, many of the provisions of development plans are framed in language whose application to a given set of facts requires the exercise of judgment. Such matters fall

within the jurisdiction of planning authorities, and their exercise of their judgment can only be challenged on the ground that it is irrational or perverse (*Tesco Stores Ltd v Secretary of State for the Environment [1995] 1 WLR 759* , 780 per Lord Hoffmann). Nevertheless, planning authorities do not live in the world of Humpty Dumpty: they cannot make the development plan mean whatever they would like it to mean.

20. The principal authority referred to in relation to this matter was the judgment of Brooke LJ in *R v Derbyshire County Council, Ex p Woods [1997] JPL 958* at 967. Properly understood, however, what was said there is not inconsistent with the approach which I have described. In the passage in question, Brooke LJ stated:

> "If there is a dispute about the meaning of the words included in a policy document which a planning authority is bound to take into account, it is of course for the court to determine as a matter of law what the words are capable of meaning. If the decision maker attaches a meaning to the words they are not properly capable of bearing, then it will have made an error of law, and it will have failed properly to understand the policy."

By way of illustration, Brooke LJ *referred to the earlier case of Northavon DC v Secretary of State for the Environment [1993] JPL 761* , which concerned a policy applicable to "institutions standing in extensive grounds". As was observed, the words spoke for themselves, but their application to particular factual situations would often be a matter of judgment for the planning authority. That exercise of judgment would only be susceptible to review in the event that it was unreasonable. The latter case might be contrasted with the case of R (Heath and Hampstead Society) v Camden LBC [2008] 2 P & CR 233 , where a planning authority's decision that a replacement dwelling was not "materially larger" than its predecessor, within the meaning of a policy, was vitiated by its failure to understand the policy correctly: read in its context, the phrase "materially larger" referred to the size of the new building compared with its predecessor, rather than requiring a broader comparison of their relative impact, as the planning authority had supposed. Similarly in *City of Edinburgh Council v Scottish Ministers 2001 SC 957* the reporter's decision that a licensed restaurant constituted "similar licensed premises" to a public house, within the meaning of a policy, was vitiated by her misunderstanding of the policy: the context was one in which a distinction was drawn between public houses, wine bars and the like, on the one hand, and restaurants, on the other.

21. A provision in the development plan which requires an assessment of whether a site is "suitable" for a particular purpose calls for judgment in its application. But the question whether such a provision is concerned with suitability for one purpose or another is not a question of planning judgment: it is a question of textual interpretation, which can only be answered by construing the language used in its context. In the present case, in particular, the question whether the word "suitable", in the policies in question, means "suitable for the development proposed by the applicant", or "suitable for meeting identified deficiencies in retail provision in the area", is not a question which can be answered by the exercise of planning judgment: it is a logically prior question as to the issue to which planning judgment requires to be directed.

22. It is of course true, as counsel for the respondents submitted, that a planning authority might misconstrue part of a policy but nevertheless reach the same conclusion, on the question whether the proposal was in accordance with the policy, as it would have reached if it had construed the policy correctly. That is not however a complete answer to a challenge to the planning authority's decision. An error in relation to one part of a policy might affect the overall conclusion as to whether a proposal was in accordance with the development plan even if the question whether the proposal was in conformity with the policy would have been answered in the same way. The policy criteria with which the proposal was considered to be incompatible might, for example, be of less weight than the criteria which were mistakenly thought to be fulfilled. Equally, a planning authority might misconstrue part of a policy but nevertheless reach the same conclusion as it would otherwise have reached on the question whether the proposal was in accordance with the development plan. Again, however, that is not a complete answer. Where it is concluded that the proposal is not in accordance with the development plan, it is necessary to

understand the nature and extent of the departure from the plan which the grant of consent would involve in order to consider on a proper basis whether such a departure is justified by other material considerations.

23. In the present case, the Lord Ordinary rejected the appellants' submissions on the basis that the interpretation of planning policy was always primarily a matter for the planning authority, whose assessment could be challenged only on the basis of unreasonableness: there was, in particular, more than one way in which the sequential approach could reasonably be applied ([2010] CSOH 128, para 23). For the reasons I have explained, that approach does not correctly reflect the role which the court has to play in the determination of the meaning of the development plan. A different approach was adopted by the Second Division: since, it was said, the proposal was in head-on conflict with the retail and employment policies of the development plan, and the sequential approach offered no justification for it, a challenge based upon an alleged misapplication of the sequential approach was entirely beside the point (2011 SC 457, [2011] CSIH 9, para 38). For the reasons I have explained, however, even where a proposal is plainly in breach of policy and contrary to the development plan, a failure properly to understand the policy in question may result in a failure to appreciate the full extent or significance of the departure from the development plan which the grant of consent would involve, and may consequently vitiate the planning authority's determination. Whether there has in fact been a misunderstanding of the policy, and whether any such misunderstanding may have led to a flawed decision, has therefore to be considered.

24. I turn then to the question whether the respondents misconstrued the policies in question in the present case. As I have explained, the appellants' primary contention is that the word "suitable", in the first criterion of Retailing Policy 4 of the structure plan and the corresponding Policy 45 of the local plan, means "suitable for meeting identified deficiencies in retail provision in the area", whereas the respondents proceeded on the basis of the construction placed upon the word by the Director of City Development, namely "suitable for the development proposed by the applicant". I accept, subject to a qualification which I shall shortly explain, that the Director and the respondents proceeded on the latter basis. Subject to that qualification, it appears to me that they were correct to do so, for the following reasons.

25. First, that interpretation appears to me to be the natural reading of the policies in question. They have been set out in paras 4 and 5 above. Read short, Retailing Policy 4 of the structure plan states that proposals for new or expanded out of centre retail developments will only be acceptable where it can be established that a number of criteria are satisfied, the first of which is that "no suitable site is available" in a sequentially preferable location. Policy 45 of the local plan is expressed in slightly different language, but it was not suggested that the differences were of any significance in the present context. The natural reading of each policy is that the word "suitable", in the first criterion, refers to the suitability of sites for the proposed development: it is the proposed development which will only be acceptable at an out of centre location if no suitable site is available more centrally. That first reason for accepting the respondents' interpretation of the policy does not permit of further elaboration.

26. Secondly, the interpretation favoured by the appellants appears to me to conflate the first and third criteria of the policies in question. The first criterion concerns the availability of a "suitable" site in a sequentially preferable location. The third criterion is that the proposal would address a deficiency in shopping provision which cannot be met in a sequentially preferable location. If "suitable" meant "suitable for meeting identified deficiencies in retail provision", as the appellants contend, then there would be no distinction between those two criteria, and no purpose in their both being included.

27. Thirdly, since it is apparent from the structure and local plans that the policies in question were intended to implement the guidance given in NPPG 8 in relation to the sequential approach, that guidance forms part of the relevant context to which regard can be had when interpreting the policies. The material parts of the guidance are set out in para 6 above. They provide further support for the respondents' interpretation of the policies. Paragraph 13 refers to the need to identify sites which can meet the requirements of developers and retailers, and to the scope for accommodating the proposed development. Paragraph 14 advises planning authorities to assist the private sector in identifying sites which could be suitable for the proposed use. Throughout the relevant section of the guidance, the focus is upon the availability of sites which might accommodate the

proposed development and the requirements of the developer, rather than upon addressing an identified deficiency in shopping provision. The latter is of course also relevant to retailing policy, but it is not the issue with which the specific question of the suitability of sites is concerned.

28. I said earlier that it was necessary to qualify the statement that the Director and the respondents proceeded, and were correct to proceed, on the basis that "suitable" meant "suitable for the development proposed by the applicant". As paragraph 13 of NPPG 8 makes clear, the application of the sequential approach requires flexibility and realism from developers and retailers as well as planning authorities. The need for flexibility and realism reflects an inbuilt difficulty about the sequential approach. On the one hand, the policy could be defeated by developers' and retailers' taking an inflexible approach to their requirements. On the other hand, as Sedley J remarked in *R v Teesside Development Corporation, Ex p William Morrison Supermarket plc and Redcar and Cleveland BC [1998] JPL 23* , 43, to refuse an out-of-centre planning consent on the ground that an admittedly smaller site is available within the town centre may be to take an entirely inappropriate business decision on behalf of the developer. The guidance seeks to address this problem. It advises that developers and retailers should have regard to the circumstances of the particular town centre when preparing their proposals, as regards the format, design and scale of the development. As part of such an approach, they are expected to consider the scope for accommodating the proposed development in a different built form, and where appropriate adjusting or sub-dividing large proposals, in order that their scale may fit better with existing development in the town centre. The guidance also advises that planning authorities should be responsive to the needs of retailers. Where development proposals in out-of-centre locations fall outside the development plan framework, developers are expected to demonstrate that town centre and edge-of-centre options have been thoroughly assessed. That advice is not repeated in the structure plan or the local plan, but the same approach must be implicit: otherwise, the policies would in practice be inoperable.

29. It follows from the foregoing that it would be an over-simplification to say that the characteristics of the proposed development, such as its scale, are necessarily definitive for the purposes of the sequential test. That statement has to be qualified to the extent that the applicant is expected to have prepared his proposals in accordance with the recommended approach: he is, for example, expected to have had regard to the circumstances of the particular town centre, to have given consideration to the scope for accommodating the development in a different form, and to have thoroughly assessed sequentially preferable locations on that footing. Provided the applicant has done so, however, the question remains, as Lord Glennie observed in Lidl UK GmbH v Scottish Ministers [2006] CSOH 165 , para 14, whether an alternative site is suitable for the proposed development, not whether the proposed development can be altered or reduced so that it can be made to fit an alternative site.

30. In the present case, it is apparent that a flexible approach was adopted. The interveners did not confine their assessment to sites which could accommodate the development in the precise form in which it had been designed, but examined sites which could accommodate a smaller development and a more restricted range of retailing. Even taking that approach, however, they did not regard the Lochee site vacated by the appellants as being suitable for their needs: it was far smaller than they required, and its car parking facilities were inadequate. In accepting that assessment, the respondents exercised their judgment as to how the policy should be applied to the facts: they did not proceed on an erroneous understanding of the policy.

31. Finally, I would observe that an error by the respondents in interpreting their policies would be material only if there was a real possibility that their determination might otherwise have been different. In the particular circumstances of the present case, I am not persuaded that there was any such possibility. The considerations in favour of the proposed development were very powerful. They were also specific to the particular development proposed: on the information before the respondents, there was no prospect of any other development of the application site, or of any development elsewhere which could deliver equivalent planning and economic benefits. Against that background, the argument that a different decision might have been taken if the respondents had been advised that the first criterion in the policies in question did not arise, rather than that criterion had been met, appears to me to be implausible.

Conclusion

32. For these reasons, and those given by Lord Hope, with which I am in entire agreement, I would dismiss the appeal.

Lord Hope

33. The question that lies at the heart of this case is whether the respondents acted unlawfully in their interpretation of the sequential approach which both the structure plan and the relevant local plan required them to adopt to new retail developments within their area. According to that approach, proposals for new or expanded out of centre developments of this kind are acceptable only where it can be established, among other things, that no suitable site is available, in the first instance, within and thereafter on the edge of city, town or district centres. Is the test as to whether no suitable site is available in these locations, when looked at sequentially, to be addressed by asking whether there is a site in each of them in turn which is suitable for the proposed development• Or does it direct attention to the question whether the proposed development could be altered or reduced so as to fit into a site which is available there as a location for this kind of development?

34. The sequential approach is described in National Planning Policy Guidance Policy 8, *Town Centres and Retailing* , para 5.2 as a fundamental principle of NPPG 8. In R v Rochdale Metropolitan Borough Council, Ex p Milne, 31 July 2000, not reported , paras 48-49, Sullivan J said that it was not unusual for development plan polices to pull in different directions and, having regard to what Lord Clyde said about the practical application of the statutory rule in *City of Edinburgh v Secretary of State for Scotland 1998 SC (HL) 33* at p 44, that he regarded as untenable the proposition that if there was a breach of any one policy in a development plan a proposed development could not be said to be "in accordance with the plan". In para 52 he said that the relative importance of a given policy to the overall objectives of the development plan was essentially a matter for the judgment of the local planning authority and that a legalistic approach to the interpretation of development plan policies was to be avoided.

35. I see no reason to question these propositions, to which Mr Kingston QC for the appellants drew our attention in his reply to Mr Armstrong's submissions for the respondents. But I do not think that they are in point in this case. We are concerned here with a particular provision in the planning documents to which the respondents are required to have regard by the statute. The meaning to be given to the crucial phrase is not a matter that can be left to the judgment of the planning authority. Nor, as the Lord Ordinary put it in his opinion at [2010] CSOH 128, para 23, is the interpretation of the policy which it sets out primarily a matter for the decision maker. As Mr Thomson for the interveners pointed out, the challenge to the respondents' decision to follow the Director's recommendation and approve the proposed development is not that it was *Wednesbury* unreasonable but that it was unlawful. I agree with Lord Reed that the issue is one of law, reading the words used objectively in their proper context.

36. In Lidl UK GmbH v The Scottish Ministers [2006] CSOH 165 the appellants appealed against a decision of the Scottish Ministers to refuse planning permission for a retail unit to be developed on a site outwith Irvine town centre. The relevant provision in the local plan required the sequential approach to be adopted to proposals for new retail development out with the town centre boundaries. Among the criteria that had to be satisfied was the requirement that no suitable sites were available, or could reasonably be made available, in or on the edge of existing town centres. In other words, town centre sites were to be considered first before edge of centre or out of town sites. The reporter held that the existing but soon to be vacated Lidl town centre site was suitable for the proposed development, although it was clear as a matter of fact that this site could not accommodate it. In para 13 Lord Glennie noted that counsel for the Scottish Ministers accepted that a site would be "suitable" in terms of the policy only if it was suitable for, or could accommodate, the development as proposed by the developer. In para 14 he said that the question was whether the alternative town centre site was suitable for the proposed development, not whether the proposed development could be altered or reduced so that it could fit in to it.

37. Mr Kingston submitted that Lord Glennie's approach would rob the sequential approach of all its force, and in the Inner House it was submitted that his decision proceeded on a concession by counsel which ought not to have been made: [2011] CSIH 9, 2011 SC 457, para 31. But I think that Lord Glennie's interpretation of the phrase was sound and that counsel was right to accept that it had the meaning which she was prepared to give to it. The wording of the relevant provision in the local plan in that case differed slightly from that with which we are concerned in this case, as it included the phrase "or can reasonably be made available". But the question to which it directs attention is the same. It is the proposal for which the developer seeks permission that has to be considered when the question is asked whether no suitable site is available within or on the edge of the town centre.

38. The context in which the word "suitable" appears supports this interpretation. It is identified by the opening words of the policy, which refer to "proposals for new or expanded out of centre retail developments" and then set out the only circumstances in which developments outwith the specified locations will be acceptable. The words "the proposal" which appear in the third and fifth of the list of the criteria which must be satisfied serve to reinforce the point that the whole exercise is directed to what the developer is proposing, not some other proposal which the planning authority might seek to substitute for it which is for something less than that sought by the developer. It is worth noting too that the phrase "no suitable site is available" appears in Policy 46 of the local plan relating to commercial developments. Here too the context indicates that the issue of suitability is directed to the developer's proposals, not some alternative scheme which might be suggested by the planning authority. I do not think that this is in the least surprising, as developments of this kind are generated by the developer's assessment of the market that he seeks to serve. If they do not meet the sequential approach criteria, bearing in mind the need for flexibility and realism to which Lord Reed refers in para 28, above, they will be rejected. But these criteria are designed for use in the real world in which developers wish to operate, not some artificial world in which they have no interest doing so.

39. For these reasons which I add merely as a footnote I agree with Lord Reed, for all the reasons he gives, that this appeal should be dismissed. I would affirm the Second Division's interlocutor.

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The Scottish Government

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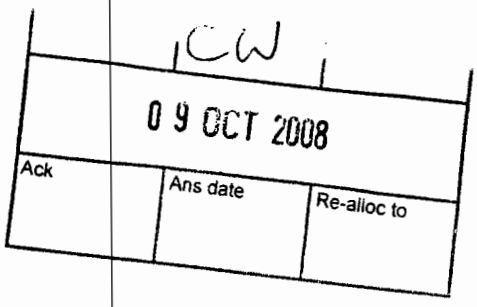

Your ref:
Our ref: NA/DUC/008
8 October 2008

Dear Mr Hyslop

TOWN AND COUNTRY PLANNING (SCOTLAND) ACT 1997
OUTLINE PLANNING PERMISSION FOR A CREMATORIUM, CEMETERY AND ASSOCIATED LICENSED PUBLIC HOUSE/RESTAURANT AT LAND ON LINLATHEN ESTATE, LINLATHEN ROAD, DUNDEE

1. This letter contains the Scottish Ministers' decision on the above application which was lodged with Dundee City Council on 16 February 2007.

2. The application was notified to the Scottish Ministers, on 23 October 2007, in accordance with the Town and Country Planning (Notification of Applications) (Scotland) Direction 2007. In terms of Section 46 of the Town and Country Planning (Scotland) Act 1997, the Scottish Ministers directed Dundee City Council, on 14 January 2008, to refer the application to them for determination.

3. The application was subsequently considered at a hearing, and including a site visit, on 14 May 2008 by Michael Shiel, a reporter appointed by the Scottish Ministers. A copy of Mr Shiel's report to the Scottish Ministers is enclosed for your information. A list of those who attended the hearing is given on page 1 of the report and a list of those who submitted written submissions is given in Appendix 1. Chapter 1 describes the application site and provides background information on the proposal.

Evidence at the Hearing

4. The evidence led at the hearing is summarised in Chapter 2.

Consideration by the Reporter

5. The Reporter's findings of fact are contained in Chapter 3, and his reasoning and recommendation that planning permission be refused appear in Chapter 4.

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Scottish Ministers' Decision

7. The Scottish Ministers have carefully considered all of the evidence presented at the hearing, the written submissions, the Reporter's reasoning and his recommendation thereon. They accept his reasoning and recommendation and adopt them for the purpose of their own decision.

8. Accordingly, the Scottish Ministers hereby refuse to grant outline planning permission for a crematorium, cemetery and associated licensed public house/restaurant at Linlathen Estate, Linlathen Road, Dundee.

9. The foregoing decision of the Scottish Ministers is final, subject to the right, conferred by Sections 237 and 239 of the Town and Country Planning (Scotland) Act 1997, of any person aggrieved by the decision to apply to the Court of Session within 6 weeks of the date hereof. On any such application the Court may quash the decision if satisfied that it is not within the powers of the Act or that the applicant's interests have been substantially prejudiced by a failure to comply with any requirements of the Act, or of the Tribunals and Inquiries Act 1992, or any orders, regulations or rules made under these Acts.

10. Copies of this letter and report have been sent to the other parties who participated in the hearing.

Yours sincerely

LYNNE McDOUGALL

Directorate for Planning and Environmental Appeals

Report to the Scottish Ministers

The Scottish Government

TOWN AND COUNTRY PLANNING (SCOTLAND) ACT 1997

Report by Michael Shiel, a Reporter appointed by the Scottish Ministers

- Case reference: NA/DUC/008
- Site Address: Land on Linlathen Estate, Linlathen Road, Dundee
- Application for outline planning permission, dated 16 February 2007, called-in by direction dated 14 January 2008.
- The development proposed: A crematorium, cemetery and associated licensed public house/restaurant
- Date of hearing by Reporter: 14 May 2008

Date of this report and recommendation: 8 August 2008.

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DX 557005 Falkirk www.scotland.gov.uk/Topics/Planning/Appeals

Directorate for Planning and Environmental Appeals

Summary of Report of Hearing into Called in Planning Application

The Scottish Government

Outline planning permission for a crematorium, cemetery and associated licensed public house/restaurant
Land on Linlathen Estate, Linlathen Road, Dundee

• Case reference	NA/DUC/008
• Case type	Called in application
• Reporter	Michael Shiel
• Planning application reference and date	07/00160/OUT, registered on 16 February 2007
• Applicant	Linlathen Developments Ltd
• Planning authority	Dundee City Council
• Other parties	Historic Scotland; Broughty Ferry Community Council; 9 local residents
• Date of application	16 February 2007
• Method of consideration and date	Hearing on 14 May 2008
• Date of report	August 2008
• Reporter's recommendation	Refuse outline planning permission

Ministers' Reasons for Call in:

The proposal conflicts with national policy regarding the protection of Scheduled Ancient Monuments; the planning authority proposes to grant planning permission against the advice of Historic Scotland; and the possible implications for development plan policies particularly in relation to the public house/restaurant element of the proposal.

The Site:

12 hectares of agricultural land on the south side of Drumsturdy Road (B961), with a strip of land extending 750 metres southwards to the end of Linlathen Road. The land rises from Drumsturdy Road to the crest of a low ridge. At the highest point of the site, in its south-east corner, is a Bronze Age burial mound known as Cairn Greg, a Scheduled Ancient Monument (SAM). North Gates Souterrain is a second SAM in the western part of the site, its presence only visible in cropmarks on aerial photographs.

Description of the Development

The application is for outline planning permission for a crematorium, cemetery and associated licensed public house/restaurant. The cemetery (5.15 hectares) would occupy the western half of the site, with a 200-space car park in the centre and the public house/restaurant to the north of it; and the crematorium (4.225 hectares) at the eastern end. The main vehicular access would be from Linlathen Road to the south, with a separate access from Drumsturdy Road to the licensed premises, which would have a 25-space car park with a pedestrian link only to the main car park.

The Council's Case:

Given the urgent need for additional burial land in Dundee; that the current proposal satisfies the requirements of local plan policy 71 on future cemetery provision; and that no suitable alternative site has been identified, there is a case for approving this application as an exception to local plan policy 74 on new development in the open countryside. On the basis of the archaeological assessment submitted with the application; the applicant's discussions with the council and its archaeological advisor; the omission of the proposed crematorium chapel nearest to Cairn Greg; and subject to suitable conditions, the development would enhance the setting of Cairn Greg and would result in satisfactory provision for the protection of archaeology in terms of policies 64 and 65. This would address the concerns of Historic Scotland. Although not currently accessible by public transport, the provision of an access road of a suitable standard and with bus stopping and turning facilities is the best that can be achieved, given that the land requirement for a cemetery will inevitably require a greenfield location.

The Appellant's Case:

The development would constitute a departure from local plan policy 74, but there is an overwhelming justification for approving it. It is consistent with policy 71. The crematorium is also justified in the context of this policy. The licensed public house/restaurant is not intended as a stand-alone proposal, but as complementary to the primary generator of the business opportunity. Historic Scotland's principal concern is considered to relate to any development directly on the scheduled area, and the revised layout addresses this. Consequently its concern with the setting of the SAM is of secondary importance. Satisfactory protection of Cairn Greg would be provided in accordance with local plan policies 64 and 65. It is under no direct threat and will remain in perpetuity. In this context, Historic Scotland's position is totally inflexible and negative.

Historic Scotland's Case:

SAMs are of national importance and developments which would have an adverse effect on them or the integrity of their settings should not be permitted unless there are exceptional circumstances. NPPG 5 makes clear that the preservation of the setting of ancient monuments is a material consideration in determining planning applications, and does not support the view that the setting of SAMs is of secondary importance. The development would have a significant adverse impact on the setting of Cairn Greg, an impressive prehistoric burial mound on the crest of a ridge with panoramic views to and from the monument in all directions. The new buildings would dramatically alter the expansive landscape setting within which the monument can still be read and provide a visual barrier which would divorce it from its topographic setting and diminish its prominence as a landscape feature. Neither the applicant nor the council has demonstrated that this is the only location suitable for a cemetery, or that there is a requirement for a crematorium and public house/restaurant. Consequently, Historic Scotland is aware of no special circumstances which outweigh the major adverse impact on the setting of Cairn Greg.

Other Parties' Cases:

The Broughty Ferry Community Council and nine residents have objected to the development, principally on the grounds that it would conflict with the local plan; transform the present rural character of the area; adversely affect the amenity of local residents; and increase the amount of traffic on Drumsturdy Road, with a potential impact on road safety.

Reporter's Reasoning:

1. Assessment against the provisions of the development plan

There is some conflict between the proposal and the relevant policies of the structure plan:

- the development would not enjoy good accessibility, particularly for pedestrians, cyclists and public transport users, in conflict with Transport Policy 4;
- the site comprises prime agricultural land, which has not been identified as essential for the implementation of the structure plan strategy, and the proposal is therefore contrary to Environmental Resources Policy 7. There is, however, no evidence that the loss of this land would have a harmful impact on agricultural interests.

Overall, the development would not be consistent with the relevant provisions of the adopted local plan:

- it conflicts with policy 74 as it does not comply with the criteria for new development in the countryside;
- although policy 71 refers to future cemetery provision, it provides no support for the crematorium and public house/restaurant. No overriding demonstration of need for these facilities has been advanced that would warrant an exception to policy 74;
- for the cemetery alone, the proposed site would meet the first two criteria of policy 71; would not meet the third as it does not have reasonable public transport access; and, in terms of the fourth criterion, is of some environmental sensitivity because of the presence of the two SAMs and possible unscheduled archaeological remains;
- the development would be likely to have an adverse effect on the setting of Cairn Greg, contrary to policy 64.
- the lack of field evaluation of potential archaeological remains within the site also runs counter to policy 65.

For these reasons, approval of the proposal would not be consistent with the development plan as a whole.

2. Assessment against other material considerations

It is probable that the new buildings would adversely affect the setting of Cairn Greg burial mound by reducing its sense of exposure and openness, especially in views to and from the north. Consequently, it would be contrary to national policy on the protection of the setting of SAMs in NPPG 5. The lack of field evaluation of potential archaeological remains within the site is not consistent with advice in PAN 42.

There is an acknowledged need for additional burial land in Dundee. However, the council has not undertaken a comprehensive search for and evaluation of potential sites to demonstrate that this is the only suitable location. Moreover, no overriding case has been made for the crematorium and public house/restaurant, which have been included as part of the comprehensive development proposals for this site, to warrant approving them as an exception to local plan policy 74; especially as it is these elements of the development that would be likely to have the greatest impact on the setting of Cairn Greg.

3. Final conclusions

Overall, the development is not consistent with the provisions of the development plan, and there are no other material considerations of sufficient weight to warrant granting outline planning permission in this case.

Directorate for Planning and Environmental Appeals
4 The Courtyard
Callendar Business Park
Falkirk
FK1 1XR

File Ref: NA/DUC/008

The Scottish Ministers
Edinburgh

Ministers

1 In accordance with my minute of appointment dated 18 March 2008 I held a hearing on 14 May 2008 in connection with an application for outline planning permission for a crematorium, cemetery and associated licensed public house/restaurant at land on Linlathen Estate, Linlathen Road, Dundee. I carried out an accompanied inspection of the site on the same day, having previously made an unaccompanied inspection of its surroundings on the previous day.

2 The application was called in for determination by the Scottish Ministers by a direction dated 14 January 2008 as the proposal conflicts with national policy regarding the protection of Scheduled Ancient Monuments; the planning authority proposes to grant planning permission against the advice of Historic Scotland; and the possible implications for development plan policies particularly in relation to the public house/restaurant element of the proposal.

3 The following parties participated in the hearing:

For the applicant:

Robert Hyslop, Managing Director, Linlathen Developments Ltd
Donald G Coutts, Director, Linlathen Developments Ltd

For Dundee City Council:

Charles Walker, Senior Planning Officer
Andrew Mulholland, Planning Officer
Michael Giblin, Senior Engineer
Tom Rees, Consultant Archaeologist, Rathmell Archaeology Ltd

For Historic Scotland

Dr Ann MacSween, Principal Inspector of Ancient Monuments
Dr Iona Murray, Senior Inspector of Ancient Monuments

4 Letters of representation in respect of the application have been submitted by the parties listed in Appendix 1.

Chapter 1 – Background

The site and its surroundings

1.1 The application site has an area of approximately 12 hectares and is situated to the north-east of Dundee. The greater part of the site is on the south side of Drumsturdy Road (B961), which forms the boundary with Angus Council at this point. It has a frontage of about 450 metres along that road, from which it is separated by a stone wall, and extends south for between 210 and 290 metres. It comprises the northern parts of two large agricultural fields, divided by a stone wall.

1.2 The land rises up from Drumsturdy Road and the site extends to the crest of a low ridge, beyond which the land falls gently southwards to the valley of the Dighty Water. At the highest point of the site, in its south-east corner, is Cairn Greg, a Scheduled Ancient Monument (SAM). This is a Bronze Age burial mound, comprising a circular area of stones with a diameter of some 40 metres, and rising to a maximum height of about 2 metres above the surrounding farmland. The mound has a covering of rough grass and there are a number of trees on it which have been cut back in the past and are now growing in coppiced form to a height of about 8-10 metres.

1.3 A second SAM is situated in the western of the two fields. Known as the North Gates Souterrain, there is no visible sign of it on the ground, its presence having been identified by cropmarks on aerial photographs. It is about 20 metres long and 2 metres wide, forming a semi-circle open to the south-east, and is of late prehistoric date. Souterrains are interpreted as underground stores associated with above ground structures and a further cropmark probably represents the remains of this structure.

1.4 Immediately north-west of the site, on the south side of Drumsturdy Road, are two cottages on either side of the northern entrance to the former Linlathen House. The western cottage is a category C listed building dating from the early nineteenth century, although it appears to have been much extended. A wide track runs between the cottages southwards alongside the western boundary of the application site, from which it is separated by a strip of waste ground and a high stone wall. It is a public right of way. There are occasional mature trees alongside this track, becoming more numerous at its southern end, where they are protected by a Tree Preservation Order. A strip of the application site runs along or parallel to this track for about 750 metres as far as a roundabout at the northern end of Linlathen Road.

1.5 Linlathen Road is a new road running north from Arbroath Road (A92) and serves two new housing estates before crossing the Dighty Water and terminating at the roundabout, which is intended to provide a second point of access to the Linlathen Economic Development Site to the west. This site is currently undeveloped and remains in agricultural use. Linlathen Road also provides access to a modern nursing home situated on the site of the former Linlathen House; a riding school to the north of it; and Linlathen Farm to the north-east.

The proposal

1.6 Outline planning permission is being sought for the construction of a crematorium, cemetery and associated licensed public house/restaurant. A layout plan submitted with the application shows the disposition of the proposed facilities within the site. This plan has been revised on a number of occasions, the most recent version being Drawing No. PL/002, Revision F, stamped as received by the council on 6 May 2008. It was agreed by the parties that this plan forms the basis on which the application should be determined. Also submitted were drawings showing a landscape appraisal, proposed landscape strategy, and landscape notes for the development. These are marked as for illustrative purposes only and do not, therefore, form part of the application.

1.7 A new access road would be constructed from the roundabout on Linlathen Road to the south-west corner of the main part of the site, where there would be a turning circle. Access would continue along the southern edge of the site, serving firstly the proposed cemetery, which would occupy 5.15 hectares of land at the western side of the site, as far as the existing stone wall between the two fields. A 60 metre diameter exclusion zone for all development would be left around the North Gates Souterrain.

1.8 East of the stone wall, a 200-space car park would be formed, occupying 0.785 hectares, with the proposed public house/restaurant to the north of it on 0.87 hectares of land. A separate access to this would be created from Drumsturdy Road with the provision of parking for 25 cars, and a pedestrian link to the main car park.

1.9 The proposed crematorium would be situated on the eastern part of the site, on an area of land extending to 4.225 hectares. There would be a further 60 metre exclusion zone around Cairn Greg and the building would be sited at least 155 metres from the edge of that zone, close to Drumsturdy Road, although separate legislation requires it to be at least 50 metres from a public road. All vehicular access to the crematorium would be on the internal access road continuing past the car park.

1.10 A Transportation Statement was submitted with the application, which stated that this type of development would not readily fit into more sustainable town centre locations. It concluded that the development would not generate new vehicle trips on the surrounding road network during the highway peak periods and, at other times, generated traffic volumes would be low. Linlathen Road has been designed to a standard to serve as a bus route in the future, and the extension to the site would be constructed to a similar standard. The report suggested that the larger development area would be served by public transport services in the future, once a "critical mass" is achieved.

1.11 Also submitted was a report entitled "Phase 1 Environmental Risk Assessment", which concluded that no significant environmental risks had been identified in relation to the site and its development, but that further geotechnical investigation would be needed to prove the suitability of the ground conditions for the proposed purpose.

1.12 The application was further accompanied by an Archaeological Desk-based Assessment, undertaken by AOC Archaeology Group. This identified sites of potential

archaeological or historic interest within and in the vicinity of the application site. Four sites of probable prehistoric date, including the two SAMs, were identified within the proposed development area, whilst the density of prehistoric cropmarks in the surrounding area indicates that previously unknown buried remains from the prehistoric period and later may exist. Although any below ground remains might have been damaged by the continual ploughing of the land, there is a high possibility that archaeological remains survive relatively undisturbed within the development area, which could be disturbed in the course of ground-breaking works. The report acknowledged that an archaeological evaluation might be required prior to the commencement of such works. It recognised the potential impact on the SAMs and advised the retention of buffers around them to preserve their integrity. It suggested that a management plan may be required to ensure their continued protection, including provision of public access to and maintenance of Cairn Greg.

The development plan

1.13 The development plan for this area comprises the Dundee and Angus Structure Plan 2001-2016 and the Dundee Local Plan Review 2005.

1.14 Three policies in the structure plan are of relevance to this development. **Transport Policy 4** seeks to ensure that development takes place at the most accessible locations, and requires new development proposals to demonstrate that they provide safe, convenient and attractive facilities for pedestrian, cycle and public transport access; provide or use walking and cycling routes which are or can be linked into established and planned networks; are accessible to or can be made accessible to the existing or proposed public transport networks; and are located where local road network capacity is available. **Environmental Resources Policy 5A** requires local plans to establish a policy framework for safeguarding and enhancing important features of the area's historic environment, including protecting the site and setting of listed buildings and SAMs, and protecting other archaeological sites. **Environmental Resources Policy 7** states that development that would result in the permanent loss of prime agricultural land will not normally be permitted except where such land is identified as essential for the implementation of the structure plan strategy.

1.15 In the adopted local plan, the application site lies within an area designated as open countryside, where **policy 74** contains a presumption against all new development unless it is located in an existing building group; involves the restoration of an existing building worthy of retention; or is supported by an agricultural justification. **Policy 71** identifies the need for new cemetery provision in Dundee and states that the council will investigate the feasibility of extending Eastern and Birkhill Cemeteries to improve the supply of burial land up to 2011. It will also investigate the provision of new burial land towards the east of the city in the period beyond 2011, using the following criteria to help identify potential sites: (a) land with limited development value; (b) land that is capable of being made available within the necessary timeframe; (c) land with reasonable public transport access; and (d) land that is not environmentally and aesthetically sensitive to the proposed use.

1.16 **Policy 64** states that developments will not be permitted which would destroy or adversely affect SAMs, other important archaeological or historic sites, or their settings,

unless it can be demonstrated that there is a significant and overriding public interest to be gained from the development that outweighs the archaeological importance of the site; there is no appropriate alternative location for the proposal; and it has been sited and designed to minimise damage to the archaeological remains. **Policy 65** requires that, where any proposal could affect a site of known archaeological importance or potential, an assessment must be provided of the archaeological value of the site and the likely impact of the development on the archaeological resource, including a field evaluation.

1.17 **Policies 81, 82 and 83** seek to enhance facilities and infrastructure for pedestrians, cyclists and public transport users respectively.

Other policy considerations

1.18 National planning policy on archaeology and planning is contained in **National Planning Policy Guideline 5: Archaeology and Planning (NPPG 5)**. Paragraph 17 states:

- ***Scheduled ancient monuments are of national importance and it is particularly important that they are preserved* in situ *and within an appropriate setting. Developments, which would have an adverse effect on scheduled monuments or the integrity of their settings, should not be permitted unless there are exceptional circumstances.***

1.19 Paragraph 25 emphasises that the preservation of ancient monuments and their setting is a material consideration in determining planning applications and appeals, whether a monument is scheduled or not.

1.20 More detailed advice is contained in **Planning Advice Note 42: Archaeology – the Planning Process and Scheduled Monument Procedures (PAN 42)**, in which paragraph 20 refers to field evaluation of sites where important archaeological remains may exist taking place before any planning application is determined. This is of particular relevance to areas of unscheduled archaeology. Paragraph 32 indicates that potential conflicts should be resolved and agreements with developers concluded before planning permission is granted, and paragraphs 33-35 give advice on appropriate planning conditions.

1.21 **Scottish Historic Environment Policy 1: Scotland's Historic Environment (SHEP 1)** sets out Scottish Ministers' strategic policies for the historic environment. It recognises that the challenge for the sustainable management of the historic environment is to identify its key characteristics and establish the boundaries within which change can continue so that it enhances rather than diminishes historic character. The three key outcomes for Scotland's historic environment are to care for, protect and enhance it; to increase public appreciation and enjoyment of it; and to recognise and skilfully harness it as a key asset in Scotland's economic, social and cultural success.

1.22 **Scottish Historic Environment Policy 2: Scheduling: protecting Scotland's nationally important monuments (SHEP 2)** stresses that ancient monuments offer a tangible, physical link with the past and are a finite, non-renewable resource, valuable both

for their own sake and as a resource for research, education, regeneration, leisure and tourism. It is the intrinsic value to the nation's heritage that is the primary consideration in deciding whether or not to schedule a site.

Consultation responses

1.23 **Angus Council** had no objection in principle to the formation of an access onto Drumsturdy Road, subject to the appropriate standards.

1.24 **Broughty Ferry Community Council** objected to the proposal on the grounds that it was a bad neighbour development contrary to the local plan, as the farmland on which it is proposed to take place is not designated for development. The proposal would therefore set a precedent for further car-dependent urban sprawl around Broughty Ferry. It also considered that the case for the inclusion of a public house was not strong and felt that it would largely operate independently and at different times from the rest of the development.

1.25 **Historic Scotland** objected to the application. Its views are set out in the following chapter.

1.26 **Rathmell Archaeology Ltd (RAL)**, acting as archaeological advisers to the council, commented on the report prepared by AOC Archaeology Group. It considered the recommendations of the report to be broadly acceptable, although it pointed out that reliance on carrying out any field evaluation after outline planning permission was granted assumed that the planning authority had accepted the case for the development in principle. RAL agreed that the proposed buffer zones around the SAMs would guarantee the physical integrity of the monuments and ameliorate any amenity impact; and noted that the omission of a second chapel from the crematorium, proposed in the original submission, substantially reduced the impact on Cairn Greg. The cessation of ploughing at North Gates should provide a stable long-term environment for the survival of this monument. With regards to the potential extent of unscheduled archaeology, RAL advised that the determination of planning permission should be informed by intrusive evaluation of the archaeological potential of the site. Information from such an evaluation may support refusal of permission or it could provide evidence that mitigation through excavation and recording would be acceptable. It felt that the lack of pre-determination investigation works was a failing of the AOC report but, on balance, recommended approval of the planning application, subject to appropriate conditions.

1.27 **The Scottish Environment Protection Agency (SEPA)** advised that it would regulate the operation of the crematorium under the Pollution Prevention and Control Regulations. It originally objected to the development because there was insufficient information to adequately assess the risk of groundwater pollution. Following the carrying out of ground investigations on the site, including digging trial pits to a maximum depth of three metres, SEPA withdrew its objection, subject to internments being restricted to a maximum depth of two metres below ground level.

1.28 **Scottish Water** had no objections to the development.

Chapter 2 – Summary of the Cases

The case for Dundee City Council

2.1 In the structure plan the relevant policies are considered to be Transport Policy 4 (TP4) and Environmental Resources Policy 7 (ERP7). The council accepts that the site is not well served by public transport, but considers it difficult to envisage how a site for a cemetery and crematorium development could be in a very accessible location, given the amount of land required. Given the constraints, the site is considered to be as accessible as possible. The council believes that TP4 is best served by ensuring that the new access road is of a suitable standard for public transport and that appropriate facilities for buses are provided, although it recognises that the provision of a bus service will depend on the operators. Although the site is prime agricultural land, the development is of a type that cannot be accommodated other than on a greenfield site. Any alternative site in the eastern part of the city would suffer from a similar constraint, and the council considers that the proposed development forms an exception to ERP7. As the land is the lowest category of prime agricultural land, the proposed development would not have any significant impact on agricultural interests.

2.2 In the Dundee Local Plan Review 2005, the site is allocated as open countryside and the council accepts that the development conflicts with policy 74. However, it is considered to meet the criteria of policy 71 on future cemetery provision. In particular, the site is not allocated for development and the strategy in the structure and local plans supports development to the west of Dundee rather than at this location. The site is available for development within a reasonable timeframe. Public transport access can be provided to a satisfactory extent, and the land is not environmentally or aesthetically sensitive. The council submits that, on the basis of the archaeological assessment accompanying the application; the applicant's discussions with the council and its archaeological advisor; the omission of the proposed crematorium chapel nearest to Cairn Greg; and subject to suitable conditions, the development would enhance the setting of the SAM and would result in satisfactory provision for the protection of archaeology in terms of policies 64 and 65. In turn, this would address the concerns of Historic Scotland. There are no other local plan policies which the development would contravene.

2.3 Turning to other material considerations, there is a need for new cemetery provision in the eastern part of the city, which will inevitably have to be met on land in the open countryside, and thus contrary to policy 74; and where accessibility will not be ideal. The council has been searching for a site for some time and in 2005 the Directors of Leisure and Arts, and of Planning and Transportation investigated the potential of two sites: Middleton Woods, to the north of the city; and Balmossie to the east. The council's representatives at the hearing indicated that they understood that it had not been found possible to extend Eastern and Birkhill Cemeteries because there is no land available at the former, whilst at Birkhill there are water table problems and constraints imposed by its position on the local authority boundary. In addition, they understood that neither Middleton Woods nor Balmossie had been found suitable.

2.4 Given the urgent need for new cemetery provision; that the current proposal satisfies the requirements of policy 71; and that no suitable alternative site has been identified, the council concludes that there is a case for approving this application as an exception to policy 74. Although there is no specific reference to a crematorium in the local plan, it considers that it and the ancillary public house/restaurant represent appropriate additional development associated with the cemetery.

2.5 With regards to the concerns of the objectors about the access onto Drumsturdy Road, most traffic would come from the A92 to the south. The proposed access can be designed to provide acceptable visibility sightlines and Angus Council has raised no objections on traffic or road safety grounds. The restricted number of parking spaces accessed from this road is intended to limit the usage of this access.

2.6 The council does not believe that the development would lead to unacceptable noise and disturbance for nearby residents. Whilst the public house/restaurant would generate evening activity, it would be located at some distance from the nearest house. The council submits that the impact of the development on the natural environment would be minimal, given that the land is largely used for commercial agriculture. Concerns about its archaeological impact have been addressed, and the development could be designed to avoid drainage and flooding problems. The existing right of way can be retained by providing a footpath along or close to the new access from Linlathen Road.

The case for the applicant

2.7 The council's analysis of the relevant policy background is broadly accepted and it is acknowledged that the development would constitute a departure from local plan policy 74, relating to development in the countryside.

2.8 However, there is an overwhelming justification for approving this proposal. In particular, it is consistent with policy 71 on future cemetery provision. The council has been considering the provision of new cemetery facilities to the east of the city for some time, including consulting with landowners to establish their interest and willingness to sell land for this purpose. This is how the applicant learned of the possibility and it has since been engaged in formulating this planning application. This site meets each of the four criteria in policy 71: (a) the landowner is willing to discount the value of the site in favour of a much-needed community facility with a lower development value; (b) the land can be made available within a reasonable timeframe; (c) it can be provided with reasonable public transport access; and (d) the site is not subject to any special status on account of environmental or aesthetic sensitivity. All other candidate sites have been ruled out for a variety of reasons. It is self-evident that any alternative site would also be in open countryside and therefore contrary to policy 74.

2.9 The proposed crematorium is justified in the context of policy 71. A report prepared for the landowner [LD4] has been submitted which demonstrates its potential viability. The existing crematorium in Dundee suffers from a lack of car parking and discussions have been held with the owners, who have indicated an interest in the current site. In any event, it is considered that Dundee could support two crematoria.

2.10 The licensed public house/restaurant is not intended as a stand-alone proposal, but as complementary and ancillary to the primary generator of the business opportunity. Given the peripheral location of the site, its inclusion is regarded as sustainable in providing an appropriate mix of uses and minimising associated traffic movements. As such, it complies with planning policy. Although the public house/restaurant would also cater for other trade, it is considered that it could be viable based on funeral business alone. A letter from Graham + Sibbald, Chartered Surveyors, [LD6] suggests that the provision of refreshment facilities is a crucial ingredient of the overall development, and that there should be a ready demand for the restaurant/bar to cater for post-ceremony functions. It considers that there would be strong interest from potential operators of such a facility.

2.11 Historic Scotland's principal concern is considered to relate to any development directly on the scheduled area, and the revised layout addresses this. Consequently its concern with the setting of the SAM is of secondary importance, and the allegation that that there would be a significant and harmful erosion of the setting of Cairn Greg is a subjective specialist judgement, which takes no account of the proven need for the development and its inevitable physical components. Although NPPG 5 is a material consideration, it dates from 1994 and pre-dates both the structure and local plans. It is not area or site specific and can, thus, have little authority in this case. In any event, all reasonable efforts have been made to provide a detailed assessment of the archaeological impact of the development through specialist consultants.

2.12 There is no presumption in either NPPG 5 or development plan policy against planning permission for development which affects a SAM. Photomontages prepared for the applicant [LD5] amply demonstrate that satisfactory protection of Cairn Greg would be provided in accordance with local plan policies 64 and 65. It is under no direct threat and will remain in perpetuity. In this context, it is considered that Historic Scotland's position is totally inflexible and negative; and not in the spirit of official guidance on developments potentially affecting the setting of SAMs.

The case for Historic Scotland

2.13 There are two Scheduled Ancient Monuments in the application site:

- Cairn Greg in the south-east corner; a Bronze Age burial mound scheduled in 1969, and recognised as of national importance because of its potential to contribute to our understanding of prehistoric funerary and ritual practices. Its situation on the crest of a broad ridge is typical of such monuments, which were deliberately sited to be visible over a wide area. It is the only scheduled Bronze Age burial mound within the Dundee City Council area.

- North Gates souterrain in the western part of the site; an underground structure of late prehistoric date, represented by cropmarks, scheduled in 1996 because of its potential to contribute to our understanding of prehistoric settlement and economy. Five individual or groups of souterrains survive within the Dundee City Council area. North Gates is one of three scheduled as being of national importance.

2.14 The definition of a SAM in the Ancient Monuments and Archaeological Areas Act 1979 does not extend to its setting, but paragraph 17 of NPPG 5 indicates that SAMs are of national importance and developments which would have an adverse effect on them, or the integrity of their settings, should not be permitted unless there are exceptional circumstances. Paragraph 25 makes clear that the preservation of the setting of ancient monuments is a material consideration in determining planning applications. NPPG 5 does not, therefore, support the applicant's view that the setting of SAMs is of secondary importance; it is as significant a material consideration as the preservation of the site itself.

2.15 In terms of the criteria in local plan policy 71, Historic Scotland considers that the site is environmentally sensitive because of the potential presence of significant archaeological features outwith the boundary of the souterrain, and their destruction which use of the land as a burial ground would entail. Given the guidance on selecting a location for a new cemetery in this policy, it is surprised that no detailed options appraisal of potential sites has been carried out. The local plan does not indicate a requirement for additional crematorium or public house/restaurant facilities.

2.16 The proposed development would have a significant adverse impact on the setting of Cairn Greg, an impressive prehistoric burial mound set on the crest of a ridge with panoramic views to and from the monument in all directions, as the photographs and viewshed analysis [HS10] demonstrate. The hillside location and proximity of the development would be highly visually intrusive and the crematorium and public house buildings would dramatically alter the expansive landscape setting within which the monument can still be read. The new buildings would provide a visual barrier which would divorce the monument from its topographic setting and diminish its prominence as a landscape feature. In this context, mitigation though planting would be inappropriate.

2.17 Historic Scotland is content in principle with the cemetery. It is the buildings associated with the crematorium and public house/restaurant which are the primary concern. The specific distance limits suggested between the buildings and the monument would not protect its setting. The proximity, scale and topographic relationship of the buildings, hardstandings and landscaping to the monument are likely to represent an excessive visual intrusion into its setting, which can presently be appreciated from significant distances away. Computer visualisations [HS11] have been produced to illustrate the potential relationship.

2.18 It is considered that neither the applicant nor the council has demonstrated that this is the only location suitable for a cemetery, or that there is a requirement for a crematorium and public house/restaurant. Consequently, Historic Scotland is aware of no special circumstances which outweigh the major adverse impact on the setting of Cairn Greg.

Written representations

2.19 Nine letters of representation were received by the council at the time of the original application from the parties listed in Appendix 1, who are mainly local residents. Four of those parties submitted further letters after the application had been considered by the

Development Quality Committee and referred to Scottish Ministers. The principal issues of concerned raised in these letters are:

- The proposed development is contrary to the local plan, which makes no reference to a crematorium and licensed premises. There is no justification for the latter, in particular, as no other cemetery in Dundee has such an ancillary facility.
- The development is inappropriate within a small rural community and would transform it from a rural to an urban area, with associated noise and disturbance.
- Consequent impact on the amenity of local residents.
- Concerns about increased traffic on Drumsturdy Road because of the narrowness of the road, its lack of footways, and perceived traffic safety issues.
- Drainage and flooding concerns, and potential for water pollution.
- Archaeological impact.
- Impact on the natural environment of the area.
- Impact on the public right of way.

Chapter 3 – Findings of fact

3.1 I find the following facts, the test being the balance of probability.

3.2 I adopt as facts the description of the site and its surroundings, the proposal, the development plan and other policy considerations, and the consultation responses contained in Chapter 1.

The character of the site and potential visual impact of the development

3.3 The main part of the site is on the northern side of a low ridge with an east-west axis. Cairn Greg is situated on the highest part of the site, at its south-east corner.

3.4 There are extensive views outwards from Cairn Greg. To the north and north-west the land falls to Drumsturdy Road and beyond, before levelling out and rising again in the distance, giving extensive views over open farmland interspersed with scattered houses and farmsteadings. There is relatively limited tree cover in this area. Westwards the view is over the main part of Dundee, with two wind turbines prominent in the middle distance. To the south there is an extensive view over the nearby farmland towards Broughty Ferry and the Firth of Tay. Only to the east is the view restricted, as the land continues to rise in that direction and there are groups of mature trees.

3.5 Cairn Greg itself is prominent from a number of directions, including from the south-west, west, north-west and north. Its visibility is currently accentuated by the trees growing on it. These have been cut down in the past as part of management works for the SAM and it is possible that this could occur again the future, following which the mound would be a less prominent feature from a distance. In nearer views, however, especially from Drumsturdy Road, it would still tend to stand out because of the different vegetation covering from the surrounding agricultural land.

3.6 The site and its surroundings are currently part of a distinctly rural landscape. Southwards the Linlathen Nursing Home and new houses to the south of the Dighty Water are screened by trees, whilst to the west the nearest industrial development is at some considerable distance and also well screened. Part of the intervening land is allocated as the Linlathen Economic Development Site. This is undeveloped at present and remains in agricultural use, contributing to the rural landscape, but this will change once it is developed. 30 hectares of the 40 hectare site is identified in the local plan as a potential single user opportunity, and this is a factor which may have delayed its development.

3.7 Any development on the application site would be prominent from Drumsturdy Road and from the extensive low-lying area to the north, because of its north-facing slope. As the application is for outline permission, there are no details of the likely size and height of the proposed crematorium and public house/restaurant buildings. In the circumstances, not a great deal of reliance can be placed on either the applicant's photomontages or the visualisations prepared by Historic Scotland. However, any new buildings on the site would be likely to be prominent from the viewpoints referred to above.

3.8 As such, any new buildings would be likely to have a significant impact on the setting of Cairn Greg. This would be particularly the case if these buildings were to breach the skyline when seen from the north, when they would substantially alter the open setting of the SAM that exists at present.

3.9 Whilst the proposed cemetery is situated at some distance to the west of Cairn Greg, and would not involve any significant structures, the general infrastructure associated with the development – access roads and paths, extensive parking areas, associated lighting – would contribute to a marked change in the character of its setting. Although the submitted landscaping proposals are intended for illustrative purposes only, it is probable that there would be extensive planting within the site to provide the environment and ambience expected of a cemetery and Garden of Remembrance. It would take several years for this planting to mature, but the long-term result, even with the maintenance of buffer zones around the SAMs, is likely to be the creation of a more enclosed and, possibly, suburban landscape character, significantly different to its present openness.

3.10 From Cairn Greg itself, the new buildings would dominate the foreground in views to the north and north-west, even though they would be on lower ground. Again the associated development would substantially change the visual setting of the burial mound; in particular its current sense of exposure in the landscape.

3.11 In views from the south, south-west and west, the overall visual impact of the development on the setting of Cairn Greg would be less significant, provided that the new buildings were not visible from these directions above the crest of the ridge. The internal access road rising up along the southern boundary of the site, with the associated boundary treatment, landscaping and lighting, would, however, have some effect in bringing the ancillary features of the development closer to the SAM.

Accessibility of the site

3.12 The site is located on the north-east periphery of the Dundee City Council administrative area, at some distance from the nearest built-up areas of the city. Direct vehicular access from a public road is currently only available from Drumsturdy Road, part of the B961 secondary road, which runs from the B978 north-eastwards through rural Angus to eventually join the A933 south of Friockheim. There is an irregular and infrequent bus service along Drumsturdy Road.

3.13 Because of this location, the site does not have good accessibility, even by the private car, but more so by public transport. Nor is access convenient on foot or by bicycle.

3.14 To provide the main vehicular access to the site, 750 metres of new road is needed from the present end of Linlathen Road, which is itself of a similar length to its junction with Arbroath Road. Any bus route to the cemetery would therefore require a 3 km round trip from Arbroath Road. Whilst the new housing, nursing home and riding school might provide some other custom, it is very unlikely that a bus operator would find a route to the cemetery commercially attractive, especially in its early years. If further development takes place in the area that situation might change, but the surrounding land, with the exception

of the Linlathen Economic Development Site is not allocated for development in the local plan. The present development plan strategy supports development to the west of the city.

3.15 The site is not, therefore, accessible by public transport and, even if the access road is built to the required standard and bus turning and stopping facilities are provided at the entrance to the cemetery, there is no guarantee that the development would be served by public transport in the foreseeable future. Whilst most people attending funerals may travel by car, accessibility by bus might be more significant for people visiting graves or memorials on a regular basis.

3.16 Given the likely land requirement for a cemetery, it might be inevitable that it will need to be located on a greenfield site and this may, as the council has suggested, imply a location relatively remote from the built-up area of Dundee. However, there is no evidence that a comprehensive evaluation of possible sites has been undertaken in relation to their accessibility by means other than the private car.

3.17 An access to the public house and restaurant is proposed from Drumsturdy Road, which is unlit, has no footways and only relatively narrow grass verges on either side. Its use by pedestrians is unattractive and potentially hazardous, especially at night. Whilst the public house might gain a substantial amount of custom during the day from those attending funerals, in the evening it would need to rely on other trade. It is difficult to see that its evening custom would come other than by car and, taken on its own merits, this is not a sustainable location for such a facility in transport terms. No evidence has been submitted to demonstrate that a 25-space car park would be sufficient for the proposed public house/restaurant at times when the cemetery car park was not open.

Archaeological impact

3.18 The Bronze Age burial mound at Cairn Greg stands in an exposed position within an open rural landscape. This location is an inherent part of its character; such features were meant to be seen from and look over a wide area. Its scheduling reflects it national importance.

3.19 The potential impact of the crematorium and public house/restaurant building on its setting has been described in paragraphs 3.7-3.11 above. The proposed cemetery would have a lesser visual impact.

3.20 The cemetery is a use which would be compatible with the presence of the prehistoric burial mound on the site. By increasing public access to the site, this development might provide an opportunity to promote access to and interpretation of Cairn Greg. Any such side benefits of the development should not, however, be at the expense of the setting of the SAM.

3.21 The setting of the North Gates Souterrain is not a significant issue as it has no visible features on the site. Cessation of agricultural operations, including ploughing, would be likely to prevent further damage to whatever underground remains exist. It is probable that

the archaeological remains associated with Cairn Greg extend beyond its current boundaries and would, therefore, also benefit from the cessation of ploughing.

3.22 A proposed buffer zone around the souterrain would protect the SAM. Any work directly affecting either monument would require applications for scheduled monument consent under the Ancient Monuments and Archaeological Areas Act 1979 and could, thus, be controlled.

3.23 The AOL Archaeology Group report identified other potential archaeological features within the western part of the application site. There are also other remains in the locality; for example, in the vicinity of the roundabout on Linlathen Road. The density of prehistoric cropmarks in the area indicates that previously unknown remains of the same period may exist within the site. No field evaluation has been carried out to give an indication of the existence and extent of any such remains. PAN 42 suggests that such an evaluation should take place in areas where important archaeological remains may exist before a planning application is determined. The council's own archaeological adviser has identified this lack of pre-determination investigative work as a failing although not one, on balance, that he considers would warrant refusal of permission in this case.

3.24 He does recommend, however, that if outline planning permission is granted it should be subject to a suspensive condition requiring further intrusive archaeological investigation of the site before any development proceeds. Whilst ground breaking work for the proposed buildings would be a one-off operation, the use of a significant part of the site as a cemetery would involve ongoing excavations that could potentially disturb or damage unscheduled archaeological remains. Further investigation may reveal that there is little of note within the site beyond the area of the SAMs, but the situation is currently unknown.

3.25 Although not strictly an archaeological issue, there is a category C listed building at North Gates, close to the north-west corner of the site. Having regard to section 59(1) of the Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997, I find that this development would not have any effect on that listed building, its setting or its features.

Other environmental issues

3.26 Following ground investigation works to determine whether and at what depth groundwater is present beneath the site, SEPA withdrew its original objection to this development and now considers that sufficient information is available to indicate that the location is suitable in terms of soil condition and adequate groundwater protection, subject to the depth of internments being limited to two metres.

3.27 Emissions from the crematorium would be controlled by SEPA under the Pollution Prevention and Control Regulations.

3.28 Despite the concerns expressed by some local residents, there is no evidence to suggest that the development would have an adverse impact on the natural environment. The greater part of the site consists of arable farmland, which is likely to have limited ecological value.

3.29 The development would inevitably transform the present appearance of the site to a more suburban character, which some residents may consider to be a negative impact. It is probable, however, that the site would be heavily landscaped to create an attractive setting for the cemetery and crematorium. There is no reason to believe that the development would result in undue noise or disturbance to local residents. In this respect, the proposed public house/restaurant would be about 220 metres from the nearest house.

3.30 Although the present character of the public right of way would be changed, its continuity could be maintained along the new access road from Linlathen Road.

The need for the cemetery

3.31 There are five cemeteries in Dundee. Of these, Birkhill and Barnhill currently have spare capacity but there are no new lairs for sale at Balgay, Eastern and Western Cemeteries. Policy 71 in the local plan indicates that the council will investigate the feasibility of extending Eastern and Birkhill Cemeteries to provide additional capacity. From the limited evidence available (see paragraph 2.3) it appears that this is not feasible.

3.32 The City Engineer's Division carried out a feasibility study of two possible sites for future cemetery provisions: one at Balmossie Farm, further east along Arbroath Road; and the other at Middleton Woods to the north of the city. The resulting report listed the characteristics of each site and the issues to be considered but came to no conclusions. Again there is some evidence that neither site would be available or suitable. It appears that the search for sites for new cemetery provision by the council was subsequently overtaken by the submission of the present application.

3.33 There is an acknowledged need for additional burial land for Dundee, at least for the period beyond 2011. The present proposal is the only site currently under consideration by the council.

The case for the crematorium

3.34 The existing crematorium in Dundee is situated on Macalpine Road, on the northern side of the city. Built by the council in 1936, it is now privately owned. There is a substantial chapel on the site as well as more modern buildings and an attractively laid out and landscaped Garden of Remembrance. Part of the site contains mature woodland, in which the car parking is located. There appears to be relatively limited parking space and there is some evidence that congestion can occur at times.

3.35 A report prepared for the landowner of the present application site [LD4] analysed existing crematorium provision in Fife and Tayside. It indicates that the present Dundee facility has a capacity of 2000 cremations per annum and that 1577 cremations were carried out in 2004. Using population projections, the report suggests that the number of cremations at Dundee Crematorium might rise to 1845 in 2016, still within its nominal capacity. New regulations on air quality issued in 2005 require emissions from 50% of all cremations to be abated by 2012. This may involve the installation of filtration systems in existing facilities, but there is also an option of "burden-sharing", a form of emissions

trading. It is believed that the owners of the existing crematorium may have initially elected to burden-share, rather than install filtration equipment at this time.

3.36 The report estimates the initial gross annual cremation income for a new crematorium to be £800,000. Based on a cremation charge of £500, this figure requires 1600 cremations per annum, and implies that all cremations in Dundee would transfer to the new facility. Although discussions have been held with the owners of the existing crematorium, there is no firm evidence that they wish to transfer their operations to this site.

3.37 Were that to happen it is unclear what would become of the present crematorium site. Not only does it contain a very substantial building but it is presumed that the Garden of Remembrance is consecrated ground and would therefore require to remain undisturbed. Whilst the applicant has suggested that Dundee could support two crematoria, and it is recognised that there might be some parking difficulties associated with the existing facility, no overriding need for the provision of a new crematorium on this site in the countryside has been shown. Nor has it been demonstrated that there would be any overwhelming advantage to be gained from relocating the present facility.

The public house and restaurant

3.38 This is intended as a complementary facility to the cemetery and crematorium, providing refreshments for post-funeral functions. No other cemetery in Dundee has such a provision on site, but there may be facilities in their vicinity. There are three hotels close to the crematorium, for example, which cater for functions. It is suggested that the provision of a licensed facility makes sense because of the peripheral location of the site.

3.39 There is no evidence available as to the likely balance between funeral and non-funeral business, although it was suggested for the applicant that the enterprise could survive on the former alone, but not the latter. There is no suggestion, however, that the public house/restaurant would not trade as an independent establishment and, thus, be at least partly reliant on custom other than that from the adjoining cemetery and crematorium.

3.40 Whilst it might be a convenient facility, it has not been shown that the provision of a public house/restaurant is an essential feature to be provided with either a cemetery or crematorium.

The development plan

3.41 The application site is in a peripheral location and does not enjoy good accessibility, particularly for pedestrians, cyclists and public transport users. There is no guarantee that a bus service to the proposed development would be provided in the foreseeable future. There is, therefore, some conflict between this proposal and structure plan policy TP4.

3.42 The site comprises prime agricultural land, which has not been identified as essential for the implementation of the structure plan strategy, and the proposal is therefore contrary to structure plan policy ERP7. There is no evidence, however, that the loss of this land would have a harmful impact on agricultural interests.

3.43 The proposal conflicts with local plan policy 74 as it does not comply with its criteria for new development in the countryside. Although policy 71 refers to the need for future cemetery provision, it provides no support for the proposed crematorium and public house/restaurant. No overriding demonstration of need for these facilities has been advanced that would warrant an exception to policy 74.

3.44 Whilst policy 71 is specifically directed towards the council investigating the provision of burial land towards the east of the city, it does not preclude consideration of proposals put to the council by developers in terms of its four criteria. This site has been brought forward by the applicant at what is referred to as a discounted site value and thus complies with the first criterion. However, all the land covered by the countryside allocation in the local plan would not currently benefit from enhanced development value and other areas of land might, therefore, equally meet that criterion. Nonetheless, the existence of a willing landowner is a positive benefit of this site, particularly in respect of the second criterion; that the land is available within the necessary timeframe. On the other hand, availability of the site to provide additional burial land might be dependant on the implementation of the total development proposed, in order to provide the necessary financial return to the developer.

3.45 The site fails to meet the third criterion of policy 71 as it does not have reasonable public transport access. In terms of the final criterion, although the site might not have any specific aesthetic attributes in its own right, it is of some environmental sensitivity. It contains two SAMs and possible unscheduled archaeological remains. It also provides a significant part of the setting of the Cairn Greg burial mound. That setting would be substantially altered as a result of the development. The new buildings in particular would be likely to diminish the sense of exposure and openness which the SAM currently enjoys, and which is integral to its setting.

3.46 Overall, therefore, the site is not fully compliant with policy 71 even for future cemetery provision alone.

3.47 Although an outline application, with no details of the size, height and design of the buildings proposed, the development would be likely to have an adverse effect on the setting of Cairn Greg, contrary to local plan policy 64. The lack of field evaluation of potential archaeological remains within the site also runs counter to policy 65.

3.48 There are no other development plan policies that have a significant bearing on the determination of this application.

Chapter 4 – Reasoning and recommendation

Reasoning

4.1 Section 25 of the Town and Country Planning (Scotland) Act 1997 requires the determination of this application to be made in accordance with the provisions of the development plan unless material considerations indicate otherwise. The development plan comprises the Dundee and Angus Structure Plan 2001-2016 and the Dundee Local Plan Review 2005. Other material considerations in this case include NPPG 5, PAN 42, SHEP 1, SHEP 2, the need for additional burial land in Dundee and the representations from local residents.

4.2 Accordingly, on the basis of the evidence presented at the hearing, the written submissions and my inspection of the site and its surroundings, I consider the determining issues in this case are: (a) whether the proposal is consistent with the relevant provisions of the development plan; and (b) whether an exception to those provisions is warranted by other material considerations.

4.3 Overall, I consider that the proposal does not comply with the development plan, for the reasons set out in paragraphs 3.41-3.47 above. Policy 71 provides some support for the cemetery element of the proposal, but none for the crematorium and public house/restaurant. Taken overall, therefore, the proposed development is not consistent with this policy. No overriding justification has been provided for the location of these additional facilities in the countryside, contrary to local plan policy 74.

4.4 Turning to other material considerations, based on the information available with this application for outline planning permission, I cannot safely conclude that the development would have no adverse effect on the setting of the Cairn Greg burial mound, an ancient monument scheduled as being of national importance. On the contrary, I consider that it is probable that the proposed new buildings would adversely affect its setting by reducing its sense of exposure and openness, especially in views to and from the north. Consequently, I consider that the proposal would be contrary not only to the relevant development plan policies but also to national policy, as set out in NPPG 5. The lack of field evaluation of potential archaeological remains within the site is not consistent with advice in PAN 42. These material considerations reinforce the case for rejecting this proposal.

4.5 A countervailing consideration is the acknowledged need for additional burial land to meet the requirements of Dundee. The proposed cemetery is the least contentious element of the overall development, especially in respect of its impact on the setting of the burial mound, and can even be considered to be a compatible use with the SAM. However, it is being put forward as an integral part of what I am satisfied is a comprehensive development of the whole site, and cannot therefore be considered in isolation. Whilst such a comprehensive approach may be understandable from the applicant's point of view, as a commercial return will be sought from the development, there is no guarantee that the land would be available for the provision of a cemetery on its own. Moreover, a cemetery on this site would still require the construction of a 750 metre access road, the need for which highlights the peripheral location of the site and its poor accessibility.

4.6 I also have reservations about the lack of field evaluation of the potential for unscheduled archaeological remains within that part of the site allocated for the cemetery, given the inevitable destructive effect a burial ground would have. It may be that no difficulties would be revealed, but the lack of evaluation prior to the determination of the application in an area of known archaeological potential does not accord with good practice.

4.7 I am not persuaded that the council has undertaken a thorough search for and evaluation of potential cemetery sites, especially in respect of public transport accessibility, to be able to conclude that this is the only suitable location. In the circumstances, I do not consider that the need for additional burial land outweighs the conflict with the provisions of the development plan that I have identified, particularly with regards to the crematorium and public house/restaurant, which enjoy no support in that plan and are the elements of the overall development that would most adversely affect the setting of Cairn Greg.

4.8 Having considered all other material considerations, I conclude that there are none that warrant determining this application other than in accordance with the provisions of the development plan.

Conditions

4.9 The council has put forward a list of 16 conditions it would wish to see imposed if planning permission is granted. The applicant has raised no objections to these conditions. I am satisfied that, with some modification, they meet the tests set out in SODD Circular 4/1998: The Use of Conditions in Planning Permissions.

Recommendation

4.10 I therefore recommend that outline planning permission for a crematorium, cemetery and associated licensed public house/restaurant at land on Linlathen Estate, Linlathen Road, Dundee, as proposed in the planning application ref. 07/00160/OUT, be refused.

4.11 However, should my recommendation not be accepted and the Scottish Ministers be minded to grant outline planning permission, such permission should be subject to the conditions set out in Appendix 2.

MICHAEL D SHIEL
Reporter

August 2008

Appendix 1

Third parties who have submitted written representations

Mrs Dee Tippett, East Pitkerrie Farmhouse, Drumsturdy Road, Kingennie, Angus

Mrs Jean Smeaton, West Pitkerrie Cottage, Drumsturdy Road, Dundee DD5 3NX

Mrs Sharon Couttie, 37 Clattowoods Drive, Dundee DD3 9SF

Mr Ronald Gazzard, Northgate Cottage, Drumsturdy Road DD5 3NN

Councillor Mrs Helen Oswald, Angus Council Members' Services, The Cross, Forfar DD8 1BX

Mr Jack & Mrs Pat Cooper, 1 Northgate Cottage, Drumsturdy Road, Dundee DD5 3NN

Mrs Christine Fearn, 14 Baldovie Road, Dundee DD4 8UD

Dr D S Hewick, 17 Davidson Street, Broughty Ferry, Dundee DD5 3AT (for Broughty Ferry Community Council)

Mr & Mrs G Hall, The Willows, Drumsturdy Road, Kingennie DD5 3NY

Mrs Elaine Davidson, Mushroom Farm, East Pitkerro, Kingennie DD5 3NY

Appendix 2

Recommended conditions if planning permission is granted

1. The development to which this permission relates shall begin within five years of the date of permission or two years of the final approval of the reserved matters, as defined in condition 3 below, whichever is the later.
Reason: to comply with Section 59(2) of the Town and Country Planning (Scotland) Act 1997.

2. The application for approval of the reserved matters referred to in condition 1 above must be made within three years of the date of this permission.
Reason: to comply with Section 59(2) of the Town and Country Planning (Scotland) Act 1997.

3. The written approval of the planning authority shall be obtained to the following reserved matters before any development is commenced on the site:

   (a) the siting of all buildings;
   (b) the design and external appearance of all buildings, including details of the external materials to be used;
   (c) the location and design of the new road to the site from Linlathen Road and of all roads within the site, including details of the lighting to be provided; and
   (d) the landscaping of the access road and site, including details of the numbers, sizes, species, positions and planting densities of all trees and shrubs to be planted; details of all new fences, walls and other boundary treatments; and details of the layout and surfacing of all parking areas, footpaths and other hardstandings.

   Reason: the application is for outline planning permission only and approval of these reserved matters is necessary to ensure an appropriate standard of development for this location.

4. The details provided in terms of the siting of all buildings shall take into account the presence of two scheduled ancient monuments on the site; in particular no buildings shall be situated either in or within 155 metres of the 60 metres diameter development exclusion zone around Cairn Greg, and no buildings or other structures shall be sited within the 60 metres development exclusion zone around the North Gates Souterrain. No development shall take place until fencing has been erected around Cairn Greg and the North Gates Souterrain in a manner and position to be agreed with the planning authority and no works shall take place within the fenced area without the prior written approval of the planning authority.
Reason: to protect the scheduled ancient monuments from damage and to minimise the impact of the development on the setting of Cairn Greg burial mound.

5. No development shall take place within the site until the applicant has secured the implementation of a programme of archaeological work in accordance with a written scheme of investigation (including a timetable) which has been submitted by the

developer, agreed by the council's Archaeological Service and approved in writing by the planning authority.
Reason: the site is considered to be of considerable archaeological interest and it is important that the opportunity created by the development to expose the history of the land, thereby contributing to the better understanding of the development of the city, is not lost.

6. Proposals for the enhancement of the scheduled ancient monument known as Cairn Greg, including public access and interpretation facilities, shall be submitted to and approved in writing by the planning authority before any development is commenced, and shall thereafter be implemented in full accordance with such approved details.
Reason: in order to compensate for any loss of amenity through enhancing access to and interpretation of the scheduled ancient monument.

7. Details of the proposed new access onto Drumsturdy Road, with associated visibility sightlines, shall be submitted to and approved in writing by the planning authority in consultation with Angus Council before any development is commenced, and the development shall be carried out only in full accordance with such approved details.
Reason: in the interests of traffic and pedestrian safety.

8. The car park for the proposed public house/restaurant shall be limited to a maximum of 25 spaces and there shall be no direct vehicular access from the Drumsturdy Road access and public house/restaurant car park to the remainder of the cemetery and crematorium development.
Reason: in order to ensure that the use of the proposed new access to Drumsturdy Road is restricted to vehicular traffic visiting the public house/restaurant only and does not provide access to the cemetery and crematorium, in the interests of pedestrian and traffic safety.

9. Details of the provision of facilities for pedestrians and for public transport to serve the proposed development, in the form of bus turning facilities, bus stops with shelters and real time information adjacent to the main entrance to the site and bus stops on both sides of Drumsturdy Road with a footpath link to the site, shall be submitted to and approved in writing by the planning authority in consultation with Angus Council before any development is commenced; and the development shall be carried out only in full accordance with such approved details.
Reason: in order to facilitate access to the site by modes of transport other than the private car.

10. The development shall be drained in a sustainable manner and details of the proposals for the disposal of surface water runoff shall be submitted to and approved in writing by the planning authority before any development is commenced; and the development shall be carried out only in full accordance with such approved details.
Reason: in order that the development is drained in a sustainable manner.

11. All internments shall be restricted to a maximum depth of two metres below ground level.

Reason: to ensure that the development does not cause pollution of ground or surface water.

12. The proposed public house/restaurant shall not open for business prior to the opening of the cemetery for burials.
Reason: the justification for the proposed public house/restaurant is as an ancillary facility to the cemetery development and its provision unrelated to that development at this location would contravene Policy 74 of the adopted Dundee Local Plan Review 2005.

13. Details of existing trees on the site to be retained and the method of protecting these trees during construction work shall be submitted to and approved in writing by the planning authority before any development is commenced; and the development shall be carried out only in full accordance with such approved details. The trees to be protected shall not be cut down, grubbed out, topped, lopped, uprooted or root pruned without the prior written consent of the planning authority. Any trees or shrubs removed without such consent or dying, being severely damaged or diseased shall be replaced with trees and shrubs of such size and species as may be directed by the planning authority and to the standard approved by the said authority.
Reason: to protect those landscape features which are of significant amenity value to the area and which would help ensure a satisfactory standard of appearance of the development.

14. The approved landscaping scheme submitted in connection with condition 3 above shall be implemented in accordance with a timescale and maintained in accordance with a written specification which has been approved in writing by the planning authority before any development is commenced. The trees and shrubs planted in accordance with the approved scheme shall not be cut down, grubbed out, topped, lopped, uprooted or root pruned without the prior written consent of the planning authority. Any trees or shrubs removed without such consent or dying, being severely damaged or diseased within five years of planting shall be replaced with trees and shrubs of such size and species as may be directed by the planning authority and to the standard approved by the said authority.
Reason: in order to ensure that the landscaping of the site is carried out as early as is practicable and has an adequate opportunity to become successfully established.

15. The existing right of way between Arbroath Road and Drumsturdy Road shall be maintained at all times both during and after construction work. Details of proposals for the protection of this right of way shall be submitted to and approved in writing by the planning authority before any development is commenced; and the development shall be carried out only in full accordance with such approved details.
Reason: in order to protect the public right of way both during and after construction.

16. Details of the incorporation of public art into the proposed development shall be submitted to and approved in writing by the planning authority before any development is commenced; and the development shall be carried out only in full accordance with such approved details.

Reason: in order to make provision for public art in accordance with Policy 56 of the adopted Dundee Local Plan Review 2005.

Appendix 3

List of documents submitted for the hearing

For Dundee City Council

DC1 Extracts from the Dundee and Angus Structure Plan 2001-2016 and the Dundee Local Plan Review 2005
DC2 National Planning Policy Guideline 5: Archaeology and Planning
Scottish Planning Policy 17: Planning for Transport
Planning Advice Note 42: Archaeology – the Planning Process and Scheduled Monument Procedures
Planning Advice Note 75: Planning for Transport
DC3 Application submission documents
DC4 Letters of objection, consultation and application correspondence
DC5 Report to Development Quality Committee on 17 September 2007
DC6 Photographs of the site and surroundings
DC7 Schedule of conditions (amended on 15 May 2008)

For Linlathen Developments Ltd

LD1 Dundee City Council public access page on planning application 07/00160/OUT
LD2 Report to Development Quality Committee on 17 September 2007
LD3 Letter from Historic Scotland, dated 8 February 2008
LD4 Report for Hugh Niven/Linlathen Developments Ltd on Proposed New Crematorium for Dundee, September 2006
LD5 Photomontage from Cairn Greg looking north-west towards the proposed development (revised 1 May 2008)
LD6 Letter from Graham + Sibbald, dated 25 February 2008, regarding the public house/restaurant

For Historic Scotland

HS1 Ancient Monuments and Archaeological Areas Act 1979 (extracts)
HS2 National Planning Policy Guideline 5: Archaeology and Planning
HS3 Scottish Historic Environment Policy 1: Scotland's Historic Environment
HS4 Scottish Historic Environment Policy 2: Scheduling: protecting Scotland's nationally important monuments
HS5 Town and Country Planning (General Development Procedure) (Scotland) Order 1992, as amended by Section 5 of the Town and Country Planning (General Development Procedure) (Scotland) (Amendment No 2) Order 1994 (extracts)
HS6 Dundee and Angus Structure Plan 2001-2016 (extracts)
HS7 Dundee Local Plan Review 2005 (extracts)
HS8 Scheduling Documents: SAM No 2889 Cairn Greg; and SAM No 6527, North Gates souterrain
HS9 Correspondence between Historic Scotland, Dundee City Council and KDM Architects

HS10 Photographs of the site and surrounding landscape and viewshed analysis of visibility to and from Cairn Greg

HS11 Visualisations of the development from key viewpoints (revised 12 May 2008)

Scottish Planning Policy

The Scottish Government
Riaghaltas na h-Alba

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Contents

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The Scottish Government series of Planning and Architecture documents are material considerations in the planning system.

Planning and Architecture Policy

Circulars	Scottish Planning Policy	National Planning Framework	Creating Places	Designing Streets
SG policy on implementing legislation	SG policy on nationally important land use planning matters	SG strategy for Scotland's long-term spatial development	SG policy statement on architecture and place	SG policy and technical guidance on street design

Planning and Design Advice and Guidance

Planning Advice	Design Advice	Web Advice
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Further information is available at: www.scotland.gov.uk/planning

This SPP replaces SPP (2010) and Designing Places (2001)

statutory

non-statutory

Scottish Planning Policy (SPP)

Purpose

i. The purpose of the SPP is to set out national planning policies which reflect Scottish Ministers' priorities for operation of the planning system and for the development[1] and use of land. The SPP promotes consistency in the application of policy across Scotland whilst allowing sufficient flexibility to reflect local circumstances. It directly relates to:

- the preparation of development plans;
- the design of development, from initial concept through to delivery; and
- the determination of planning applications and appeals.

Status

ii. The SPP is a statement of Scottish Government policy on how nationally important land use planning matters should be addressed across the country. It is non-statutory. However, Section 3D of the Town and Country Planning (Scotland) 1997 Act requires that functions relating to the preparation of the National Planning Framework by Scottish Ministers and development plans by planning authorities must be exercised with the objective of contributing to sustainable development. Under the Act, Scottish Ministers are able to issue guidance on this requirement to which planning authorities must have regard. The Principal Policy on Sustainability is guidance under section 3E of the Act.

iii. The 1997 Act requires planning applications to be determined in accordance with the development plan unless material considerations indicate otherwise. As a statement of Ministers' priorities the content of the SPP is a material consideration that carries significant weight, though it is for the decision-maker to determine the appropriate weight in each case. Where development plans and proposals accord with this SPP, their progress through the planning system should be smoother.

1 The Planning (Scotland) Act 2006 extends the definition of development to include marine fish farms out to 12 nautical miles.

iv. The SPP sits alongside the following Scottish Government planning policy documents:

- the National Planning Framework (NPF)[2], which provides a statutory framework for Scotland's long-term spatial development. The NPF sets out the Scottish Government's spatial development priorities for the next 20 to 30 years. The SPP sets out policy that will help to deliver the objectives of the NPF;
- Creating Places[3], the policy statement on architecture and place, which contains policies and guidance on the importance of architecture and design;
- Designing Streets[4], which is a policy statement putting street design at the centre of placemaking. It contains policies and guidance on the design of new or existing streets and their construction, adoption and maintenance; and
- Circulars[5], which contain policy on the implementation of legislation or procedures.

v. The SPP should be read and applied as a whole. Where 'must' is used it reflects a legislative requirement to take action. Where 'should' is used it reflects Scottish Ministers' expectations of an efficient and effective planning system. The Principal Policies on Sustainability and Placemaking are overarching and should be applied to all development. The key documents referred to provide contextual background or more detailed advice and guidance. Unless otherwise stated, reference to Strategic Development Plans (SDP) covers Local Development Plans outwith SDP areas. The SPP does not restate policy and guidance set out elsewhere. A glossary of terms is included at the end of this document.

2 www.scotland.gov.uk/Topics/Built-Environment/planning/National-Planning-Framework

3 www.scotland.gov.uk/Publications/2013/06/9811/0

4 www.scotland.gov.uk/Publications/2010/03/22120652/0

5 www.scotland.gov.uk/Topics/Built-Environment/planning/publications/circulars

Introduction

The Planning System

1. The planning system has a vital role to play in delivering high-quality places for Scotland. Scottish Planning Policy (SPP) focuses plan making, planning decisions and development design on the Scottish Government's Purpose of creating a more successful country, with opportunities for all of Scotland to flourish, through increasing sustainable economic growth.

2. Planning should take a positive approach to enabling high-quality development and making efficient use of land to deliver long-term benefits for the public while protecting and enhancing natural and cultural resources.

3. Further information and guidance on planning in Scotland is available at www.scotland.gov.uk/planning[6]. An explanation of the planning system can be found in A Guide to the Planning System in Scotland[7].

Core Values of the Planning Service

4. Scottish Ministers expect the planning service to perform to a high standard and to pursue continuous improvement. The service should:

- focus on outcomes, maximising benefits and balancing competing interests;
- play a key role in facilitating sustainable economic growth, particularly the creation of new jobs and the strengthening of economic capacity and resilience within communities;
- be plan-led, with plans being up-to-date and relevant;
- make decisions in a timely, transparent and fair way to provide a supportive business environment and engender public confidence in the system;
- be inclusive, engaging all interests as early and effectively as possible;
- be proportionate, only imposing conditions and obligations where necessary; and
- uphold the law and enforce the terms of decisions made.

People Make the System Work

5. The primary responsibility for the operation of the planning system lies with strategic development planning authorities, and local and national park authorities. However, all those involved with the system have a responsibility to engage and work together constructively and proportionately to achieve quality places for Scotland. This includes the Scottish Government and its agencies, public bodies, statutory consultees, elected members, communities, the general public, developers, applicants, agents, interest groups and representative organisations.

6 www.scotland.gov.uk/Topics/built-environment/planning

7 www.scotland.gov.uk/Publications/2009/08/11133705/0

6. Throughout the planning system, opportunities are available for everyone to engage in the development decisions which affect them. Such engagement between stakeholders should be early, meaningful and proportionate. Innovative approaches, tailored to the unique circumstances are encouraged, for example charrettes or mediation initiatives. Support or concern expressed on matters material to planning should be given careful consideration in developing plans and proposals and in determining planning applications. Effective engagement can lead to better plans, better decisions and more satisfactory outcomes and can help to avoid delays in the planning process.

7. Planning authorities and developers should ensure that appropriate and proportionate steps are taken to engage with communities during the preparation of development plans, when development proposals are being formed and when applications for planning permission are made. Individuals and community groups should ensure that they focus on planning issues and use available opportunities for engaging constructively with developers and planning authorities.

8. Further information can be found in the following:

- Town and Country Planning (Scotland) Act 1997[8] as amended, plus associated legislation: sets out minimum requirements for consultation and engagement
- Circular 6/2013: Development Planning[9]
- Circular 3/2013: Development Management Procedures[10]
- The Standards Commission for Scotland: Guidance on the Councillors' Code of Conduct[11]
- Planning Advice Note 3/2010: Community Engagement[12]
- A Guide to the Use of Mediation in the Planning System in Scotland (2009)[13]

Outcomes: How Planning Makes a Difference

9. The Scottish Government's Purpose of creating a more successful country, with opportunities for all of Scotland to flourish, through increasing sustainable economic growth is set out in the Government Economic Strategy. The aim is to ensure that the entire public sector is fully aligned to deliver the Purpose. The relationship of planning to the Purpose is shown on page 8.

10. The Scottish Government's 16 national outcomes[14] articulate in more detail how the Purpose is to be achieved. Planning is broad in scope and cross cutting in nature and therefore contributes to the achievement of all of the national outcomes. The pursuit of these outcomes provides the impetus for other national plans, policies and strategies and many of the principles and policies set out in them are reflected in both the SPP and NPF3.

8 www.legislation.gov.uk/ukpga/1997/8/contents
9 www.scotland.gov.uk/Publications/2013/12/9924/0
10 www.scotland.gov.uk/Publications/2013/12/9882/0
11 www.standardscommissionscotland.org.uk/webfm_send/279
12 www.scotland.gov.uk/Publications/2010/08/30094454/0
13 www.scotland.gov.uk/Publications/2009/03/10154116/0
14 www.scotland.gov.uk/About/Performance/scotPerforms/outcome

11. NPF3 and this SPP share a single vision for the planning system in Scotland:

> We live in a Scotland with a growing, low-carbon economy with progressively narrowing disparities in well-being and opportunity. It is growth that can be achieved whilst reducing emissions and which respects the quality of environment, place and life which makes our country so special. It is growth which increases solidarity – reducing inequalities between our regions. We live in sustainable, well-designed places and homes which meet our needs. We enjoy excellent transport and digital connections, internally and with the rest of the world.

12. At the strategic and local level, planning can make a very important contribution to the delivery of Single Outcome Agreements[15], through their shared focus on 'place'. Effective integration between land use planning and community planning is crucial and development plans should reflect close working with Community Planning Partnerships[16].

13. The following four planning outcomes explain how planning should support the vision. The outcomes are consistent across the NPF and SPP and focus on creating a successful sustainable place, a low carbon place, a natural, resilient place and a more connected place. For planning to make a positive difference, development plans and new development need to contribute to achieving these outcomes.

Outcome 1: A successful, sustainable place – supporting sustainable economic growth and regeneration, and the creation of well-designed, sustainable places.

14. NPF3 aims to strengthen the role of our city regions and towns, create more vibrant rural places, and realise the opportunities for sustainable growth and innovation in our coastal and island areas.

15. The SPP sets out how this should be delivered on the ground. By locating the right development in the right place, planning can provide opportunities for people to make sustainable choices and improve their quality of life. Well-planned places promote well-being, a sense of identity and pride, and greater opportunities for social interaction. Planning therefore has an important role in promoting strong, resilient and inclusive communities. Delivering high-quality buildings, infrastructure and spaces in the right locations helps provide choice over where to live and style of home, choice as to how to access amenities and services and choice to live more active, engaged, independent and healthy lifestyles.

16. Good planning creates opportunities for people to contribute to a growing, adaptable and productive economy. By allocating sites and creating places that are attractive to growing economic sectors, and enabling the delivery of necessary infrastructure, planning can help provide the confidence required to secure private sector investment, thus supporting innovation, creating employment and benefiting related businesses.

Outcome 2: A low carbon place – reducing our carbon emissions and adapting to climate change.

15 www.scotland.gov.uk/Topics/Government/PublicServiceReform/CP/SOA2012

16 www.scotland.gov.uk/Topics/Government/PublicServiceReform/CP

17. NPF3 will facilitate the transition to a low carbon economy, particularly by supporting diversification of the energy sector. The spatial strategy as a whole aims to reduce greenhouse gas emissions and facilitate adaptation to climate change.

18. The Climate Change (Scotland) Act 2009 sets a target of reducing greenhouse gas emissions by at least 80% by 2050, with an interim target of reducing emissions by at least 42% by 2020. Annual greenhouse gas emission targets are set in secondary legislation. Section 44 of the Act places a duty on every public body to act:

- in the way best calculated to contribute to the delivery of emissions targets in the Act;
- in the way best calculated to help deliver the Scottish Government's climate change adaptation programme; and
- in a way that it considers is most sustainable.

19. The SPP sets out how this should be delivered on the ground. By seizing opportunities to encourage mitigation and adaptation measures, planning can support the transformational change required to meet emission reduction targets and influence climate change. Planning can also influence people's choices to reduce the environmental impacts of consumption and production, particularly through energy efficiency and the reduction of waste.

Outcome 3: A natural, resilient place – helping to protect and enhance our natural and cultural assets, and facilitating their sustainable use.

20. NPF3 emphasises the importance of our environment as part of our cultural identity, an essential contributor to well-being and an economic opportunity. Our spatial strategy aims to build resilience and promotes protection and sustainable use of our world-class environmental assets.

21. The SPP sets out how this should be delivered on the ground. By protecting and making efficient use of Scotland's existing resources and environmental assets, planning can help us to live within our environmental limits and to pass on healthy ecosystems to future generations. Planning can help to manage and improve the condition of our assets, supporting communities in realising their aspirations for their environment and facilitating their access to enjoyment of it. By enhancing our surroundings, planning can help make Scotland a uniquely attractive place to work, visit and invest and therefore support the generation of jobs, income and wider economic benefits.

Outcome 4: A more connected place – supporting better transport and digital connectivity.

22. NPF3 reflects our continuing investment in infrastructure, to strengthen transport links within Scotland and to the rest of the world. Improved digital connections will also play a key role in helping to deliver our spatial strategy for sustainable growth.

23. The SPP sets out how this should be delivered on the ground. By aligning development more closely with transport and digital infrastructure, planning can improve sustainability and connectivity. Improved connections facilitate accessibility within and between places – within Scotland and beyond – and support economic growth and an inclusive society.

SG Purpose	To focus government and public services on creating a more successful country, with opportunities for all to flourish, through increasing sustainable economic growth.										
SG National Outcomes	The planning system and service contribute to all 16 National Outcomes										
SG National Plans, Policies & Strategies	**Government Economic Strategy**										
	Infrastructure Investment Plan										
	Scotland's Digital Future	Electricity & Heat Generation Policy Statements	2020 Challenge for Scotland's Biodiversity	Scottish Historic Environment Strategy and Policy	Housing Strategy	National Planning Framework & Scottish Planning Policy	Land Use Strategy	Low Carbon Scotland: Report of Proposals and Policies	National Marine Plan	Regeneration Strategy	National Transport Strategy
Planning Vision	We live in a Scotland with a growing, low carbon economy with progressively narrowing disparities in well-being and opportunity. It is growth that can be achieved whilst reducing emissions and which respects the quality of environment, place and life which makes our country so special. It is growth which increases solidarity – reducing inequalities between our regions. We live in sustainable, well-designed places and homes which meet our needs. We enjoy excellent transport and digital connections, internally and with the rest of the world.										
Planning Outcomes	Planning makes Scotland **a successful, sustainable place** – supporting sustainable economic growth and regeneration, and the creation of well-designed places.			Planning makes Scotland **a low carbon place** – reducing our carbon emissions and adapting to climate change.			Planning makes Scotland **a natural, resilient place** – helping to protect and enhance our natural and cultural assets, and facilitating their sustainable use.		Planning makes Scotland **a connected place** – supporting better transport and digital connectivity.		
National Planning	**Scottish Planning Policy (SPP)**						**National Planning Framework (NPF)**				
	Principal Policies										
	Sustainability			Placemaking							
	Subject Policies										
	Town Centres	Heat and Electricity		Natural Environment	Travel			*Cities and Towns*			
	Rural Development			Green Infrastructure				*Rural Areas*			
	Homes							*Coast and Islands*			
	Business & Employment	Zero Waste		Aquacultural	Digital Connectivity			*National Developments*			
				Minerals							
	Historic Environment			Flooding & Drainage							
	COMMUNITY PLANNING										
Strategic	Strategic Development Plans										
Local	Local Development Plans										
Site	Master Plans										

Principal Policies

Sustainability

NPF and wider policy context

24. The Scottish Government's central purpose is to focus government and public services on creating a more successful country, with opportunities for all of Scotland to flourish, through increasing sustainable economic growth.

25. The Scottish Government's commitment to the concept of sustainable development is reflected in its Purpose. It is also reflected in the continued support for the five guiding principles set out in the UK's shared framework for sustainable development. Achieving a sustainable economy, promoting good governance and using sound science responsibly are essential to the creation and maintenance of a strong, healthy and just society capable of living within environmental limits.

26. The NPF is the spatial expression of the Government Economic Strategy (2011) and sustainable economic growth forms the foundations of its strategy. The NPF sits at the top of the development plan hierarchy and must be taken into account in the preparation of strategic and local development plans.

27. The Government Economic Strategy indicates that sustainable economic growth is the key to unlocking Scotland's potential and outlines the multiple benefits of delivering the Government's purpose, including creating a supportive business environment, achieving a low carbon economy, tackling health and social problems, maintaining a high-quality environment and passing on a sustainable legacy for future generations.

Policy Principles

This SPP introduces a presumption in favour of development that contributes to sustainable development.

28. The planning system should support economically, environmentally and socially sustainable places by enabling development that balances the costs and benefits of a proposal over the longer term. The aim is to achieve the right development in the right place; it is not to allow development at any cost.

29. This means that policies and decisions should be guided by the following principles:

- giving due weight to net economic benefit;
- responding to economic issues, challenges and opportunities, as outlined in local economic strategies;
- supporting good design and the six qualities of successful places;
- making efficient use of existing capacities of land, buildings and infrastructure including supporting town centre and regeneration priorities;
- supporting delivery of accessible housing, business, retailing and leisure development;

- supporting delivery of infrastructure, for example transport, education, energy, digital and water;
- supporting climate change mitigation and adaptation including taking account of flood risk;
- improving health and well-being by offering opportunities for social interaction and physical activity, including sport and recreation;
- having regard to the principles for sustainable land use set out in the Land Use Strategy;
- protecting, enhancing and promoting access to cultural heritage, including the historic environment;
- protecting, enhancing and promoting access to natural heritage, including green infrastructure, landscape and the wider environment;
- reducing waste, facilitating its management and promoting resource recovery; and
- avoiding over-development, protecting the amenity of new and existing development and considering the implications of development for water, air and soil quality.

Key Documents

- National Planning Framework[17]
- Government Economic Strategy[18]
- Planning Reform: Next Steps[19]
- Getting the Best from Our Land – A Land Use Strategy for Scotland[20]
- UK's Shared Framework for Sustainable Development[21]

Delivery

Development Planning

30. Development plans should:

- be consistent with the policies set out in this SPP, including the presumption in favour of development that contributes to sustainable development;
- positively seek opportunities to meet the development needs of the plan area in a way which is flexible enough to adapt to changing circumstances over time;
- support existing business sectors, taking account of whether they are expanding or contracting and, where possible, identify and plan for new or emerging sectors likely to locate in their area;
- be up-to-date, place-based and enabling with a spatial strategy that is implemented through policies and proposals; and
- set out a spatial strategy which is both sustainable and deliverable, providing confidence to stakeholders that the outcomes can be achieved.

17 www.scotland.gov.uk/Topics/Built-Environment/planning/National-Planning-Framework
18 www.scotland.gov.uk/Publications/2011/09/13091128/0
19 www.scotland.gov.uk/Publications/2012/03/3467
20 www.scotland.gov.uk/Publications/2011/03/17091927/0
21 http://archive.defra.gov.uk/sustainable/government/documents/SDFramework.pdf

31. Action programmes should be actively used to drive delivery of planned developments: to align stakeholders, phasing, financing and infrastructure investment over the long term.

Development Management

32. The presumption in favour of sustainable development does not change the statutory status of the development plan as the starting point for decision-making. Proposals that accord with up-to-date plans should be considered acceptable in principle and consideration should focus on the detailed matters arising. For proposals that do not accord with up-to-date development plans, the primacy of the plan is maintained and this SPP and the presumption in favour of development that contributes to sustainable development will be material considerations.

33. Where relevant policies in a development plan are out-of-date[22] or the plan does not contain policies relevant to the proposal, then the presumption in favour of development that contributes to sustainable development will be a significant material consideration. Decision-makers should also take into account any adverse impacts which would significantly and demonstrably outweigh the benefits when assessed against the wider policies in this SPP. The same principle should be applied where a development plan is more than five years old.

34. Where a plan is under review, it may be appropriate in some circumstances to consider whether granting planning permission would prejudice the emerging plan. Such circumstances are only likely to apply where the development proposed is so substantial, or its cumulative effect would be so significant, that to grant permission would undermine the plan-making process by predetermining decisions about the scale, location or phasing of new developments that are central to the emerging plan. Prematurity will be more relevant as a consideration the closer the plan is to adoption or approval.

35. To support the efficient and transparent handling of planning applications by planning authorities and consultees, applicants should provide good quality and timely supporting information that describes the economic, environmental and social implications of the proposal. In the spirit of planning reform, this should be proportionate to the scale of the application and planning authorities should avoid asking for additional impact appraisals, unless necessary to enable a decision to be made. Clarity on the information needed and the timetable for determining proposals can be assisted by good communication and project management, for example, use of processing agreements setting out the information required and covering the whole process including planning obligations.

22 Development plans or their policies should not be considered out-of-date solely on the grounds that they were adopted prior to the publication of this SPP. However, the policies in the SPP will be a material consideration which should be taken into account when determining applications.

Placemaking

NPF and wider policy context

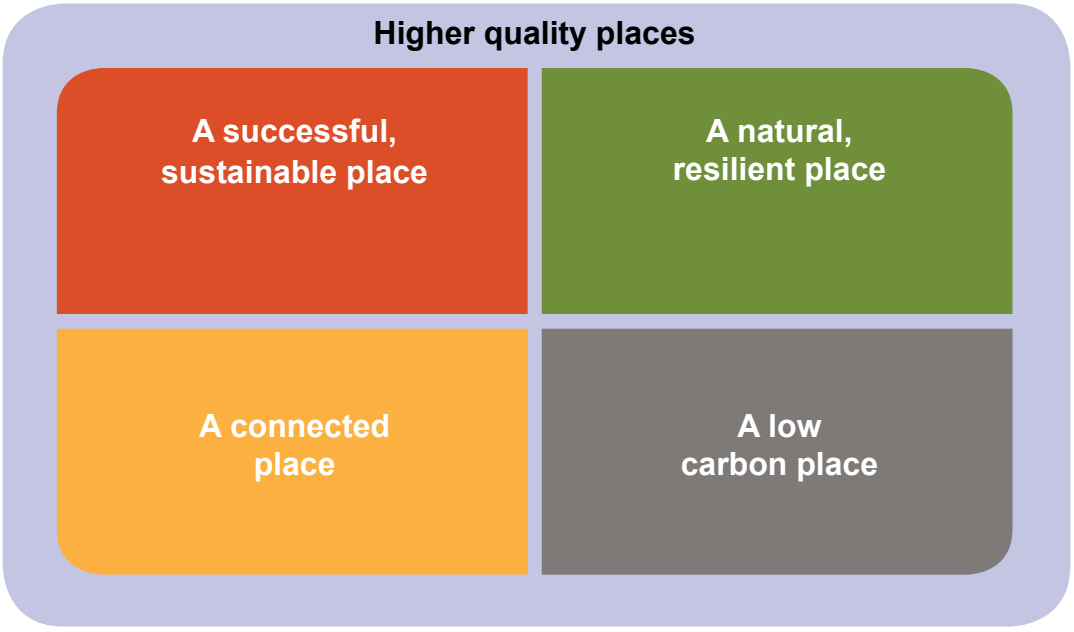
36. Planning's purpose is to create better places. Placemaking is a creative, collaborative process that includes design, development, renewal or regeneration of our urban or rural built environments. The outcome should be sustainable, well-designed places and homes which meet people's needs. The Government Economic Strategy supports an approach to place that recognises the unique contribution that every part of Scotland can make to achieving our shared outcomes. This means harnessing the distinct characteristics and strengths of each place to improve the overall quality of life for people. Reflecting this, NPF3 sets out an agenda for placemaking in our city regions, towns, rural areas, coast and islands.

37. The Government's policy statement on architecture and place for Scotland, Creating Places, emphasises that quality places are successful places. It sets out the value that high-quality design can deliver for Scotland's communities and the important role that good buildings and places play in promoting healthy, sustainable lifestyles; supporting the prevention agenda and efficiency in public services; promoting Scotland's distinctive identity all over the world; attracting visitors, talent and investment; delivering our environmental ambitions; and providing a sense of belonging, a sense of identity and a sense of community. It is clear that places which have enduring appeal and functionality are more likely to be valued by people and therefore retained for generations to come.

Policy Principles

Planning should take every opportunity to create high quality places by taking a design-led approach.

38. This means taking a holistic approach that responds to and enhances the existing place while balancing the costs and benefits of potential opportunities over the long term. This means considering the relationships between:



39. The design-led approach should be applied at all levels – at the national level in the NPF, at the regional level in strategic development plans, at the local level in local development plans and at site and individual building level within master plans that respond to how people use public spaces.

Planning should direct the right development to the right place.

40. This requires spatial strategies within development plans to promote a sustainable pattern of development appropriate to the area. To do this decisions should be guided by the following policy principles:

- optimising the use of existing resource capacities, particularly by co-ordinating housing and business development with infrastructure investment including transport, education facilities, water and drainage, energy, heat networks and digital infrastructure;
- using land within or adjacent to settlements for a mix of uses. This will also support the creation of more compact, higher density, accessible and more vibrant cores;
- considering the re-use or re-development of brownfield land before new development takes place on greenfield sites;
- considering whether the permanent, temporary or advanced greening of all or some of a site could make a valuable contribution to green and open space networks, particularly where it is unlikely to be developed for some time, or is unsuitable for development due to its location or viability issues; and
- locating development where investment in growth or improvement would have most benefit for the amenity of local people and the vitality of the local economy.

Planning should support development that is designed to a high-quality, which demonstrates the six qualities of successful place.

- ***Distinctive***

41. This is development that complements local features, for example landscapes, topography, ecology, skylines, spaces and scales, street and building forms, and materials to create places with a sense of identity.

- ***Safe and Pleasant***

42. This is development that is attractive to use because it provides a sense of security through encouraging activity. It does this by giving consideration to crime rates and providing a clear distinction between private and public space, by having doors that face onto the street creating active frontages, and by having windows that overlook well-lit streets, paths and open spaces to create natural surveillance. A pleasant, positive sense of place can be achieved by promoting visual quality, encouraging social and economic interaction and activity, and by considering the place before vehicle movement.

- ***Welcoming***

43. This is development that helps people to find their way around. This can be by providing or accentuating landmarks to create or improve views, it can be locating a distinctive work of art to mark places such as gateways, and it can include appropriate signage and distinctive lighting to improve safety and show off attractive buildings.

- ***Adaptable***

44. This is development that can accommodate future changes of use because there is a mix of building densities, tenures and typologies where diverse but compatible uses can be integrated. It takes into account how people use places differently, for example depending on age, gender and degree of personal mobility and providing versatile greenspace.

- ***Resource Efficient***

45. This is development that re-uses or shares existing resources, maximises efficiency of the use of resources through natural or technological means and prevents future resource depletion, for example by mitigating and adapting to climate change. This can mean denser development that shares infrastructure and amenity with adjacent sites. It could include siting development to take shelter from the prevailing wind; or orientating it to maximise solar gain. It could also include ensuring development can withstand more extreme weather, including prolonged wet or dry periods, by working with natural environmental processes such as using landscaping and natural shading to cool spaces in built areas during hotter periods and using sustainable drainage systems to conserve and enhance natural features whilst reducing the risk of flooding. It can include using durable materials for building and landscaping as well as low carbon technologies that manage heat and waste efficiently.

- ***Easy to Move Around and Beyond***

46. This is development that considers place and the needs of people before the movement of motor vehicles. It could include using higher densities and a mix of uses that enhance accessibility by reducing reliance on private cars and prioritising sustainable and active travel choices, such as walking, cycling and public transport. It would include paths and routes which connect places directly and which are well-connected with the wider environment beyond the site boundary. This may include providing facilities that link different means of travel.

Key Documents

- National Planning Framework[23]
- Getting the Best from Our Land – A Land Use Strategy for Scotland[24]
- Creating Places –A Policy Statement on Architecture and Place for Scotland[25]
- Designing Streets[26]
- Planning Advice Note 77: Designing Safer Places[27]
- Green Infrastructure: Design and Placemaking[28]

23 www.scotland.gov.uk/Topics/Built-Environment/planning/National-Planning-Framework
24 www.scotland.gov.uk/Publications/2011/03/17091927/0
25 www.scotland.gov.uk/Publications/2013/06/9811/0
26 www.scotland.gov.uk/Publications/2010/03/22120652/0
27 www.scotland.gov.uk/Publications/2006/03/08094923/0
28 www.scotland.gov.uk/Publications/2011/11/04140525/0

Delivery

47. Planning should adopt a consistent and relevant approach to the assessment of design and place quality such as that set out in the forthcoming Scottish Government Place Standard.

Development Planning

48. Strategic and local development plans should be based on spatial strategies that are deliverable, taking into account the scale and type of development pressure and the need for growth and regeneration. An urban capacity study, which assesses the scope for development within settlement boundaries, may usefully inform the spatial strategy, and local authorities should make use of land assembly, including the use of compulsory purchase powers[29] where appropriate. Early discussion should take place between local authorities, developers and relevant agencies to ensure that investment in necessary new infrastructure is addressed in a timely manner.

49. For most settlements, a green belt is not necessary as other policies can provide an appropriate basis for directing development to the right locations. However, where the planning authority considers it appropriate, the development plan may designate a green belt around a city or town to support the spatial strategy by:

- directing development to the most appropriate locations and supporting regeneration;
- protecting and enhancing the character, landscape setting and identity of the settlement; and
- protecting and providing access to open space.

50. In developing the spatial strategy, planning authorities should identify the most sustainable locations for longer-term development and, where necessary, review the boundaries of any green belt.

51. The spatial form of the green belt should be appropriate to the location. It may encircle a settlement or take the shape of a buffer, corridor, strip or wedge. Local development plans should show the detailed boundary of any green belt, giving consideration to:

- excluding existing settlements and major educational and research uses, major businesses and industrial operations, airports and Ministry of Defence establishments;
- the need for development in smaller settlements within the green belt, where appropriate leaving room for expansion;
- redirecting development pressure to more suitable locations; and
- establishing clearly identifiable visual boundary markers based on landscape features such as rivers, tree belts, railways or main roads[30]. Hedges and field enclosures will rarely provide a sufficiently robust boundary.

52. Local development plans should describe the types and scales of development which would be appropriate within a green belt. These may include:

- development associated with agriculture, including the reuse of historic agricultural buildings;
- development associated with woodland and forestry, including community woodlands;
- horticulture, including market gardening and directly connected retailing;

29 www.scotland.gov.uk/Topics/archive/National-Planning-Policy/themes/ComPur

30 Note: where a main road forms a green belt boundary, any proposed new accesses would still require to meet the usual criteria.

- recreational uses that are compatible with an agricultural or natural setting;
- essential infrastructure such as digital communications infrastructure and electricity grid connections;
- development meeting a national requirement or established need, if no other suitable site is available; and
- intensification of established uses subject to the new development being of a suitable scale and form.

53. The creation of a new settlement may occasionally be a necessary part of a spatial strategy, where it is justified either by the scale and nature of the housing land requirement and the existence of major constraints to the further growth of existing settlements, or by its essential role in promoting regeneration or rural development.

54. Where a development plan spatial strategy indicates that a new settlement is appropriate, it should specify its scale and location, and supporting infrastructure requirements, particularly where these are integral to the viability and deliverability of the proposed development. Supplementary guidance can address more detailed issues such as design and delivery.

55. Local development plans should contribute to high-quality places by setting out how they will embed a design-led approach. This should include:

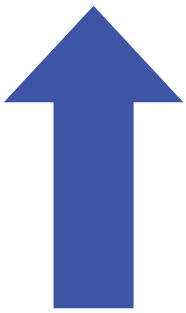
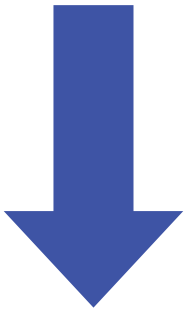
- reference to the six qualities of successful places which enable consideration of each place as distinctly different from other places and which should be evident in all development;
- using processes that harness and utilise the knowledge of communities and encourage active participation to deliver places with local integrity and relevance; and
- specifying when design tools, such as those at paragraph 57 should be used.

Development Management

56. Design is a material consideration in determining planning applications. Planning permission may be refused and the refusal defended at appeal or local review solely on design grounds.

Tools for Making Better Places

57. Design tools guide the quality of development in and across places to promote positive change. They can help to provide certainty for stakeholders as a contribution to sustainable economic growth. Whichever tools are appropriate to the task, they should focus on delivering the six qualities of successful places and could be adopted as supplementary guidance.

Scale	Tool
STRATEGIC	**Design Frameworks** For larger areas of significant change, so must include some flexibility. To address major issues in a co-ordinated and viable way. May include general principles as well as maps and diagrams to show the importance of connections around and within a place.
	**Development Briefs** For a place or site, to form the basis of dialogue between the local authority and developers. To advise how policies should be implemented. May include detail on function, layout, plot sizes, building heights and lines, and materials.
	Master Plans For a specific site that may be phased so able to adapt over time. To describe and illustrate how a proposal will meet the vision and how it will work on the ground. May include images showing the relationship of people and place. See Planning Advice Note 83: Masterplanning[31]
	**Design Guides** For a particular subject, e.g. shop fronts. To show how development can be put into practice in line with policy. Includes detail, e.g. images of examples.
SITE SPECIFIC	**Design Statements** Required to accompany some planning applications. To explain how the application meets policy and guidance, for example by close reference to key considerations of street design with Designing Streets. See Planning Advice Note 68: Design Statements[32]

31 www.scotland.gov.uk/Publications/2008/11/10114526/0

32 www.scotland.gov.uk/Publications/2003/08/18013/25389

Subject Policies

A Successful, Sustainable Place

Promoting Town Centres

NPF and wider context

58. NPF3 reflects the importance of town centres as a key element of the economic and social fabric of Scotland. Much of Scotland's population lives and works in towns, within city regions, in our rural areas and on our coasts and islands. Town centres are at the heart of their communities and can be hubs for a range of activities. It is important that planning supports the role of town centres to thrive and meet the needs of their residents, businesses and visitors for the 21st century.

59. The town centre first principle, stemming from the Town Centre Action Plan, promotes an approach to wider decision-making that considers the health and vibrancy of town centres.

Policy Principles

60. Planning for town centres should be flexible and proactive, enabling a wide range of uses which bring people into town centres. The planning system should:

- apply a town centre first policy[33] when planning for uses which attract significant numbers of people, including retail and commercial leisure, offices, community and cultural facilities;
- encourage a mix of uses in town centres to support their vibrancy, vitality and viability throughout the day and into the evening;
- ensure development plans, decision-making and monitoring support successful town centres; and
- consider opportunities for promoting residential use within town centres where this fits with local need and demand.

Key Documents

- National Review of Town Centres External Advisory Group Report: Community and Enterprise in Scotland's Town Centres[34]
- Town Centre Action Plan – the Scottish Government response[35]
- Planning Advice Note 59: Improving Town Centres[36]
- Planning Advice Note 52: Planning and Small Towns[37]

33 A town centre first policy is intended to support town centres, where these exist, or new centres which are supported by the development plan. Where there are no town centres in the vicinity, for example in more remote rural and island areas, the expectation is that local centres will be supported. The town centre first policy is not intended to divert essential services and developments away from such rural areas. See section on Rural Development.

34 www.scotland.gov.uk/Resource/0042/00426972.pdf

35 www.scotland.gov.uk/Publications/2013/11/6415

36 www.scotland.gov.uk/Publications/1999/10/pan59-root/pan59

37 www.scotland.gov.uk/Publications/1997/04/pan52

- Town Centres Masterplanning Toolkit[38]

Development Plans

61. Plans should identify a network of centres and explain how they can complement each other. The network is likely to include city centres, town centres, local centres and commercial centres and may be organised as a hierarchy. Emerging or new centres designated within key new developments or land releases should also be shown within the network of centres. In remoter rural and island areas, it may not be necessary to identify a network.

62. Plans should identify as town centres those centres which display:

- a diverse mix of uses, including shopping;
- a high level of accessibility;
- qualities of character and identity which create a sense of place and further the well-being of communities;
- wider economic and social activity during the day and in the evening; and
- integration with residential areas.

63. Plans should identify as commercial centres those centres which have a more specific focus on retailing and/or leisure uses, such as shopping centres, commercial leisure developments, mixed retail and leisure developments, retail parks and factory outlet centres. Where necessary to protect the role of town centres, plans should specify the function of commercial centres, for example where retail activity may be restricted to the sale of bulky goods.

64. Local authorities, working with community planning partners, businesses and community groups as appropriate, should prepare a town centre health check. Annex A sets out a range of indicators which may be relevant. The purpose of a health check is to assess a town centre's strengths, vitality and viability, weaknesses and resilience. It will be used to inform development plans and decisions on planning applications. Health checks should be regularly updated, to monitor town centre performance, preferably every two years.

65. Local authorities, working with partners, should use the findings of the health check to develop a strategy to deliver improvements to the town centre. Annex A contains guidance on key elements in their preparation.

66. The spatial elements of town centre strategies should be included in the development plan or supplementary guidance. Plans should address any significant changes in the roles and functions of centres over time, where change is supported by the results of a health check. Plans should assess how centres can accommodate development and identify opportunities.

67. There are concerns about the number and clustering of some non-retail uses, such as betting offices and high interest money lending premises, in some town and local centres. Plans should include policies to support an appropriate mix of uses in town centres, local centres and high streets. Where a town centre strategy indicates that further provision of particular activities would undermine the character and amenity of centres or the well-being of communities, plans should include policies to prevent such over-provision and clustering.

38 http://creatingplacesscotland.org/people-communities/policy/town-centre-masterplanning-toolkit#overlay-context=people-communities/policy

68. Development plans should adopt a sequential town centre first approach when planning for uses which generate significant footfall, including retail and commercial leisure uses, offices, community and cultural facilities and, where appropriate, other public buildings such as libraries, and education and healthcare facilities. This requires that locations are considered in the following order of preference:

- town centres (including city centres and local centres);
- edge of town centre;
- other commercial centres identified in the development plan; and
- out-of-centre locations that are, or can be, made easily accessible by a choice of transport modes.

69. Planning authorities, developers, owners and occupiers should be flexible and realistic in applying the sequential approach, to ensure that different uses are developed in the most appropriate locations. It is important that community, education and healthcare facilities are located where they are easily accessible to the communities that they are intended to serve.

Development Management

70. Decisions on development proposals should have regard to the context provided by the network of centres identified in the development plan and the sequential approach outlined above. New development in a town centre should contribute to providing a range of uses and should be of a scale which is appropriate to that centre. The impact of new development on the character and amenity of town centres, local centres and high streets will be a material consideration in decision-making. The aim is to recognise and prioritise the importance of town centres and encourage a mix of developments which support their vibrancy, vitality and viability. This aim should also be taken into account in decisions concerning proposals to expand or change the use of existing development.

71. Where development proposals in edge of town centre, commercial centre or out-of-town locations are contrary to the development plan, it is for applicants to demonstrate that more central options have been thoroughly assessed and that the impact on existing town centres is acceptable. Where a new public building or office with a gross floorspace over 2,500m^2 is proposed outwith a town centre, and is contrary to the development plan, an assessment of the impact on the town centre should be carried out. Where a retail and leisure development with a gross floorspace over 2,500m^2 is proposed outwith a town centre, contrary to the development plan, a retail impact analysis should be undertaken. For smaller retail and leisure proposals which may have a significant impact on vitality and viability, planning authorities should advise when retail impact analysis is necessary.

72. This analysis should consider the relationship of the proposed development with the network of centres identified in the development plan. Where possible, authorities and developers should agree the data required and present information on areas of dispute in a succinct and comparable form. Planning authorities should consider the potential economic impact of development and take into account any possible displacement effect.

73. Out-of-centre locations should only be considered for uses which generate significant footfall[39] where:

- all town centre, edge of town centre and other commercial centre options have been assessed and discounted as unsuitable or unavailable;

39 As noted at paragraph 69, a flexible approach is required for community, education and healthcare facilities.

- the scale of development proposed is appropriate, and it has been shown that the proposal cannot reasonably be altered or reduced in scale to allow it to be accommodated at a sequentially preferable location;
- the proposal will help to meet qualitative or quantitative deficiencies; and
- there will be no significant adverse effect on the vitality and viability of existing town centres.

Promoting Rural Development

NPF Context

74. NPF3 sets out a vision for vibrant rural, coastal and island areas, with growing, sustainable communities supported by new opportunities for employment and education. The character of rural and island areas and the challenges they face vary greatly across the country, from pressurised areas of countryside around towns and cities to more remote and sparsely populated areas. Between these extremes are extensive intermediate areas under varying degrees of pressure and with different kinds of environmental assets meriting protection. Scotland's long coastline is an important resource both for development and for its particular environmental quality, especially in the areas of the three island councils.

Policy Principles

75. The planning system should:

- in all rural and island areas promote a pattern of development that is appropriate to the character of the particular rural area and the challenges it faces;
- encourage rural development that supports prosperous and sustainable communities and businesses whilst protecting and enhancing environmental quality; and
- support an integrated approach to coastal planning.

Key documents

- Getting the Best from Our Land – A Land Use Strategy for Scotland[40]
- National Marine Plan

Delivery

76. In the pressurised areas easily accessible from Scotland's cities and main towns, where ongoing development pressures are likely to continue, it is important to protect against an unsustainable growth in car-based commuting and the suburbanisation of the countryside, particularly where there are environmental assets such as sensitive landscapes or good quality agricultural land. Plans should make provision for most new urban development to take place within, or in planned extensions to, existing settlements.

77. In remote and fragile areas and island areas outwith defined small towns, the emphasis should be on maintaining and growing communities by encouraging development that provides suitable sustainable economic activity, while preserving important environmental assets such as landscape and wildlife habitats that underpin continuing tourism visits and quality of place.

78. In the areas of intermediate accessibility and pressure for development, plans should be tailored to local circumstances, seeking to provide a sustainable network of settlements and a

40 www.scotland.gov.uk/Publications/2011/03/17091927/0

range of policies that provide for additional housing requirements, economic development, and the varying proposals that may come forward, while taking account of the overarching objectives and other elements of the plan.

79. Plans should set out a spatial strategy which:

- reflects the development pressures, environmental assets, and economic needs of the area, reflecting the overarching aim of supporting diversification and growth of the rural economy;
- promotes economic activity and diversification, including, where appropriate, sustainable development linked to tourism and leisure, forestry, farm and croft diversification and aquaculture, nature conservation, and renewable energy developments, while ensuring that the distinctive character of the area, the service function of small towns and natural and cultural heritage are protected and enhanced;
- makes provision for housing in rural areas in accordance with the spatial strategy, taking account of the different development needs of local communities;
- where appropriate, sets out policies and proposals for leisure accommodation, such as holiday units, caravans, and huts;
- addresses the resource implications of the proposed pattern of development, including facilitating access to local community services and support for public transport; and
- considers the services provided by the natural environment, safeguarding land which is highly suitable for particular uses such as food production or flood management.

80. Where it is necessary to use good quality land for development, the layout and design should minimise the amount of such land that is required. Development on prime agricultural land, or land of lesser quality that is locally important should not be permitted except where it is essential:

- as a component of the settlement strategy or necessary to meet an established need, for example for essential infrastructure, where no other suitable site is available; or
- for small-scale development directly linked to a rural business; or
- for the generation of energy from a renewable source or the extraction of minerals where this accords with other policy objectives and there is secure provision for restoration to return the land to its former status.

81. In accessible or pressured rural areas, where there is a danger of unsustainable growth in long-distance car-based commuting or suburbanisation of the countryside, a more restrictive approach to new housing development is appropriate, and plans and decision-making should generally:

- guide most new development to locations within or adjacent to settlements; and
- set out the circumstances in which new housing outwith settlements may be appropriate, avoiding use of occupancy restrictions.

82. In some most pressured areas, the designation of green belts may be appropriate.

83. In remote rural areas, where new development can often help to sustain fragile communities, plans and decision-making should generally:

- encourage sustainable development that will provide employment;
- support and sustain fragile and dispersed communities through provision for appropriate development, especially housing and community-owned energy;

- include provision for small-scale housing[41] and other development which supports sustainable economic growth in a range of locations, taking account of environmental protection policies and addressing issues of location, access, siting, design and environmental impact;
- where appropriate, allow the construction of single houses outwith settlements provided they are well sited and designed to fit with local landscape character, taking account of landscape protection and other plan policies;
- not impose occupancy restrictions on housing.

National Parks

84. National Parks are designated under the National Parks (Scotland) Act 2000 because they are areas of national importance for their natural and cultural heritage. The four aims of national parks are to:

- conserve and enhance the natural and cultural heritage of the area;
- promote sustainable use of the natural resources of the area;
- promote understanding and enjoyment (including enjoyment in the form of recreation) of the special qualities of the area by the public; and
- promote sustainable economic and social development of the area's communities.

85. These aims are to be pursued collectively. However if there is a conflict between the first aim and any of the others then greater weight must be given to the first aim. Planning decisions should reflect this weighting. Paragraph 213 also applies to development outwith a National Park that affects the Park.

86. Development plans for National Parks are expected to be consistent with the National Park Plan, which sets out the management strategy for the Park. The authority preparing a development plan for a National Park, or which affects a National Park, is required to pay special attention to the desirability of consistency with the National Park Plan, having regard to the contents.

Coastal Planning

87. The planning system should support an integrated approach to coastal planning to ensure that development plans and regional marine plans are complementary. Terrestrial planning by planning authorities overlaps with marine planning in the intertidal zone. On the terrestrial side, mainland planning authorities should work closely with neighbouring authorities, taking account of the needs of port authorities and aquaculture, where appropriate. On the marine side, planning authorities will need to ensure integration with policies and activities arising from the National Marine Plan, Marine Planning Partnerships, Regional Marine Plans, and Integrated Coastal Zone Management, as well as aquaculture.

Development Plans

88. Plans should recognise that rising sea levels and more extreme weather events resulting from climate change will potentially have a significant impact on coastal and island areas, and that a precautionary approach to flood risk should be taken. They should confirm that new development requiring new defences against coastal erosion or coastal flooding will not be supported except where there is a clear justification for a departure from the general policy to

41 including clusters and groups; extensions to existing clusters and groups; replacement housing; plots for self build; holiday homes; new build or conversion linked to rural business.

avoid development in areas at risk. Where appropriate, development plans should identify areas at risk and areas where a managed realignment of the coast would be beneficial.

89. Plans should identify areas of largely developed coast that are a major focus of economic or recreational activity that are likely to be suitable for further development; areas subject to significant constraints; and largely unspoiled areas of the coast that are generally unsuitable for development. It should be explained that this broad division does not exclude important local variations, for example where there are areas of environmental importance within developed estuaries, or necessary developments within the largely unspoiled coast where there is a specific locational need, for example for defence purposes, tourism developments of special significance, or essential onshore developments connected with offshore energy projects or (where appropriate) aquaculture.

90. Plans should promote the developed coast as the focus of developments requiring a coastal location or which contribute to the economic regeneration or well-being of communities whose livelihood is dependent on marine or coastal activities. They should provide for the development requirements of uses requiring a coastal location, including ports and harbours, tourism and recreation, fish farming, land-based development associated with offshore energy projects and specific defence establishments.

91. Plans should safeguard unspoiled sections of coast which possess special environmental or cultural qualities, such as wild land. The economic value of these areas should be considered and maximised, provided that environmental impact issues can be satisfactorily addressed.

Supporting Business and Employment

NPF Context

92. NPF3 supports the many and varied opportunities for planning to support business and employment. These range from a focus on the role of cities as key drivers of our economy, to the continuing need for diversification of our rural economy to strengthen communities and retain young people in remote areas. Planning should address the development requirements of businesses and enable key opportunities for investment to be realised. It can support sustainable economic growth by providing a positive policy context for development that delivers economic benefits.

Policy Principles

93. The planning system should:

- promote business and industrial development that increases economic activity while safeguarding and enhancing the natural and built environments as national assets;
- allocate sites that meet the diverse needs of the different sectors and sizes of business which are important to the plan area in a way which is flexible enough to accommodate changing circumstances and allow the realisation of new opportunities; and
- give due weight to net economic benefit of proposed development.

Key Documents

- Government Economic Strategy[42]

42 www.scotland.gov.uk/Topics/Economy/EconomicStrategy

- Tourism Development Framework for Scotland[43]
- A Guide to Development Viability[44]

Delivery

Development Planning

94. Plans should align with relevant local economic strategies. These will help planning authorities to meet the needs and opportunities of indigenous firms and inward investors, recognising the potential of key sectors for Scotland with particular opportunities for growth, including:

- energy;
- life sciences, universities and the creative industries;
- tourism and the food and drink sector;
- financial and business services.

95. Plans should encourage opportunities for home-working, live-work units, micro-businesses and community hubs.

96. Development plans should support opportunities for integrating efficient energy and waste innovations within business environments. Industry stakeholders should engage with planning authorities to help facilitate co-location, as set out in paragraph 179.

97. Strategic development plan policies should reflect a robust evidence base in relation to the existing principal economic characteristics of their areas, and any anticipated change in these.

98. Strategic development plans should identify an appropriate range of locations for significant business clusters. This could include sites identified in the National Renewables Infrastructure Plan[45], Enterprise Areas[46], business parks, science parks, large and medium-sized industrial sites and high amenity sites.

99. Strategic development plans and local development plans outwith SDP areas should identify any nationally important clusters of industries handling hazardous substances within their areas and safeguard them from development which, either on its own or in combination with other development, would compromise their continued operation or growth potential. This is in the context of the wider statutory requirements in the Town and Country Planning (Development Planning) (Scotland) Regulations 2009[47] to have regard to the need to maintain appropriate distances between sites with hazardous substances and areas where the public are likely to be present and areas of particular natural sensitivity or interest.

100. Development plans should be informed by the Tourism Development Framework for Scotland in order to maximise the sustainable growth of regional and local visitor economies. Strategic development plans should identify and safeguard any nationally or regionally important locations for tourism or recreation development within their areas.

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43 www.visitscotland.org/pdf/Tourism%20Development%20Framework%20-%20FINAL.pdf

44 www.scotland.gov.uk/Resource/Doc/212607/0109620.pdf

45 www.scottish-enterprise.com/~/media/SE/Resources/Documents/Sectors/Energy/energy-renewables-reports/National-renewables-infrastructure-plan.ashx

46 www.scotland.gov.uk/Topics/Economy/EconomicStrategy/Enterprise-Areas

47 These statutory requirements are due to be amended in 2015 as part of the implementation of Directive 2012/18/EU on the control of major-accident hazards involving dangerous substances.

101. Local development plans should allocate a range of sites for business, taking account of current market demand; location, size, quality and infrastructure requirements; whether sites are serviced or serviceable within five years; the potential for a mix of uses; their accessibility to transport networks by walking, cycling and public transport and their integration with and access to existing transport networks. The allocation of such sites should be informed by relevant economic strategies and business land audits in respect of land use classes 4, 5 and 6.

102. Business land audits should be undertaken regularly by local authorities to inform reviews of development plans, and updated more frequently if relevant. Business land audits should monitor the location, size, planning status, existing use, neighbouring land uses and any significant land use issues (e.g. underused, vacant, derelict) of sites within the existing business land supply.

103. New sites should be identified where existing sites no longer meet current needs and market expectations. Where existing business sites are underused, for example where there has been an increase in vacancy rates, reallocation to enable a wider range of viable business or alternative uses should be considered, taking careful account of the potential impacts on existing businesses on the site.

104. Local development plans should locate development which generates significant freight movements, such as manufacturing, processing, distribution and warehousing, on sites accessible to suitable railheads or harbours or the strategic road network. Through appraisal, care should be taken in locating such development to minimise any impact on congested, inner urban and residential areas.

105. Planning authorities should consider the potential to promote opportunities for tourism and recreation facilities in their development plans. This may include new developments or the enhancement of existing facilities.

Development Management

106. Efficient handling of planning applications should be a key priority, particularly where jobs and investment are involved. To assist with this, pre-application discussions are strongly encouraged to determine the information that should be submitted to support applications. Such information should be proportionate and relevant to the development and sufficient for the planning authority requirements on matters such as the number of jobs to be created, hours of working, transport requirements, environmental effects, noise levels and the layout and design of buildings. Decisions should be guided by the principles set out in paragraphs 28 to 35.

107. Proposals for development in the vicinity of major-accident hazard sites should take into account the potential impacts on the proposal and the major-accident hazard site of being located in proximity to one another. Decisions should be informed by the Health and Safety Executive's advice, based on the PADHI tool. Similar considerations apply in respect of development proposals near licensed explosive sites (including military explosive storage sites).

108. Proposals for business, industrial and service uses should take into account surrounding sensitive uses, areas of particular natural sensitivity or interest and local amenity, and make a positive contribution towards placemaking.

Enabling Delivery of New Homes

NPF Context

109. NPF3 aims to facilitate new housing development, particularly in areas within our cities network where there is continuing pressure for growth, and through innovative approaches to rural housing provision. House building makes an important contribution to the economy. Planning can help to address the challenges facing the housing sector by providing a positive and flexible approach to development. In particular, provision for new homes should be made in areas where economic investment is planned or there is a need for regeneration or to support population retention in rural and island areas.

Policy Principles

110. The planning system should:

- identify a generous supply of land for each housing market area within the plan area to support the achievement of the housing land requirement across all tenures, maintaining at least a 5-year supply of effective housing land at all times;
- enable provision of a range of attractive, well-designed, energy efficient, good quality housing, contributing to the creation of successful and sustainable places; and
- have a sharp focus on the delivery of allocated sites embedded in action programmes, informed by strong engagement with stakeholders.

Key Documents

- The Housing (Scotland) Act 2001[48] requires local authorities to prepare a local housing strategy supported by an assessment of housing need and demand
- Planning Advice Note 2/2010: Affordable Housing and Housing Land Audits[49]

Delivery

111. Local authorities should identify functional housing market areas, i.e. geographical areas where the demand for housing is relatively self-contained. These areas may significantly overlap and will rarely coincide with local authority boundaries. They can be dynamic and complex, and can contain different tiers of sub-market area, overlain by mobile demand, particularly in city regions.

112. Planning for housing should be undertaken through joint working by housing market partnerships, involving both housing and planning officials within local authorities, and cooperation between authorities where strategic planning responsibilities and/or housing market areas are shared, including national park authorities. Registered social landlords, developers, other specialist interests, and local communities should also be encouraged to engage with housing market partnerships. In rural or island areas where there is no functional housing market area, the development plan should set out the most appropriate approach for the area.

48 www.legislation.gov.uk/asp/2001/10/contents

49 www.scotland.gov.uk/Publications/2010/08/31111624/0

Development Planning

113. Plans should be informed by a robust housing need and demand assessment (HNDA), prepared in line with the Scottish Government's HNDA Guidance[50]. This assessment provides part of the evidence base to inform both local housing strategies and development plans (including the main issues report). It should produce results both at the level of the functional housing market area and at local authority level, and cover all tenures. Where the Scottish Government is satisfied that the HNDA is robust and credible, the approach used will not normally be considered further at a development plan examination.

114. The HNDA, development plan, and local housing strategy processes should be closely aligned, with joint working between housing and planning teams. Local authorities may wish to wait until the strategic development plan is approved in city regions, and the local development plan adopted elsewhere, before finalising the local housing strategy, to ensure that any modifications to the plans can be reflected in local housing strategies, and in local development plans in the city regions.

115. Plans should address the supply of land for all housing. They should set out the housing supply target (separated into affordable and market sector) for each functional housing market area, based on evidence from the HNDA. The housing supply target is a policy view of the number of homes the authority has agreed will be delivered in each housing market area over the periods of the development plan and local housing strategy, taking into account wider economic, social and environmental factors, issues of capacity, resource and deliverability, and other important requirements such as the aims of National Parks. The target should be reasonable, should properly reflect the HNDA estimate of housing demand in the market sector, and should be supported by compelling evidence. The authority's housing supply target should also be reflected in the local housing strategy.

116. Within the overall housing supply target[51], plans should indicate the number of new homes to be built over the plan period. This figure should be increased by a margin of 10 to 20% to establish the housing land requirement, in order to ensure that a generous supply of land for housing is provided. The exact extent of the margin will depend on local circumstances, but a robust explanation for it should be provided in the plan.

117. The housing land requirement can be met from a number of sources, most notably sites from the established supply which are effective or expected to become effective in the plan period, sites with planning permission, proposed new land allocations, and in some cases a proportion of windfall development. Any assessment of the expected contribution to the housing land requirement from windfall sites must be realistic and based on clear evidence of past completions and sound assumptions about likely future trends. In urban areas this should be informed by an urban capacity study.

118. Strategic development plans should set out the housing supply target and the housing land requirement for the plan area, each local authority area, and each functional housing market area. They should also state the amount and broad locations of land which should be allocated in local development plans to meet the housing land requirement up to year 12 from the expected year of plan approval, making sure that the requirement for each housing market area is met in full. Beyond year 12 and up to year 20, the strategic development plan should provide an indication of the possible scale and location of housing land, including by local development plan area.

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50 www.scotland.gov.uk/Topics/Built-Environment/Housing/supply-demand/chma/hnda

51 Note: the housing supply target may in some cases include a contribution from other forms of delivery, for example a programme to bring empty properties back into use.

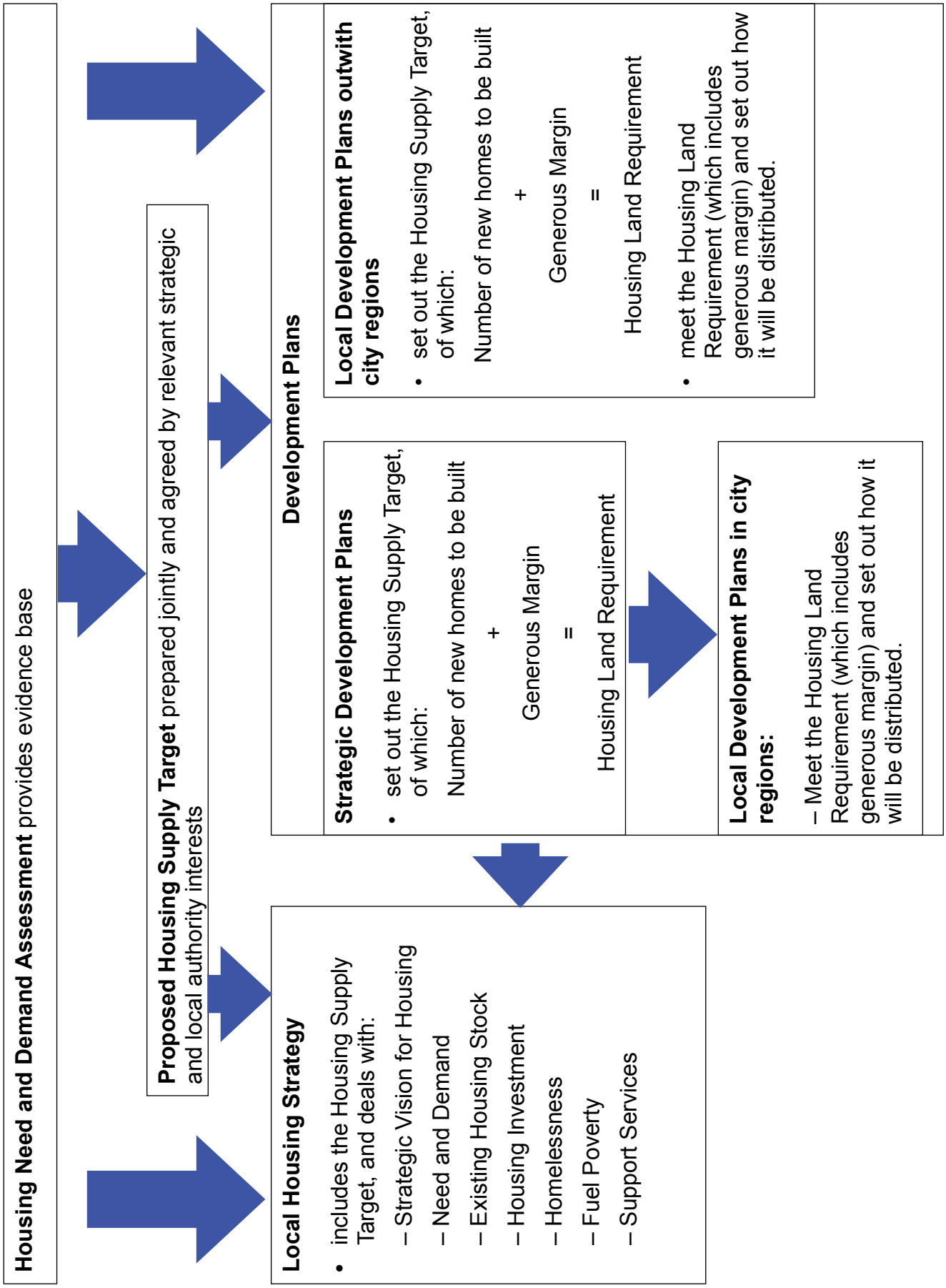
119. Local development plans in city regions should allocate a range of sites which are effective or expected to become effective in the plan period to meet the housing land requirement of the strategic development plan up to year 10 from the expected year of adoption. They should provide for a minimum of 5 years effective land supply at all times. In allocating sites, planning authorities should be confident that land can be brought forward for development within the plan period and that the range of sites allocated will enable the housing supply target to be met.

120. Outwith city regions, local development plans should set out the housing supply target (separated into affordable and market sector) and the housing land requirement for each housing market area in the plan area up to year 10 from the expected year of adoption. They should allocate a range of sites which are effective or expected to become effective in the plan period to meet the housing land requirement in full. They should provide a minimum of 5 years effective land supply at all times. Beyond year 10 and up to year 20, the local development plan should provide an indication of the possible scale and location of the housing land requirement.

121. In the National Parks, local development plans should draw on the evidence provided by the HNDAs of the constituent housing authorities. National Park authorities should aim to meet the housing land requirement in full in their area. However, they are not required to do so, and they should liaise closely with neighbouring planning authorities to ensure that any remaining part of the housing land requirement for the National Parks is met in immediately adjoining housing market areas, and that a 5-year supply of effective land is maintained.

122. Local development plans should allocate appropriate sites to support the creation of sustainable mixed communities and successful places and help to ensure the continued delivery of new housing.

Diagram 1: Housing Land, Development Planning and the Local Housing Strategy



Maintaining a 5-year Effective Land Supply

123. Planning authorities should actively manage the housing land supply. They should work with housing and infrastructure providers to prepare an annual housing land audit as a tool to critically review and monitor the availability of effective housing land, the progress of sites through the planning process, and housing completions, to ensure a generous supply of land for house building is maintained and there is always enough effective land for at least five years. A site is only considered effective where it can be demonstrated that within five years it will be free of constraints[52] and can be developed for housing. In remoter rural areas and island communities, where the housing land requirement and market activity are of a more limited scale, the housing land audit process may be adapted to suit local circumstances.

124. The development plan action programme, prepared in tandem with the plan, should set out the key actions necessary to bring each site forward for housing development and identify the lead partner. It is a key tool, and should be used alongside the housing land audit to help planning authorities manage the land supply.

125. Planning authorities, developers, service providers and other partners in housing provision should work together to ensure a continuing supply of effective land and to deliver housing, taking a flexible and realistic approach. Where a shortfall in the 5-year effective housing land supply emerges, development plan policies for the supply of housing land will not be considered up-to-date, and paragraphs 32-35 will be relevant.

Affordable Housing

126. Affordable housing is defined broadly as housing of a reasonable quality that is affordable to people on modest incomes. Affordable housing may be provided in the form of social rented accommodation, mid-market rented accommodation, shared ownership housing, shared equity housing, housing sold at a discount (including plots for self-build), and low cost housing without subsidy.

127. Where the housing supply target requires provision for affordable housing, strategic development plans should state how much of the total housing land requirement this represents.

128. Local development plans should clearly set out the scale and distribution of the affordable housing requirement for their area. Where the HNDA and local housing strategy process identify a shortage of affordable housing, the plan should set out the role that planning will take in addressing this. Planning authorities should consider whether it is appropriate to allocate some small sites specifically for affordable housing. Advice on the range of possible options for provision of affordable housing is set out in PAN 2/2010.

129. Plans should identify any expected developer contributions towards delivery of affordable housing. Where a contribution is required, this should generally be for a specified proportion of the serviced land within a development site to be made available for affordable housing. Planning authorities should consider the level of affordable housing contribution which is likely to be deliverable in the current economic climate, as part of a viable housing development. The level of affordable housing required as a contribution within a market site should generally be no more than 25% of the total number of houses. Consideration should also be given to the nature of the affordable housing required and the extent to which this can be met by proposals capable of development with little or no public subsidy. Where permission is sought for specialist housing, as described in paragraphs 132-134, a contribution to affordable housing may not always be required.

52 Planning Advice Note 2/2010: Affordable Housing and Housing Land Audits sets out more fully the measure of effective sites www.scotland.gov.uk/Publications/2010/08/31111624/5

130. Plans should consider how affordable housing requirements will be met over the period of the plan. Planning and housing officials should work together closely to ensure that the phasing of land allocations and the operation of affordable housing policies combine to deliver housing across the range of tenures. In rural areas, where significant unmet local need for affordable housing has been shown, it may be appropriate to introduce a 'rural exceptions' policy which allows planning permission to be granted for affordable housing on small sites that would not normally be used for housing, for example because they lie outwith the adjacent built-up area and are subject to policies of restraint.

131. Any detailed policies on how the affordable housing requirement is expected to be delivered, including any differences in approach for urban and rural areas, should be set out in supplementary guidance. Where it is considered that housing built to meet an identified need for affordable housing should remain available to meet such needs in perpetuity, supplementary guidance should set out the measures to achieve this. Any specific requirements on design may also be addressed in supplementary guidance.

Specialist Housing Provision and Other Specific Needs

132. As part of the HNDA, local authorities are required to consider the need for specialist provision that covers accessible and adapted housing, wheelchair housing and supported accommodation, including care homes and sheltered housing. This supports independent living for elderly people and those with a disability. Where a need is identified, planning authorities should prepare policies to support the delivery of appropriate housing and consider allocating specific sites.

133. HNDAs will also evidence need for sites for Gypsy/Travellers and Travelling Showpeople. Development plans and local housing strategies should address any need identified, taking into account their mobile lifestyles. In city regions, the strategic development plan should have a role in addressing cross-boundary considerations. If there is a need, local development plans should identify suitable sites for these communities. They should also consider whether policies are required for small privately-owned sites for Gypsy/Travellers, and for handling applications for permanent sites for Travelling Showpeople (where account should be taken of the need for storage and maintenance of equipment as well as accommodation). These communities should be appropriately involved in identifying sites for their use.

134. Local development plans should address any need for houses in multiple occupation (HMO). More information is provided in Circular 2/2012 Houses in Multiple Occupation[53]. Planning authorities should also consider the housing requirements of service personnel and sites for people seeking self-build plots. Where authorities believe it appropriate to allocate suitable sites for self-build plots, the sites may contribute to meeting the housing land requirement.

53 www.scotland.gov.uk/Publications/2012/06/4191

Valuing the Historic Environment

NPF and wider policy context

135. NPF3 recognises the contribution made by our cultural heritage to our economy, cultural identity and quality of life. Planning has an important role to play in maintaining and enhancing the distinctive and high-quality, irreplaceable historic places which enrich our lives, contribute to our sense of identity and are an important resource for our tourism and leisure industry.

136. The historic environment is a key cultural and economic asset and a source of inspiration that should be seen as integral to creating successful places. Culture-led regeneration can have a profound impact on the well-being of a community in terms of the physical look and feel of a place and can also attract visitors, which in turn can bolster the local economy and sense of pride or ownership.

Policy Principles

137. The planning system should:

- promote the care and protection of the designated and non-designated historic environment (including individual assets, related settings and the wider cultural landscape) and its contribution to sense of place, cultural identity, social well-being, economic growth, civic participation and lifelong learning; and
- enable positive change in the historic environment which is informed by a clear understanding of the importance of the heritage assets affected and ensure their future use. Change should be sensitively managed to avoid or minimise adverse impacts on the fabric and setting of the asset, and ensure that its special characteristics are protected, conserved or enhanced.

Key Documents

- Scottish Historic Environment Policy[54]
- Historic Environment Strategy for Scotland[55]
- Managing Change in the Historic Environment – Historic Scotland's guidance note series[56]
- Planning Advice Note 2/2011: Planning and Archaeology[57]
- Planning Advice Note 71: Conservation Area Management[58]
- Scottish Historic Environment Databases[59]

54 www.historic-scotland.gov.uk/index/heritage/policy/shep.htm
55 www.scotland.gov.uk/Publications/2014/03/8522
56 www.historic-scotland.gov.uk/managingchange
57 www.scotland.gov.uk/Publications/2011/08/04132003/0
58 www.scotland.gov.uk/Publications/2004/12/20450/49052
59 http://smrforum-scotland.org.uk/wp-content/uploads/2014/03/SHED-Strategy-Final-April-2014.pdf

Delivery

Development Planning

138. Strategic development plans should protect and promote their significant historic environment assets. They should take account of the capacity of settlements and surrounding areas to accommodate development without damage to their historic significance.

139. Local development plans and supplementary guidance should provide a framework for protecting and, where appropriate, enhancing all elements of the historic environment. Local planning authorities should designate and review existing and potential conservation areas and identify existing and proposed Article 4 Directions. This should be supported by Conservation Area Appraisals and Management Plans.

Development Management

140. The siting and design of development should take account of all aspects of the historic environment. In support of this, planning authorities should have access to a Sites and Monuments Record (SMR) and/or a Historic Environment Record (HER) that contains necessary information about known historic environment features and finds in their area.

Listed Buildings

141. Change to a listed building should be managed to protect its special interest while enabling it to remain in active use. Where planning permission and listed building consent are sought for development to, or affecting, a listed building, special regard must be given to the importance of preserving and enhancing the building, its setting and any features of special architectural or historic interest. The layout, design, materials, scale, siting and use of any development which will affect a listed building or its setting should be appropriate to the character and appearance of the building and setting. Listed buildings should be protected from demolition or other work that would adversely affect it or its setting.

142. Enabling development may be acceptable where it can be clearly shown to be the only means of preventing the loss of the asset and securing its long-term future. Any development should be the minimum necessary to achieve these aims. The resultant development should be designed and sited carefully to preserve or enhance the character and setting of the historic asset.

Conservation Areas

143. Proposals for development within conservation areas and proposals outwith which will impact on its appearance, character or setting, should preserve or enhance the character and appearance of the conservation area. Proposals that do not harm the character or appearance of the conservation area should be treated as preserving its character or appearance. Where the demolition of an unlisted building is proposed through Conservation Area Consent, consideration should be given to the contribution the building makes to the character and appearance of the conservation area. Where a building makes a positive contribution the presumption should be to retain it.

144. Proposed works to trees in conservation areas require prior notice to the planning authority and statutory Tree Preservation Orders[60] can increase the protection given to such trees. Conservation Area Appraisals should inform development management decisions.

60 www.scotland.gov.uk/Publications/2011/01/28152314/0

Scheduled Monuments

145. Where there is potential for a proposed development to have an adverse effect on a scheduled monument or on the integrity of its setting, permission should only be granted where there are exceptional circumstances. Where a proposal would have a direct impact on a scheduled monument, the written consent of Scottish Ministers via a separate process is required in addition to any other consents required for the development.

Historic Marine Protected Areas

146. Where planning control extends offshore, planning authorities should ensure that development will not significantly hinder the preservation objectives of Historic Marine Protected Areas.

World Heritage Sites

147. World Heritage Sites are of international importance. Where a development proposal has the potential to affect a World Heritage Site, or its setting, the planning authority must protect and preserve its Outstanding Universal Value.

Gardens and Designed Landscapes

148. Planning authorities should protect and, where appropriate, seek to enhance gardens and designed landscapes included in the Inventory of Gardens and Designed Landscapes and designed landscapes of regional and local importance.

Battlefields

149. Planning authorities should seek to protect, conserve and, where appropriate, enhance the key landscape characteristics and special qualities of sites in the Inventory of Historic Battlefields.

Archaeology and Other Historic Environment Assets

150. Planning authorities should protect archaeological sites and monuments as an important, finite and non-renewable resource and preserve them in situ wherever possible. Where in situ preservation is not possible, planning authorities should, through the use of conditions or a legal obligation, ensure that developers undertake appropriate excavation, recording, analysis, publication and archiving before and/or during development. If archaeological discoveries are made, they should be reported to the planning authority to enable discussion on appropriate measures, such as inspection and recording.

151. There is also a range of non-designated historic assets and areas of historical interest, including historic landscapes, other gardens and designed landscapes, woodlands and routes such as drove roads which do not have statutory protection. These resources are, however, an important part of Scotland's heritage and planning authorities should protect and preserve significant resources as far as possible, in situ wherever feasible.

A Low Carbon Place

Delivering Heat and Electricity

NPF Context

152. NPF3 is clear that planning must facilitate the transition to a low carbon economy, and help to deliver the aims of the Scottish Government's Report on Proposals and Policies[61]. Our spatial strategy facilitates the development of generation technologies that will help to reduce greenhouse gas emissions from the energy sector. Scotland has significant renewable energy resources, both onshore and offshore. Spatial priorities range from extending heat networks in our cities and towns to realising the potential for renewable energy generation in our coastal and island areas.

153. Terrestrial and marine planning facilitate development of renewable energy technologies, link generation with consumers and guide new infrastructure to appropriate locations. Efficient supply of low carbon and low cost heat and generation of heat and electricity from renewable energy sources are vital to reducing greenhouse gas emissions and can create significant opportunities for communities. Renewable energy also presents a significant opportunity for associated development, investment and growth of the supply chain, particularly for ports and harbours identified in the National Renewables Infrastructure Plan[62]. Communities can also gain new opportunities from increased local ownership and associated benefits.

Policy Principles

154. The planning system should:

- support the transformational change to a low carbon economy, consistent with national objectives and targets[63], including deriving:
  - 30% of overall energy demand from renewable sources by 2020;
  - 11% of heat demand from renewable sources by 2020; and
  - the equivalent of 100% of electricity demand from renewable sources by 2020;
- support the development of a diverse range of electricity generation from renewable energy technologies – including the expansion of renewable energy generation capacity – and the development of heat networks;
- guide development to appropriate locations and advise on the issues that will be taken into account when specific proposals are being assessed;
- help to reduce emissions and energy use in new buildings and from new infrastructure by enabling development at appropriate locations that contributes to:
  - Energy efficiency;
  - Heat recovery;
  - Efficient energy supply and storage;

61 www.scotland.gov.uk/Topics/Environment/climatechange/scotlands-action/lowcarbon/meetingthetargets

62 www.scottish-enterprise.com/~/media/SE/Resources/Documents/Sectors/Energy/energy-renewables-reports/National-renewables-infrastructure-plan.ashx

63 Further targets may be set in due course, for example district heating targets have been proposed.

- Electricity and heat from renewable sources; and
- Electricity and heat from non-renewable sources where greenhouse gas emissions can be significantly reduced.

Key Documents

- Electricity Generation Policy Statement[64]
- 2020 Routemap for Renewable Energy in Scotland[65]
- Towards Decarbonising Heat: Maximising the opportunities for Scotland, Draft Heat Generation Policy Statement[66]
- Low Carbon Scotland: Meeting Our Emissions Reductions Targets 2013 - 2027[67]

Delivery

Development Planning

155. Development plans should seek to ensure an area's full potential for electricity and heat from renewable sources is achieved, in line with national climate change targets, giving due regard to relevant environmental, community and cumulative impact considerations.

156. Strategic development plans should support national priorities for the construction or improvement of strategic energy infrastructure, including generation, storage, transmission and distribution networks. They should address cross-boundary issues, promoting an approach to electricity and heat that supports the transition to a low carbon economy.

157. Local development plans should support new build developments, infrastructure or retrofit projects which deliver energy efficiency and the recovery of energy that would otherwise be wasted both in the specific development and surrounding area. They should set out the factors to be taken into account in considering proposals for energy developments. These will depend on the scale of the proposal and its relationship to the surrounding area and are likely to include the considerations set out at paragraph 169.

Heat

158. Local development plans should use heat mapping to identify the potential for co-locating developments with a high heat demand with sources of heat supply. Heat supply sources include harvestable woodlands, sawmills producing biomass, biogas production sites and developments producing unused excess heat, as well as geothermal systems, heat recoverable from mine waters, aquifers, other bodies of water and heat storage systems. Heat demand sites for particular consideration include high density developments, communities off the gas grid, fuel poor areas and anchor developments such as hospitals, schools, leisure centres and heat intensive industry.

159. Local development plans should support the development of heat networks in as many locations as possible, even where they are initially reliant on carbon-based fuels if there is potential to convert them to run on renewable or low carbon sources of heat in the future. Local development plans should identify where heat networks, heat storage and energy centres exist or would be appropriate and include policies to support their implementation. Policies should support

64 www.scotland.gov.uk/Topics/Business-Industry/Energy/EGPSMain

65 www.scotland.gov.uk/Publications/2011/08/04110353/0

66 www.scotland.gov.uk/Publications/2014/03/2778

67 www.scotland.gov.uk/Topics/Environment/climatechange/scotlands-action/lowcarbon/meetingthetargets

safeguarding of piperuns within developments for later connection and pipework to the curtilage of development. Policies should also give consideration to the provision of energy centres within new development. Where a district network exists, or is planned, or in areas identified as appropriate for district heating, policies may include a requirement for new development to include infrastructure for connection, providing the option to use heat from the network.

160. Where heat networks are not viable, microgeneration and heat recovery technologies associated with individual properties should be encouraged.

Onshore Wind

161. Planning authorities should set out in the development plan a spatial framework identifying those areas that are likely to be most appropriate for onshore wind farms as a guide for developers and communities, following the approach set out below in Table 1. Development plans should indicate the minimum scale[68] of onshore wind development that their spatial framework is intended to apply to. Development plans should also set out the criteria that will be considered in deciding all applications for wind farms of different scales – including extensions and re-powering – taking account of the considerations set out at paragraph 169.

162. Both strategic and local development planning authorities, working together where required, should identify where there is strategic capacity for wind farms, and areas with the greatest potential for wind development, considering cross-boundary constraints and opportunities. Strategic development planning authorities are expected to take the lead in dealing with cross-boundary constraints and opportunities and will coordinate activity with constituent planning authorities.

163. The approach to spatial framework preparation set out in the SPP should be followed in order to deliver consistency nationally and additional constraints should not be applied at this stage. The spatial framework is complemented by a more detailed and exacting development management process where the merits of an individual proposal will be carefully considered against the full range of environmental, community, and cumulative impacts (see paragraph 169).

164. Individual properties and those settlements not identified within the development plan will be protected by the safeguards set out in the local development plan policy criteria for determining wind farms and the development management considerations accounted for when determining individual applications.

165. Grid capacity should not be used as a reason to constrain the areas identified for wind farm development or decisions on individual applications for wind farms. It is for wind farm developers to discuss connections to the grid with the relevant transmission network operator. Consideration should be given to underground grid connections where possible.

166. Proposals for onshore wind turbine developments should continue to be determined while spatial frameworks and local policies are being prepared and updated. Moratoria on onshore wind development are not appropriate.

68 For example, Loch Lomond and The Trossachs and Cairngorms National Parks refer to developments of more than one turbine and over 30 metres in height as large-scale commercial wind turbines.

Table 1: Spatial Frameworks

<table>
<tr><td colspan="3">Group 1: Areas where wind farms will not be acceptable:

National Parks and National Scenic Areas.</td></tr>
<tr><td colspan="3">Group 2: Areas of significant protection:

Recognising the need for significant protection, in these areas wind farms may be appropriate in some circumstances. Further consideration will be required to demonstrate that any significant effects on the qualities of these areas can be substantially overcome by siting, design or other mitigation.</td></tr>
<tr><td>National and international designations:

• World Heritage Sites;
• Natura 2000 and Ramsar sites;
• Sites of Special Scientific Interest;
• National Nature Reserves;
• Sites identified in the Inventory of Gardens and Designed Landscapes;
• Sites identified in the Inventory of Historic Battlefields.</td><td>Other nationally important mapped environmental interests:

• areas of wild land as shown on the 2014 SNH map of wild land areas;
• carbon rich soils, deep peat and priority peatland habitat.</td><td>Community separation for consideration of visual impact:

• an area not exceeding 2km around cities, towns and villages identified on the local development plan with an identified settlement envelope or edge. The extent of the area will be determined by the planning authority based on landform and other features which restrict views out from the settlement.</td></tr>
<tr><td colspan="3">Group 3: Areas with potential for wind farm development:

Beyond groups 1 and 2, wind farms are likely to be acceptable, subject to detailed consideration against identified policy criteria.</td></tr>
</table>

Other Renewable Electricity Generating Technologies and Storage

167. Development plans should identify areas capable of accommodating renewable electricity projects in addition to wind generation, including hydro-electricity generation related to river or tidal flows or energy storage projects of a range of scales.

168. Development plans should identify areas which are weakly connected or unconnected to the national electricity network and facilitate development of decentralised and mobile energy storage installations. Energy storage schemes help to support development of renewable energy and maintain stability of the electricity network in areas where reinforcement is needed to manage congestion. Strategic development planning authorities are expected to take the lead in dealing with cross-boundary constraints and opportunities and will coordinate activity between constituent planning authorities.

Development Management

169. Proposals for energy infrastructure developments should always take account of spatial frameworks for wind farms and heat maps where these are relevant. Considerations will vary relative to the scale of the proposal and area characteristics but are likely to include:

- net economic impact, including local and community socio-economic benefits such as employment, associated business and supply chain opportunities;
- the scale of contribution to renewable energy generation targets;
- effect on greenhouse gas emissions;
- cumulative impacts – planning authorities should be clear about likely cumulative impacts arising from all of the considerations below, recognising that in some areas the cumulative impact of existing and consented energy development may limit the capacity for further development;
- impacts on communities and individual dwellings, including visual impact, residential amenity, noise and shadow flicker;
- landscape and visual impacts, including effects on wild land;
- effects on the natural heritage, including birds;
- impacts on carbon rich soils, using the carbon calculator;
- public access, including impact on long distance walking and cycling routes and scenic routes identified in the NPF;
- impacts on the historic environment, including scheduled monuments, listed buildings and their settings;
- impacts on tourism and recreation;
- impacts on aviation and defence interests and seismological recording;
- impacts on telecommunications and broadcasting installations, particularly ensuring that transmission links are not compromised;
- impacts on road traffic;
- impacts on adjacent trunk roads;
- effects on hydrology, the water environment and flood risk;
- the need for conditions relating to the decommissioning of developments, including ancillary infrastructure, and site restoration;

- opportunities for energy storage; and
- the need for a robust planning obligation to ensure that operators achieve site restoration.

170. Areas identified for wind farms should be suitable for use in perpetuity. Consents may be time-limited but wind farms should nevertheless be sited and designed to ensure impacts are minimised and to protect an acceptable level of amenity for adjacent communities.

171. Proposals for energy generation from non-renewable sources may be acceptable where carbon capture and storage or other emissions reduction infrastructure is either already in place or committed within the development's lifetime and proposals must ensure protection of good environmental standards.

172. Where new energy generation or storage proposals are being considered, the potential to connect those projects to off-grid areas should be considered.

Community Benefit

173. Where a proposal is acceptable in land use terms, and consent is being granted, local authorities may wish to engage in negotiations to secure community benefit in line with the Scottish Government Good Practice Principles for Community Benefits from Onshore Renewable Energy Developments[69].

Existing Wind Farm Sites

174. Proposals to repower existing wind farms which are already in suitable sites where environmental and other impacts have been shown to be capable of mitigation can help to maintain or enhance installed capacity, underpinning renewable energy generation targets. The current use of the site as a wind farm will be a material consideration in any such proposals.

Planning for Zero Waste

NPF and Wider Context

175. NPF3 recognises that waste is a resource and an opportunity, rather than a burden. Scotland has a Zero Waste Policy, which means wasting as little as possible and recognising that every item and material we use, either natural or manufactured, is a resource which has value for our economy. Planning plays a vital role in supporting the provision of facilities and infrastructure for future business development, investment and employment.

Policy Principles

176. The planning system should:

- promote developments that minimise the unnecessary use of primary materials and promote efficient use of secondary materials;
- support the emergence of a diverse range of new technologies and investment opportunities to secure economic value from secondary resources, including reuse, refurbishment, remanufacturing and reprocessing;
- support achievement of Scotland's zero waste targets: recycling 70% of household waste and sending no more than 5% of Scotland's annual waste arisings to landfill by 2025; and
- help deliver infrastructure at appropriate locations, prioritising development in line with the waste hierarchy: waste prevention, reuse, recycling, energy recovery and waste disposal.

69 www.scotland.gov.uk/Publications/2013/11/8279

Key Documents

- EU revised Waste Framework Directive[70] (2008/98/EC)
- Waste (Scotland) Regulations 2012[71]: a statutory framework to maximise the quantity and quality of materials available for recycling and minimise the need for residual waste infrastructure;
- Zero Waste Plan[72] and accompanying regulations and supporting documents;
- Safeguarding Scotland's Resources: A blueprint for a more resource efficient and circular economy;
- Circular 6/2013 Development Planning[73];
- SEPA waste data sources: including Waste Data Digests[74] and Waste Infrastructure Maps[75];
- SEPA Thermal Treatment of Waste Guidelines 2013[76];
- Waste capacity tables[77] (formerly Zero Waste Plan Annex B capacity tables)

Delivery

177. Planning authorities and SEPA should work collaboratively to achieve zero waste objectives, having regard to the Zero Waste Plan, through development plans and development management. A revised version of PAN 63: Planning and Waste Management will be published in due course.

Development Planning

178. Plans should give effect to the aims of the Zero Waste Plan and promote the waste hierarchy.

179. For new developments, including industrial, commercial, and residential, plans should promote resource efficiency and the minimisation of waste during construction and operation.

180. Plans should enable investment opportunities in a range of technologies and industries to maximise the value of secondary resources and waste to the economy, including composting facilities, transfer stations, materials recycling facilities, anaerobic digestion, mechanical, biological and thermal treatment plants. In line with the waste hierarchy, particular attention should be given to encouraging opportunities for reuse, refurbishment, remanufacturing and reprocessing of high value materials and products. Industry and business should engage with planning authorities to help identify sites which would enable co-location with end users of outputs where appropriate.

181. Planning authorities should have regard to the annual update of required capacity for source segregated and unsorted waste, mindful of the need to achieve the all-Scotland operational capacity. However, this should not be regarded as a cap and planning authorities should generally facilitate growth in sustainable resource management.

70 http://ec.europa.eu/environment/waste/framework/revision.htm
71 www.legislation.gov.uk/sdsi/2012/9780111016657/contents
72 www.scotland.gov.uk/Topics/Environment/waste-and-pollution/Waste-1/wastestrategy
73 www.scotland.gov.uk/Publications/2013/12/9924/0
74 www.sepa.org.uk/waste/waste_data/waste_data_digest.aspx
75 www.sepa.org.uk/waste/waste_infrastructure_maps.aspx
76 www.sepa.org.uk/waste/waste_regulation/energy_from_waste.aspx
77 www.scotland.gov.uk/Topics/Environment/waste-and-pollution/Waste-1/wastestrategy/annexb

182. The planning system should support the provision of a network of infrastructure to allow Scotland's waste and secondary resources to be managed in one of the nearest appropriate installations, by means of the most appropriate methods and technologies, in order to protect the environment and public health. While a significant shortfall of waste management infrastructure exists, emphasis should be placed on need over proximity. The achievement of a sustainable strategy may involve waste crossing planning boundaries. However, as the national network of installations becomes more fully developed, there will be scope for giving greater weight to proximity in identifying suitable locations for new waste facilities.

183. Any sites identified specifically for energy from waste facilities should enable links to be made to potential users of renewable heat and energy. Such schemes are particularly suitable in locations where there are premises nearby with a long-term demand for heat. Paragraphs 158 to 160 set out policy on heat networks and mapping.

184. Plans should safeguard existing waste management installations and ensure that the allocation of land on adjacent sites does not compromise waste handling operations, which may operate 24 hours a day and partly outside buildings.

185. Strategic development plans and local development plans outwith city regions should set out spatial strategies which make provision for new infrastructure, indicating clearly that it can generally be accommodated on land designated for employment, industrial or storage and distribution uses.

186. Local development plans should identify appropriate locations for new infrastructure, allocating specific sites where possible, and should provide a policy framework which facilitates delivery. Suitable sites will include those which have been identified for employment, industry or storage and distribution. Updated Scottish Government planning advice on identifying sites and assessing their suitability will be provided in due course.

187. Local development plans should identify where masterplans or development briefs will be required to guide the development of waste installations for major sites.

Development Management

188. In determining applications for new installations, authorities should take full account of the policy set out at paragraph 176. Planning authorities should determine whether proposed developments would constitute appropriate uses of the land, leaving the regulation of permitted installations to SEPA.

189. SEPA's Thermal Treatment of Waste Guidelines 2013 and addendum sets out policy on thermal treatment plants.

190. All new development including residential, commercial and industrial properties should include provision for waste separation and collection to meet the requirements of the Waste (Scotland) Regulations.

191. Planning authorities should consider the need for buffer zones between dwellings or other sensitive receptors and some waste management facilities. As a guide, appropriate buffer distances may be:

- 100m between sensitive receptors and recycling facilities, small-scale thermal treatment or leachate treatment plant;
- 250m between sensitive receptors and operations such as outdoor composting, anaerobic digestion, mixed waste processing, thermal treatment or landfill gas plant; and
- greater between sensitive receptors and landfill sites.

192. Planning authorities should:

- consider requiring the preparation of site waste management plans for construction sites;
- secure decommissioning or restoration (including landfill) to agreed standards as a condition of planning permission for waste management facilities; and
- ensure that landfill consents are subject to an appropriate financial bond unless the operator can demonstrate that their programme of restoration, including the necessary financing, phasing and aftercare of sites, is sufficient.

A Natural, Resilient Place

Valuing the Natural Environment

NPF Context

193. The natural environment forms the foundation of the spatial strategy set out in NPF3. The environment is a valued national asset offering a wide range of opportunities for enjoyment, recreation and sustainable economic activity. Planning plays an important role in protecting, enhancing and promoting access to our key environmental resources, whilst supporting their sustainable use.

Policy Principles

194. The planning system should:

- facilitate positive change while maintaining and enhancing distinctive landscape character;
- conserve and enhance protected sites and species, taking account of the need to maintain healthy ecosystems and work with the natural processes which provide important services to communities;
- promote protection and improvement of the water environment, including rivers, lochs, estuaries, wetlands, coastal waters and groundwater, in a sustainable and co-ordinated way;
- seek to protect soils from damage such as erosion or compaction;
- protect and enhance ancient semi-natural woodland as an important and irreplaceable resource, together with other native or long-established woods, hedgerows and individual trees with high nature conservation or landscape value;
- seek benefits for biodiversity from new development where possible, including the restoration of degraded habitats and the avoidance of further fragmentation or isolation of habitats; and
- support opportunities for enjoying and learning about the natural environment.

Key Documents

- Getting the Best from Our Land – A Land Use Strategy for Scotland[78]
- The 2020 Challenge for Scotland's Biodiversity[79]
- European Landscape Convention[80]
- Nature Conservation (Scotland) Act 2004[81]
- The Conservation (Natural Habitats etc) Regulations[82]
- The Wildlife and Countryside Act 1981[83]

78 www.scotland.gov.uk/Topics/Environment/Countryside/Landusestrategy
79 www.scotland.gov.uk/Publications/2013/06/5538
80 www.coe.int/t/dg4/cultureheritage/heritage/landscape/default_en.asp
81 www.legislation.gov.uk/asp/2004/6/contents
82 www.legislation.gov.uk/uksi/1994/2716/contents/made
83 www.legislation.gov.uk/ukpga/1981/69

- EU Birds Directive – 2009/147/EC[84]
- EU Habitats Directive – 92/43/EEC[85]
- Ramsar Convention on Wetlands of International Importance[86]
- National Parks (Scotland) Act 2000[87]
- River Basin Management Plans[88]

Delivery

195. Planning authorities, and all public bodies, have a duty under the Nature Conservation (Scotland) Act 2004 to further the conservation of biodiversity. This duty must be reflected in development plans and development management decisions. They also have a duty under the Water Environment and Water Services (Scotland) Act 2003 to protect and improve Scotland's water environment. The Scottish Government expects public bodies to apply the Principles for Sustainable Land Use, as set out in the Land Use Strategy, when taking significant decisions affecting the use of land.

Development Plans

196. International, national and locally designated areas and sites should be identified and afforded the appropriate level of protection in development plans. Reasons for local designation should be clearly explained and their function and continuing relevance considered when preparing plans. Buffer zones should not be established around areas designated for their natural heritage importance. Plans should set out the factors which will be taken into account in development management. The level of protection given to local designations should not be as high as that given to international or national designations.

197. Planning authorities are encouraged to limit non-statutory local designations to areas designated for their local landscape or nature conservation value:

- the purpose of areas of local landscape value should be to:
  - safeguard and enhance the character and quality of a landscape which is important or particularly valued locally or regionally; or
  - promote understanding and awareness of the distinctive character and special qualities of local landscapes; or
  - safeguard and promote important local settings for outdoor recreation and tourism.
- local nature conservation sites should seek to accommodate the following factors:
  - species diversity, species or habitat rarity, naturalness and extent of habitat;
  - contribution to national and local biodiversity objectives;
  - potential contribution to the protection or enhancement of connectivity between habitats or the development of green networks; and
  - potential to facilitate enjoyment and understanding of natural heritage.

84 ec.europa.eu/environment/nature/legislation/birdsdirective/index_en.htm
85 ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm
86 www.ramsar.org/cda/en/ramsar-home/main/ramsar/1_4000_0
87 www.legislation.gov.uk/asp/2000/10/contents
88 www.sepa.org.uk/water/river_basin_planning.aspx

198. Local nature conservation sites designated for their geodiversity should be selected for their value for scientific study and education, their historical significance and cultural and aesthetic value, and for their potential to promote public awareness and enjoyment.

199. Plans should address the potential effects of development on the natural environment, including proposals for major-accident hazard sites and the cumulative effects of incremental changes. They should consider the natural and cultural components together, and promote opportunities for the enhancement of degraded landscapes, particularly where this helps to restore or strengthen the natural processes which underpin the well-being and resilience of communities.

200. Wild land character is displayed in some of Scotland's remoter upland, mountain and coastal areas, which are very sensitive to any form of intrusive human activity and have little or no capacity to accept new development. Plans should identify and safeguard the character of areas of wild land as identified on the 2014 SNH map of wild land areas.

201. Plans should identify woodlands of high nature conservation value and include policies for protecting them and enhancing their condition and resilience to climate change. Forestry Commission Scotland's Native Woodland Survey of Scotland[89] provides information and guidance. Planning authorities should consider preparing forestry and woodland strategies as supplementary guidance to inform the development of forestry and woodland in their area, including the expansion of woodland of a range of types to provide multiple benefits. Scottish Government advice on planning for forestry and woodlands is set out in The Right Tree in the Right Place[90].

Development Management

202. The siting and design of development should take account of local landscape character. Development management decisions should take account of potential effects on landscapes and the natural and water environment, including cumulative effects. Developers should seek to minimise adverse impacts through careful planning and design, considering the services that the natural environment is providing and maximising the potential for enhancement.

203. Planning permission should be refused where the nature or scale of proposed development would have an unacceptable impact on the natural environment. Direct or indirect effects on statutorily protected sites will be an important consideration, but designation does not impose an automatic prohibition on development.

204. Planning authorities should apply the precautionary principle where the impacts of a proposed development on nationally or internationally significant landscape or natural heritage resources are uncertain but there is sound evidence indicating that significant irreversible damage could occur. The precautionary principle should not be used to impede development without justification. If there is any likelihood that significant irreversible damage could occur, modifications to the proposal to eliminate the risk of such damage should be considered. If there is uncertainty, the potential for research, surveys or assessments to remove or reduce uncertainty should be considered.

205. Where peat and other carbon rich soils are present, applicants should assess the likely effects of development on carbon dioxide (CO_2) emissions. Where peatland is drained or otherwise disturbed, there is liable to be a release of CO_2 to the atmosphere. Developments should aim to minimise this release.

89 www.forestry.gov.uk/nwss

90 www.forestry.gov.uk/pdf/fcfc129.pdf/$file/fcfc129.pdf

206. Where non-native species are present on site, or where planting is planned as part of a development, developers should take into account the provisions of the Wildlife and Countryside Act 1981 relating to non-native species.

International Designations

Natura 2000 Sites

207. Sites designated as Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) make up the Natura 2000 network of protected areas. Any development plan or proposal likely to have a significant effect on these sites which is not directly connected with or necessary to their conservation management must be subject to an "appropriate assessment" of the implications for the conservation objectives. Such plans or proposals may only be approved if the competent authority has ascertained by means of an "appropriate assessment" that there will be no adverse effect on the integrity of the site.

208. A derogation is available for authorities to approve plans or projects which could adversely affect the integrity of a Natura site if:

- there are no alternative solutions;
- there are imperative reasons of overriding public interest, including those of a social or economic nature; and
- compensatory measures are provided to ensure that the overall coherence of the Natura network is protected.

209. If an authority wishes to use this derogation, Scottish Ministers must be notified. For sites hosting a priority habitat or species (as defined in Article 1 of the Habitats Directive), prior consultation with the European Commission via Scottish Ministers is required unless either the proposal is necessary for public health or safety reasons or it will have beneficial consequences of primary importance to the environment.

210. Authorities should afford the same level of protection to proposed SACs and SPAs (i.e. sites which have been approved by Scottish Ministers for formal consultation but which have not yet been designated) as they do to sites which have been designated.

Ramsar Sites

211. All Ramsar sites are also Natura 2000 sites and/or Sites of Special Scientific Interest and are protected under the relevant statutory regimes.

National Designations

212. Development that affects a National Park, National Scenic Area, Site of Special Scientific Interest or a National Nature Reserve should only be permitted where:

- the objectives of designation and the overall integrity of the area will not be compromised; or
- any significant adverse effects on the qualities for which the area has been designated are clearly outweighed by social, environmental or economic benefits of national importance.

213. Planning decisions for development within National Parks must be consistent with paragraphs 84-85.

Protected Species

214. The presence (or potential presence) of a legally protected species is an important consideration in decisions on planning applications. If there is evidence to suggest that a protected species is present on site or may be affected by a proposed development, steps must be taken to establish their presence. The level of protection afforded by legislation must be factored into the planning and design of the development and any impacts must be fully considered prior to the determination of the application. Certain activities – for example those involving European Protected Species as specified in the Conservation (Natural Habitats, &c.) Regulations 1994 and wild birds, protected animals and plants under the Wildlife and Countryside Act 1981 – may only be undertaken under licence. Following the introduction of the Wildlife and Natural Environment (Scotland) Act 2011, Scottish Natural Heritage is now responsible for the majority of wildlife licensing in Scotland.

Areas of Wild Land

215. In areas of wild land (see paragraph 200), development may be appropriate in some circumstances. Further consideration will be required to demonstrate that any significant effects on the qualities of these areas can be substantially overcome by siting, design or other mitigation.

Woodland

216. Ancient semi-natural woodland is an irreplaceable resource and, along with other woodlands, hedgerows and individual trees, especially veteran trees of high nature conservation and landscape value, should be protected from adverse impacts resulting from development. Tree Preservation Orders[91] can be used to protect individual trees and groups of trees considered important for amenity or their cultural or historic interest.

217. Where appropriate, planning authorities should seek opportunities to create new woodland and plant native trees in association with development. If a development would result in the severing or impairment of connectivity between important woodland habitats, workable mitigation measures should be identified and implemented, preferably linked to a wider green network (see also the section on green infrastructure).

218. The Scottish Government's Control of Woodland Removal Policy[92] includes a presumption in favour of protecting woodland. Removal should only be permitted where it would achieve significant and clearly defined additional public benefits. Where woodland is removed in association with development, developers will generally be expected to provide compensatory planting. The criteria for determining the acceptability of woodland removal and further information on the implementation of the policy is explained in the Control of Woodland Removal Policy, and this should be taken into account when preparing development plans and determining planning applications.

91 www.scotland.gov.uk/Publications/2011/01/28152314/0

92 www.forestry.gov.uk/pdf/fcfc125.pdf/%24FILE/fcfc125.pdf

Maximising the Benefits of Green Infrastructure

NPF Context

219. NPF3 aims to significantly enhance green infrastructure networks, particularly in and around our cities and towns. Green infrastructure and improved access to open space can help to build stronger, healthier communities. It is an essential part of our long-term environmental performance and climate resilience. Improving the quality of our places and spaces through integrated green infrastructure networks can also encourage investment and development.

Policy Principles

220. Planning should protect, enhance and promote green infrastructure, including open space and green networks, as an integral component of successful placemaking.

221. The planning system should:

- consider green infrastructure as an integral element of places from the outset of the planning process;
- assess current and future needs and opportunities for green infrastructure to provide multiple benefits;
- facilitate the provision and long-term, integrated management of green infrastructure and prevent fragmentation; and
- provide for easy and safe access to and within green infrastructure, including core paths and other important routes, within the context of statutory access rights under the Land Reform (Scotland) Act 2003.

Key Documents

- Green Infrastructure: Design and Placemaking[93]
- Getting the Best from Our Land – A Land Use Strategy for Scotland[94]
- Planning Advice Note 65: Planning and Open Space[95]
- Reaching Higher – Scotland's National Strategy for Sport[96]
- The Play Strategy for Scotland and Action Plan[97]
- Let's Get Scotland Walking: The National Walking Strategy[98]

Delivery

Development Planning

222. Development plans should be based on a holistic, integrated and cross-sectoral approach to green infrastructure. They should be informed by relevant, up-to-date audits, strategies and action plans covering green infrastructure's multiple functions, for example open space, playing fields, pitches, outdoor access, core paths, active travel strategies, the historic environment, biodiversity, forestry and woodland, river basins, flood management, coastal zones and the marine environment.

93 www.scotland.gov.uk/Publications/2011/11/04140525/0
94 www.scotland.gov.uk/Publications/2011/03/17091927/0
95 www.scotland.gov.uk/Publications/2008/05/30100623/0
96 www.scotland.gov.uk/Topics/ArtsCultureSport/Sport/NationalStrategies/Sport-21
97 www.scotland.gov.uk/Publications/2013/10/9424
98 www.scotland.gov.uk/Publications/2014/06/5743

Plans should promote consistency with these and reflect their priorities and spatial implications.

223. Strategic development plans should safeguard existing strategic or regionally important assets and identify strategic priorities for green infrastructure addressing cross-boundary needs and opportunities.

224. Local development plans should identify and protect open space identified in the open space audit and strategy as valued and functional or capable of being brought into use to meet local needs.

225. Local development plans should seek to enhance existing and promote the creation of new green infrastructure, which may include retrofitting. They should do this through a design-led approach, applying standards which facilitate appropriate provision, addressing deficits or surpluses within the local context. The standards delivered through a design-led approach should result in a proposal that is appropriate to place, including connections to other green infrastructure assets. Supplementary guidance or master plans may be used to achieve this.

226. Local development plans should identify sites for new indoor or outdoor sports, recreation or play facilities where a need has been identified in a local facility strategy, playing field strategy or similar document. They should provide for good quality, accessible facilities in sufficient quantity to satisfy current and likely future community demand. Outdoor sports facilities should be safeguarded from development except where:

- the proposed development is ancillary to the principal use of the site as an outdoor sports facility;
- the proposed development involves only a minor part of the outdoor sports facility and would not affect its use and potential for sport and training;
- the outdoor sports facility which would be lost would be replaced either by a new facility of comparable or greater benefit for sport in a location that is convenient for users, or by the upgrading of an existing outdoor sports facility to provide a facility of better quality on the same site or at another location that is convenient for users and maintains or improves the overall playing capacity in the area; or
- the relevant strategy (see paragraph 224) and consultation with **sport**scotland show that there is a clear excess of provision to meet current and anticipated demand in the area, and that the site would be developed without detriment to the overall quality of provision.

227. Local development plans should safeguard existing and potential allotment sites to ensure that local authorities meet their statutory duty to provide allotments where there is proven demand. Plans should also encourage opportunities for a range of community growing spaces.

228. Local development plans should safeguard access rights and core paths, and encourage new and enhanced opportunities for access linked to wider networks.

229. Local development plans should encourage the temporary use of unused or underused land as green infrastructure while making clear that this will not prevent any future development potential which has been identified from being realised. This type of greening may provide the advance structure planting to create the landscape framework for any future development.

Development Management

230. Development of land allocated as green infrastructure for an unrelated purpose should have a strong justification. This should be based on evidence from relevant audits and strategies that the proposal will not result in a deficit of that type of provision within the local area and that alternative sites have been considered. Poor maintenance and neglect should not be used as a justification for development for other purposes.

231. Development proposals that would result in or exacerbate a deficit of green infrastructure should include provision to remedy that deficit with accessible infrastructure of an appropriate type, quantity and quality.

232. In the design of green infrastructure, consideration should be given to the qualities of successful places. Green infrastructure should be treated as an integral element in how the proposal responds to local circumstances, including being well-integrated into the overall design layout and multi-functional. Arrangements for the long-term management and maintenance of green infrastructure, and associated water features, including common facilities, should be incorporated into any planning permission.

233. Proposals that affect regional and country parks must have regard to their statutory purpose of providing recreational access to the countryside close to centres of population, and should take account of their wider objectives as set out in their management plans and strategies.

Promoting Responsible Extraction of Resources

NPF Context

234. Minerals make an important contribution to the economy, providing materials for construction, energy supply and other uses, and supporting employment. NPF3 notes that minerals will be required as construction materials to support our ambition for diversification of the energy mix. Planning should safeguard mineral resources and facilitate their responsible use. Our spatial strategy underlines the need to address restoration of past minerals extraction sites in and around the Central Belt.

Policy Principles

235. The planning system should:

- recognise the national benefit of indigenous coal, oil and gas production in maintaining a diverse energy mix and improving energy security;
- safeguard workable resources and ensure that an adequate and steady supply is available to meet the needs of the construction, energy and other sectors;
- minimise the impacts of extraction on local communities, the environment and the built and natural heritage; and
- secure the sustainable restoration of sites to beneficial afteruse after working has ceased.

Key Documents

- Electricity Generation Policy Statement[99]
- Management of Extractive Waste (Scotland) Regulations 2010[100]
- PAN 50: Controlling the Environmental Effects of Surface Mineral Workings[101]
- Planning Advice Note 64: Reclamation of Surface Mineral Workings[102]
- Circular 2/2003: Safeguarding of Aerodromes, Technical Sites and Military Explosive Storage Areas[103]
- Circular 34/1996: Environment Act 1995 Section 96[104]

Delivery

Development Planning

236. Strategic development plans should ensure that adequate supplies of construction aggregates can be made available from within the plan area to meet the likely development needs of the city region over the plan period.

237. Local development plans should safeguard all workable mineral resources which are of economic or conservation value and ensure that these are not sterilised by other development. Plans should set out the factors that specific proposals will need to address, including:

- disturbance, disruption and noise, blasting and vibration, and potential pollution of land, air and water;
- impacts on local communities, individual houses, sensitive receptors and economic sectors important to the local economy;
- benefits to the local and national economy;
- cumulative impact with other mineral and landfill sites in the area;
- effects on natural heritage, habitats and the historic environment;
- landscape and visual impacts, including cumulative effects;
- transport impacts; and
- restoration and aftercare (including any benefits in terms of the remediation of existing areas of dereliction or instability).

238. Plans should support the maintenance of a landbank of permitted reserves for construction aggregates of at least 10 years at all times in all market areas through the identification of areas of search. Such areas can be promoted by developers or landowners as part of the plan preparation process or by planning authorities where they wish to guide development to particular areas. As an alternative, a criteria-based approach may be taken, particularly where a sufficient landbank already exists or substantial unconstrained deposits are available.

99 www.scotland.gov.uk/Publications/2013/06/5757
100 www.legislation.gov.uk/ssi/2010/60/contents/made
101 www.scotland.gov.uk/Publications/1996/10/17729/23424
102 www.scotland.gov.uk/Publications/2003/01/16122/16256
103 www.scotland.gov.uk/Publications/2003/01/16204/17030
104 www.scotland.gov.uk/Publications/1996/11/circular-34-1996-root/circular-34-1996-guidance

239. Local development plans should identify areas of search where surface coal extraction is most likely to be acceptable during the plan period and set out the preferred programme for the development of other safeguarded areas beyond the plan period, with particular emphasis on protecting local communities from significant cumulative impacts. Where possible, plans should secure extraction prior to permanent development above workable coal reserves.

240. For areas covered by a Petroleum Exploration and Development Licence (PEDL), local development plans should also:

- identify licence areas;
- encourage operators to be as clear as possible about the minimum and maximum extent of operations (e.g. number of wells and duration) at the exploration phase whilst recognising that the factors to be addressed by applications should be relevant and proportionate to the appropriate exploration, appraisal and production phases of operations;
- confirm that applicants should engage with local communities, residents and other stakeholders at each stage of operations, beginning in advance of any application for planning permission and in advance of any operations;
- ensure that when developing proposals, applicants should consider, where possible, transport of the end product by pipeline, rail or water rather than road; and
- provide a consistent approach to extraction where licences extend across local authority boundaries.

241. Policies should protect areas of peatland and only permit commercial extraction in areas suffering historic, significant damage through human activity and where the conservation value is low and restoration is impossible.

Development Management

242. Operators should provide sufficient information to enable a full assessment to be made of the likely effects of development together with appropriate control, mitigation and monitoring measures. This should include the provision of an adequate buffer zone between sites and settlements, taking account of the specific circumstances of individual proposals, including size, duration, location, method of working, topography, the characteristics of the various environmental effects likely to arise and the mitigation that can be provided.

243. Borrow pits should only be permitted if there are significant environmental or economic benefits compared to obtaining material from local quarries; they are time-limited; tied to a particular project and appropriate reclamation measures are in place.

244. Consent should only be granted for surface coal extraction proposals which are either environmentally acceptable (or can be made so by planning conditions) or provide local or community benefits which clearly outweigh the likely impacts of extraction. Site boundaries within 500 metres of the edge of settlements will only be environmentally acceptable where local circumstances, such as the removal of dereliction, small-scale prior extraction or the stabilisation of mining legacy, justify a lesser distance. Non-engineering works and mitigation measures within 500 metres may be acceptable.

245. To assist planning authorities with their consideration of impacts on local communities, neighbouring uses and the environment, applicants should undertake a risk assessment for all proposals for shale gas and coal bed methane extraction. The assessment can, where appropriate, be undertaken as part of any environmental impact assessment and should also be developed in consultation with statutory consultees and local communities so that it informs the design of the proposal. The assessment should clearly identify those onsite activities (i.e. emission of pollutants, the creation and disposal of waste) that pose a potential risk using a source–pathway–receptor model and explain how measures, including those under environmental and other legislation, will be used to monitor, manage and mitigate any identified risks to health, amenity and the environment. The evidence from, and outcome of, the assessment should lead to buffer zones being proposed in the application which will protect all sensitive receptors from unacceptable risks. When considering applications, planning authorities and statutory consultees must assess the distances proposed by the applicant. Where proposed distances are considered inadequate the Scottish Government expects planning permission to be refused.

246. Conditions should be drafted in a way which ensures that hydraulic fracturing does not take place where permission for such operations is not sought and that any subsequent application to do so is subject to appropriate consultation. If such operations are subsequently proposed, they should, as a matter of planning policy, be regarded as a substantial change in the description of the development for which planning permission is sought or a material variation to the existing planning permission. Where PEDL and Underground Coal licences are granted for the same or overlapping areas, consideration should be given to the most efficient sequencing of extraction.

247. The Scottish Government is currently exploring a range of options relating to the effective regulation of surface coal mining. This is likely to result in further guidance on effective restoration measures in due course. In the meantime, planning authorities should, through planning conditions and legal agreements, continue to ensure that a high standard of restoration and aftercare is managed effectively and that such work is undertaken at the earliest opportunity. A range of financial guarantee options is currently available and planning authorities should consider the most effective solution on a site-by-site basis. All solutions should provide assurance and clarity over the amount and period of the guarantee and in particular, where it is a bond, the risks covered (including operator failure) and the triggers for calling in a bond, including payment terms. In the aggregates sector, an operator may be able to demonstrate adequate provision under an industry-funded guarantee scheme.

248. Planning authorities should ensure that rigorous procedures are in place to monitor consents, including restoration arrangements, at appropriate intervals, and ensure that appropriate action is taken when necessary. The review of mineral permissions every 15 years should be used to apply up-to-date operating and environmental standards although requests from operators to postpone reviews should be considered favourably if existing conditions are already achieving acceptable standards. Conditions should not impose undue restrictions on consents at quarries for building or roofing stone to reflect the likely intermittent or low rate of working at such sites.

Supporting Aquaculture

NPF Context

249. Aquaculture makes a significant contribution to the Scottish economy, particularly for coastal and island communities. Planning can help facilitate sustainable aquaculture whilst protecting and maintaining the ecosystem upon which it depends. Planning can play a role in supporting the sectoral growth targets to grow marine finfish (including farmed Atlantic salmon) production sustainably to 210,000 tonnes; and shellfish, particularly mussels, sustainably to 13,000 tonnes with due regard to the marine environment by 2020.

Policy Principles

250. The planning system should:

- play a supporting role in the sustainable growth of the finfish and shellfish sectors to ensure that the aquaculture industry is diverse, competitive and economically viable;
- guide development to coastal locations that best suit industry needs with due regard to the marine environment;
- maintain a presumption against further marine finfish farm developments on the north and east coasts to safeguard migratory fish species.

Key Documents

- National Marine Plan

Delivery

Development Planning

251. Local development plans should make positive provision for aquaculture developments. Plans, or supplementary guidance, should take account of Marine Scotland's locational policies when identifying areas potentially suitable for new development and sensitive areas which are unlikely to be appropriate for such development. They should also set out the issues that will be considered when assessing specific proposals, which could include:

- impacts on, and benefits for, local communities;
- economic benefits of the sustainable development of the aquaculture industry;
- landscape, seascape and visual impact;
- biological carrying capacity;
- effects on coastal and marine species (including wild salmonids) and habitats;
- impacts on the historic environment and the sea or loch bed;
- interaction with other users of the marine environment (including commercial fisheries, Ministry of Defence, navigational routes, ports and harbours, anchorages, tourism, recreational and leisure activities); and
- cumulative effects on all of the above factors.

Development Management

252. Applications should be supported, where necessary, by sufficient information to demonstrate:

- operational arrangements (including noise, light, access, waste and odour) are satisfactory and sufficient mitigation plans are in place; and
- the siting and design of cages, lines and associated facilities are appropriate for the location. This should be done through the provision of information on the extent of the site; the type, number and physical scale of structures; the distribution of the structures across the planning area; on-shore facilities; and ancillary equipment.

253. Any land-based facilities required for the proposal should, where possible, be considered at the same time. The planning system should not duplicate other control regimes such as controlled activities regulation licences from SEPA or fish health, sea lice and containment regulation by Marine Scotland.

Managing Flood Risk and Drainage

NPF Context

254. NPF3 supports a catchment-scale approach to sustainable flood risk management. The spatial strategy aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Flooding can impact on people and businesses. Climate change will increase the risk of flooding in some parts of the country. Planning can play an important part in reducing the vulnerability of existing and future development to flooding.

Policy Principles

255. The planning system should promote:

- a precautionary approach to flood risk from all sources, including coastal, water course (fluvial), surface water (pluvial), groundwater, reservoirs and drainage systems (sewers and culverts), taking account of the predicted effects of climate change;
- flood avoidance: by safeguarding flood storage and conveying capacity, and locating development away from functional flood plains and medium to high risk areas;
- flood reduction: assessing flood risk and, where appropriate, undertaking natural and structural flood management measures, including flood protection, restoring natural features and characteristics, enhancing flood storage capacity, avoiding the construction of new culverts and opening existing culverts where possible; and
- avoidance of increased surface water flooding through requirements for Sustainable Drainage Systems (SuDS) and minimising the area of impermeable surface.

256. To achieve this the planning system should prevent development which would have a significant probability of being affected by flooding or would increase the probability of flooding elsewhere. Piecemeal reduction of the functional floodplain should be avoided given the cumulative effects of reducing storage capacity.

257. Alterations and small-scale extensions to existing buildings are outwith the scope of this policy, provided that they would not have a significant effect on the storage capacity of the functional floodplain or local flooding problems.

Key Documents

- Flood Risk Management (Scotland) Act 2009[105]
- Updated Planning Advice Note on Flooding
- Delivering Sustainable Flood Risk Management[106] (Scottish Government, 2011).
- Surface Water Management Planning Guidance[107] (Scottish Government, 2013).

Delivery

258. Planning authorities should have regard to the probability of flooding from all sources and take flood risk into account when preparing development plans and determining planning applications. The calculated probability of flooding should be regarded as a best estimate and not a precise forecast. Authorities should avoid giving any indication that a grant of planning permission implies the absence of flood risk.

259. Developers should take into account flood risk and the ability of future occupiers to insure development before committing themselves to a site or project, as applicants and occupiers have ultimate responsibility for safeguarding their property.

Development Planning

260. Plans should use strategic flood risk assessment (SFRA) to inform choices about the location of development and policies for flood risk management. They should have regard to the flood maps prepared by Scottish Environment Protection Agency (SEPA), and take account of finalised and approved Flood Risk Management Strategies and Plans and River Basin Management Plans.

261. Strategic and local development plans should address any significant cross boundary flooding issues. This may include identifying major areas of the flood plain and storage capacity which should be protected from inappropriate development, major flood protection scheme requirements or proposals, and relevant drainage capacity issues.

262. Local development plans should protect land with the potential to contribute to managing flood risk, for instance through natural flood management, managed coastal realignment, washland or green infrastructure creation, or as part of a scheme to manage flood risk.

263. Local development plans should use the following flood risk framework to guide development. This sets out three categories of coastal and watercourse flood risk, together with guidance on surface water flooding, and the appropriate planning approach for each (the annual probabilities referred to in the framework relate to the land at the time a plan is being prepared or a planning application is made):

- **Little or No Risk** – annual probability of coastal or watercourse flooding is less than 0.1% (1:1000 years)
  - No constraints due to coastal or watercourse flooding.

105 www.legislation.gov.uk/asp/2009/6/contents

106 www.scotland.gov.uk/Publications/2011/06/15150211/0

107 http://www.scotland.gov.uk/Publications/2013/02/7909/0

- **Low to Medium Risk** – annual probability of coastal or watercourse flooding is between 0.1% and 0.5% (1:1000 to 1:200 years)
  - Suitable for most development. A flood risk assessment may be required at the upper end of the probability range (i.e. close to 0.5%), and for essential infrastructure and the most vulnerable uses. Water resistant materials and construction may be required.
  - Generally not suitable for civil infrastructure. Where civil infrastructure must be located in these areas or is being substantially extended, it should be designed to be capable of remaining operational and accessible during extreme flood events.
- **Medium to High Risk** – annual probability of coastal or watercourse flooding is greater than 0.5% (1:200 years)
  - May be suitable for:
    - residential, institutional, commercial and industrial development within built-up areas provided flood protection measures to the appropriate standard already exist and are maintained, are under construction, or are a planned measure in a current flood risk management plan;
    - essential infrastructure within built-up areas, designed and constructed to remain operational during floods and not impede water flow;
    - some recreational, sport, amenity and nature conservation uses, provided appropriate evacuation procedures are in place; and
    - job-related accommodation, e.g. for caretakers or operational staff.
  - Generally not suitable for:
    - civil infrastructure and the most vulnerable uses;
    - additional development in undeveloped and sparsely developed areas, unless a location is essential for operational reasons, e.g. for navigation and water-based recreation, agriculture, transport or utilities infrastructure (which should be designed and constructed to be operational during floods and not impede water flow), and an alternative, lower risk location is not available; and
    - new caravan and camping sites.
  - Where built development is permitted, measures to protect against or manage flood risk will be required and any loss of flood storage capacity mitigated to achieve a neutral or better outcome.
  - Water-resistant materials and construction should be used where appropriate. Elevated buildings on structures such as stilts are unlikely to be acceptable.

Surface Water Flooding

- Infrastructure and buildings should generally be designed to be free from surface water flooding in rainfall events where the annual probability of occurrence is greater than 0.5% (1:200 years).
- Surface water drainage measures should have a neutral or better effect on the risk of flooding both on and off the site, taking account of rain falling on the site and run-off from adjacent areas.

Development Management

264. It is not possible to plan for development solely according to the calculated probability of flooding. In applying the risk framework to proposed development, the following should therefore be taken into account:

- the characteristics of the site;
- the design and use of the proposed development;
- the size of the area likely to flood;
- depth of flood water, likely flow rate and path, and rate of rise and duration;
- the vulnerability and risk of wave action for coastal sites;
- committed and existing flood protection methods: extent, standard and maintenance regime;
- the effects of climate change, including an allowance for freeboard;
- surface water run-off from adjoining land;
- culverted watercourses, drains and field drainage;
- cumulative effects, especially the loss of storage capacity;
- cross-boundary effects and the need for consultation with adjacent authorities;
- effects of flood on access including by emergency services; and
- effects of flood on proposed open spaces including gardens.

265. Land raising should only be considered in exceptional circumstances, where it is shown to have a neutral or better impact on flood risk outside the raised area. Compensatory storage may be required.

266. The flood risk framework set out above should be applied to development management decisions. Flood Risk Assessments (FRA) should be required for development in the medium to high category of flood risk, and may be required in the low to medium category in the circumstances described in the framework above, or where other factors indicate heightened risk. FRA will generally be required for applications within areas identified at high or medium likelihood of flooding/flood risk in SEPA's flood maps.

267. Drainage Assessments, proportionate to the development proposal and covering both surface and foul water, will be required for areas where drainage is already constrained or otherwise problematic, or if there would be off-site effects.

268. Proposed arrangements for SuDS should be adequate for the development and appropriate long-term maintenance arrangements should be put in place.

A Connected Place

Promoting Sustainable Transport and Active Travel

NPF Context

269. The spatial strategy set out in NPF3 is complemented by an ongoing programme of investment in transport infrastructure. The economy relies on efficient transport connections, within Scotland and to international markets. Planning can play an important role in improving connectivity and promoting more sustainable patterns of transport and travel as part of the transition to a low carbon economy.

Policy Principles

270. The planning system should support patterns of development which:

- optimise the use of existing infrastructure;
- reduce the need to travel;
- provide safe and convenient opportunities for walking and cycling for both active travel and recreation, and facilitate travel by public transport;
- enable the integration of transport modes; and
- facilitate freight movement by rail or water.

271. Development plans and development management decisions should take account of the implications of development proposals on traffic, patterns of travel and road safety.

Key Documents

- National Transport Strategy[108]
- Climate Change (Scotland) Act 2009[109]
- Low Carbon Scotland: Meeting the Emissions Reduction Targets 2013-2027[110]
- Infrastructure Investment Plan[111]
- Strategic Transport Projects Review[112]
- Transport Assessment Guidance[113]
- Development Planning and Management Transport Appraisal Guidance (DPMTAG)[114]
- PAN 66: Best Practice in Handling Applications Affecting Trunk Roads[115]

108 www.scotland.gov.uk/Publications/2006/12/04104414/0

109 www.legislation.gov.uk/asp/2009/12/contents

110 www.scotland.gov.uk/Topics/Environment/climatechange/scotlands-action/lowcarbon/meetingthetargets

111 www.scotland.gov.uk/Publications/2011/12/05141922/0

112 www.transportscotland.gov.uk/strategic-transport-projects-review

113 www.transportscotland.gov.uk/system/files/documents/tsc-basic-pages/Planning_Reform_-_DPMTAG_-_Development_Management__DPMTAG_Ref__17__-_Transport_Assessment_Guidance_FINAL_-_June_2012.pdf

114 www.transportscotland.gov.uk/development-planning-and-management-transport-appraisal-guidance-dpmtag

115 www.scotland.gov.uk/Resource/Doc/47021/0026434.pdf

- Design Manual for Roads and Bridges[116]
- Designing Streets[117]
- Roads for All[118]
- Cycling Action Plan in Scotland[119] (CAPS)
- Let's Get Scotland Walking: The National Walking Strategy[120]
- A More Active Scotland – Building a Legacy from the Commonwealth Games[121]
- Switched On Scotland: A Roadmap to Widespread Adoption of Plug-in Vehicles[122]
- Tourism Development Framework for Scotland[123]

Delivery

Development Planning

272. Development plans should take account of the relationship between land use and transport and particularly the capacity of the existing transport network, environmental and operational constraints, and proposed or committed transport projects.

273. The spatial strategies set out in plans should support development in locations that allow walkable access to local amenities and are also accessible by cycling and public transport. Plans should identify active travel networks and promote opportunities for travel by more sustainable modes in the following order of priority: walking, cycling, public transport, cars. The aim is to promote development which maximises the extent to which its travel demands are met first through walking, then cycling, then public transport and finally through use of private cars. Plans should facilitate integration between transport modes.

274. In preparing development plans, planning authorities are expected to appraise the impact of the spatial strategy and its reasonable alternatives on the transport network, in line with Transport Scotland's DPMTAG guidance. This should include consideration of previously allocated sites, transport opportunities and constraints, current capacity and committed improvements to the transport network. Planning authorities should ensure that a transport appraisal is undertaken at a scale and level of detail proportionate to the nature of the issues and proposals being considered, including funding requirements. Appraisals should be carried out in time to inform the spatial strategy and the strategic environmental assessment. Where there are potential issues for the strategic transport network, the appraisal should be discussed with Transport Scotland at the earliest opportunity.

116 www.dft.gov.uk/ha/standards/dmrb/index.htm
117 www.scotland.gov.uk/Publications/2010/03/22120652/0
118 http://www.transportscotland.gov.uk/guides/j256264-00.htm
116 www.transportscotland.gov.uk/strategy-and-research/publications-and-consultations/cycling-action-plan-2013
120 www.scotland.gov.uk/Publications/2014/06/5743
121 www.scotland.gov.uk/Publications/2014/02/8239/0
122 www.transportscotland.gov.uk/report/j272736-00.htm
123 www.visitscotland.org/pdf/Tourism%20Development%20Framework%20-%20FINAL.pdf

275. Development plans should identify any required new transport infrastructure or public transport services, including cycle and pedestrian routes, trunk road and rail infrastructure. The deliverability of this infrastructure, and by whom it will be delivered, should be key considerations in identifying the preferred and alternative land use strategies. Plans and associated documents, such as supplementary guidance and the action programme, should indicate how new infrastructure or services are to be delivered and phased, and how and by whom any developer contributions will be made. These should be prepared in consultation with all of the parties responsible for approving and delivering the infrastructure. Development plans should support the provision of infrastructure necessary to support positive changes in transport technologies, such as charging points for electric vehicles.

276. Where public transport services required to serve a new development cannot be provided commercially, a contribution from the developer towards an agreed level of service may be appropriate. The development plan action programme should set out how this will be delivered, and the planning authority should coordinate discussions with the public transport provider, developer, Transport Scotland where appropriate, and relevant regional transport partnerships at an early stage in the process. In rural areas the plan should be realistic about the likely viability of public transport services and innovative solutions such as demand-responsive public transport and small-scale park and ride facilities at nodes on rural bus corridors should be considered.

277. Disused railway lines with a reasonable prospect of being reused as rail, tram, bus rapid transit or active travel routes should be safeguarded in development plans. The strategic case for a new station should emerge from a complete and robust multimodal transport appraisal in line with Scottish Transport Appraisal Guidance. Any appraisal should include consideration of making best use of current rail services; and should demonstrate that the needs of local communities, workers or visitors are sufficient to generate a high level of demand, and that there would be no adverse impact on the operation of the rail service franchise. Funding partners must be identified. Agreement should be reached with Transport Scotland and Network Rail before rail proposals are included in a development plan or planning application and it should be noted that further technical assessment and design work will be required before any proposed new station can be confirmed as viable.

278. While new junctions on trunk roads are not normally acceptable, the case for a new junction will be considered where the planning authority considers that significant economic growth or regeneration benefits can be demonstrated. New junctions will only be considered if they are designed in accordance with DMRB and where there would be no adverse impact on road safety or operational performance.

279. Significant travel-generating uses should be sited at locations which are well served by public transport, subject to parking restraint policies, and supported by measures to promote the availability of high-quality public transport services. New development areas should be served by public transport providing access to a range of destinations. Development plans should indicate when a travel plan will be required to accompany a proposal for a development which will generate significant travel.

280. Along with sound choices on the location of new development, appropriate street layout and design are key are to achieving the policy principles at paragraph 270. The design of all new development should follow the placemaking approach set out in this SPP and the principles of Designing Streets, to ensure the creation of places which are distinctive, welcoming, adaptable, resource efficient, safe and pleasant and easy to move around and beyond.

281. National maximum parking standards for certain types and scales of development have been set to promote consistency (see Annex B: Parking Policies and Standards). Where an area is well served by sustainable transport modes, planning authorities may set more restrictive standards, and where public transport provision is limited, planning authorities may set less restrictive standards. Local authorities should also take account of relevant town centre strategies when considering appropriate parking provision (see paragraphs 64-65 and Annex A: Town Centre Health Checks and Strategies).

282. When preparing development plans, planning authorities should consider the need for improved and additional freight transfer facilities. Strategic freight sites should be safeguarded in development plans. Existing roadside facilities and provision for lorry parking should be safeguarded and, where required, development plans should make additional provision for the overnight parking of lorries at appropriate locations on routes with a high volume of lorry traffic. Where appropriate, development plans should also identify suitable locations for new or expanded rail freight interchanges to support increased movement of freight by rail. Facilities allowing the transfer of freight from road to rail or water should also be considered.

283. Planning authorities and port operators should work together to address the planning and transport needs of ports and opportunities for rail access should be safeguarded in development plans. Planning authorities should ensure that there is appropriate road access to ferry terminals for cars and freight, and support the provision of bus and train interchange facilities.

284. Planning authorities, airport operators and other stakeholders should work together to prepare airport masterplans and address other planning and transport issues relating to airports. Relevant issues include public safety zone safeguarding, surface transport access for supplies, air freight, staff and passengers, related on- and off-site development such as transport interchanges, offices, hotels, car parks, warehousing and distribution services, and other development benefiting from good access to the airport.

285. Canals, which are scheduled monuments, should be safeguarded as assets which can contribute to sustainable economic growth through sensitive development and regeneration. Consideration should be given to planning for new uses for canals, where appropriate.

Development Management

286. Where a new development or a change of use is likely to generate a significant increase in the number of trips, a transport assessment should be carried out. This should identify any potential cumulative effects which need to be addressed.

287. Planning permission should not be granted for significant travel-generating uses at locations which would increase reliance on the car and where:

- direct links to local facilities via walking and cycling networks are not available or cannot be made available;
- access to local facilities via public transport networks would involve walking more than 400m; or
- the transport assessment does not identify satisfactory ways of meeting sustainable transport requirements.

Guidance is available in Transport Assessment and Implementation: A Guide[124]

124 www.scotland.gov.uk/Publications/2005/08/1792325/23264

288. Buildings and facilities should be accessible by foot and bicycle and have appropriate operational and servicing access for large vehicles. Cycle routes, cycle parking and storage should be safeguarded and enhanced wherever possible.

289. Consideration should be given to how proposed development will contribute to fulfilling the objectives of Switched On Scotland – A Roadmap to Widespread Adoption of Plug-in Vehicles. Electric vehicle charge points should always be considered as part of any new development and provided where appropriate.

290. Development proposals that have the potential to affect the performance or safety of the strategic transport network need to be fully assessed to determine their impact. Where existing infrastructure has the capacity to accommodate a development without adverse impacts on safety or unacceptable impacts on operational performance, further investment in the network is not likely to be required. Where such investment is required, the cost of the mitigation measures required to ensure the continued safe and effective operation of the network will have to be met by the developer.

291. Consideration should be given to appropriate planning restrictions on construction and operation related transport modes when granting planning permission, especially where bulk material movements are expected, for example freight from extraction operations.

Supporting Digital Connectivity

NPF Context

292. NPF3 highlights the importance of our digital infrastructure, across towns and cities, and in particular our more remote rural and island areas. Our economy and social networks depend heavily on high-quality digital infrastructure. To facilitate investment across Scotland, planning has an important role to play in strengthening digital communications capacity and coverage across Scotland.

Policy Principles

293. The planning system should support:

- development which helps deliver the Scottish Government's commitment to world-class digital connectivity;
- the need for networks to evolve and respond to technology improvements and new services;
- inclusion of digital infrastructure in new homes and business premises; and
- infrastructure provision which is sited and designed to keep environmental impacts to a minimum.

Key Documents

- Scotland's Digital Future[125] and associated Infrastructure Action Plan[126]
- Scotland's Cities: Delivering for Scotland[127]
- A National Telehealth and Telecare Delivery Plan for Scotland to 2015[128]

125 www.scotland.gov.uk/Resource/Doc/981/0114237.pdf
126 www.scotland.gov.uk/Publications/2012/01/1487
127 www.scotland.gov.uk/Publications/2012/01/05104741/0
128 www.scotland.gov.uk/Resource/0041/00411586.pdf

- Planning Advice Note 62, Radio Telecommunications provides advice on siting and design[129]
- Circular 2/2003: Safeguarding of Aerodromes, Technical Sites and Military Explosives Storage Areas[130]

Delivery

Development Planning

294. Local development plans should reflect the infrastructure roll-out plans of digital communications operators, community groups and others, such as the Scottish Government, the UK Government and local authorities.

295. Local development plans should provide a consistent basis for decision-making by setting out the criteria which will be applied when determining planning applications for communications equipment. They should ensure that the following options are considered when selecting sites and designing base stations:

- mast or site sharing;
- installation on buildings or other existing structures;
- installing the smallest suitable equipment, commensurate with technological requirements;
- concealing or disguising masts, antennas, equipment housing and cable runs using design and camouflage techniques where appropriate; and
- installation of ground-based masts.

296. Local development plans should set out the matters to be addressed in planning applications for specific developments, including:

- an explanation of how the proposed equipment fits into the wider network;
- a description of the siting options (primarily for new sites) and design options which satisfy operational requirements, alternatives considered, and the reasons for the chosen solution;
- details of the design, including height, materials and all components of the proposal;
- details of any proposed landscaping and screen planting, where appropriate;
- an assessment of the cumulative effects of the proposed development in combination with existing equipment in the area;
- a declaration that the equipment and installation is designed to be in full compliance with the appropriate ICNIRP guidelines for public exposure to radiofrequency radiation[131]; and
- an assessment of visual impact, if relevant.

297. Policies should encourage developers to explore opportunities for the provision of digital infrastructure to new homes and business premises as an integral part of development. This should be done in consultation with service providers so that appropriate, universal and future-proofed infrastructure is installed and utilised.

129 www.scotland.gov.uk/Publications/2001/09/pan62/pan62-

130 www.scotland.gov.uk/Publications/2003/01/16204/17030

131 The radiofrequency public exposure guidelines of the International Commission on Non-Ionising Radiation Protection, as expressed in EU Council recommendation 1999/519/ EC on the limitation of exposure of the general public to electromagnetic fields.

Development Management

298. Consideration should be given to how proposals for infrastructure to deliver new services or infrastructure to improve existing services will contribute to fulfilling the objectives for digital connectivity set out in the Scottish Government's World Class 2020 document. For developments that will deliver entirely new connectivity – for example, mobile connectivity in a "not spot" – consideration should be given to the benefits of this connectivity for communities and the local economy.

299. All components of equipment should be considered together and designed and positioned as sensitively as possible, though technical requirements and constraints may limit the possibilities. Developments should not physically obstruct aerodrome operations, technical sites or existing transmitter/receiver facilities. The cumulative visual effects of equipment should be taken into account.

300. Planning authorities should not question the need for the service to be provided nor seek to prevent competition between operators. The planning system should not be used to secure objectives that are more properly achieved under other legislation. Emissions of radiofrequency radiation are controlled and regulated under other legislation and it is therefore not necessary for planning authorities to treat radiofrequency radiation as a material consideration.

Annex A – Town Centre Health Checks and Strategies

Town centre health checks should cover a range of indicators, such as:

Activities

- retailer representation and intentions (multiples and independents);
- employment;
- cultural and social activity;
- community activity;
- leisure and tourism facilities;
- resident population; and
- evening/night-time economy.

Physical environment

- space in use for the range of town centre functions and how it has changed;
- physical structure of the centre, condition and appearance including constraints and opportunities and assets;
- historic environment; and
- public realm and green infrastructure.

Property

- vacancy rates, particularly at street level in prime retail areas;
- vacant sites;
- committed developments;
- commercial yield; and
- prime rental values.

Accessibility

- pedestrian footfall;
- accessibility;
- cycling facilities and ease of movement;
- public transport infrastructure and facilities;
- parking offer; and
- signage and ease of navigation.

Community

- attitudes, perceptions and aspirations.

Town centre strategies should:

- be prepared collaboratively with community planning partners, businesses and the local community;
- recognise the changing roles of town centres and networks, and the effect of trends in consumer activity;
- establish an agreed long-term vision for the town centre;
- seek to maintain and improve accessibility to and within the town centre;
- seek to reduce the centre's environmental footprint, through, for example, the development or extension of sustainable urban drainage or district heating networks;
- identify how green infrastructure can enhance air quality, open space, landscape/settings, reduce urban heat island effects, increase capacity of drainage systems, and attenuate noise;
- indicate the potential for change through redevelopment, renewal, alternative uses and diversification based on an analysis of the role and function of the centre;
- promote opportunities for new development, using master planning and design, while seeking to safeguard and enhance built and natural heritage;
- consider constraints such as fragmented site ownership, unit size and funding availability, and recognise the rapidly changing nature of retail formats;
- identify actions, tools and delivery mechanisms to overcome these constraints, for example improved management, Town Teams, Business Improvement Districts or the use of compulsory purchase powers[132]; and
- include monitoring against the baseline provided by the health check to assess the extent to which it has delivered improvements.

More detailed advice on town centre health checks and strategies can be found in the Town Centre Masterplanning Toolkit.

132 www.scotland.gov.uk/Topics/archive/National-Planning-Policy/themes/ComPur

Annex B – Parking Policies and Standards

Parking Restraint Policy – National Maximum Parking Standards for New Development

In order to achieve consistency in the levels of parking provision for specific types and scales of development, the following national standards have been set:

- retail (food) (Use Class 1) 1000m^2 and above – up to 1 space per 14m^2;
- retail (non-food) (Use Class 1) 1000m^2 and above – up to 1 space per 20m^2;
- business (Use Class 4) 2500m^2 and above – up to 1 space per 30m^2;
- cinemas (Use Class 11a) 1000m^2 and above – up to 1 space per 5 seats;
- conference facilities 1000m^2 and above – up to 1 space per 5 seats;
- stadia 1500 seats and above – up to 1 space per 15 seats;
- leisure (other than cinemas and stadia) 1000m^2 and above – up to 1 space per 22m^2; and
- higher and further education (non-residential elements) 2500m^2 and above – up to 1 space per 2 staff plus 1 space per 15 students.

Local standards should support the viability of town centres. Developers of individual sites within town centres may be required to contribute to the overall parking requirement for the centre in lieu of individual parking provision.

Parking for Disabled People – Minimum Provision Standards for New Development

Specific provision should be made for parking for disabled people in addition to general provision. In retail, recreation and leisure developments, the minimum number of car parking spaces for disabled people should be:

- 3 spaces or 6% (whichever is greater) in car parks with up to 200 spaces; or
- 4 spaces plus 4% in car parks with more than 200 spaces.

Employers have a duty under employment law to consider the disabilities of their employees and visitors to their premises. The minimum number of car parking spaces for disabled people at places of employment should be:

- 1 space per disabled employee plus 2 spaces or 5% (whichever is greater) in car parks with up to 200 spaces; or
- 6 spaces plus 2% in car parks with more than 200 spaces.

Glossary

Affordable housing	Housing of a reasonable quality that is affordable to people on modest incomes.
Anchor development (in the context of heat demand)	A large scale development which has a constant high demand for heat.
Article 4 Direction	Article 4 of the Town and Country Planning (General Permitted Development) (Scotland) Order 1992 gives the Scottish Government and planning authorities the power to remove permitted development rights by issuing a direction.
Biodiversity	The variability in living organisms and the ecological complexes of which they are part. This includes diversity within species, between species and of ecosystems (UN Convention on Biological Diversity, 1992).
Brownfield land	Land which has previously been developed. The term may cover vacant or derelict land, land occupied by redundant or unused building and developed land within the settlement boundary where further intensification of use is considered acceptable.
Civil infrastructure (in the context of flood risk)	Hospitals, fire stations, emergency depots, schools, care homes, ground-based electrical and telecommunications equipment.
Climate change adaptation	The adjustment in economic, social or natural systems in response to actual or expected climatic change, to limit harmful consequences and exploit beneficial opportunities.
Climate change mitigation	Reducing the amount of greenhouse gases in the atmosphere and reducing activities which emit greenhouse gases to help slow down or make less severe the impacts of future climate change.
Community	A body of people. A community can be based on location (for example people who live or work in or use an area) or common interest (for example the business community, sports or heritage groups).
Cumulative impact	Impact in combination with other development. That includes existing developments of the kind proposed, those which have permission, and valid applications which have not been determined. The weight attached to undetermined applications should reflect their position in the application process.
Cumulative effects (in the context of the strategic transport network)	The effect on the operational performance of transport networks of a number of developments in combination, recognising that the effects of a group of sites, or development over an area may need different mitigation when considered together than when considered individually.

Ecosystems services	The benefits people obtain from ecosystems; these include provisioning services such as food, water, timber and fibre; regulating services that affect climate, floods, disease, waste and water quality; cultural services with recreational, aesthetic, and spiritual benefits; and supporting services such as soil formation, photosynthesis and nutrient cycling.
Effective housing land supply	The part of the established housing land supply which is free or expected to be free of development constraints in the period under consideration and will therefore be available for the construction of housing.
Energy Centre	A stand alone building or part of an existing or proposed building where heat or combined heat and electricity generating plant can be installed to service a district network.
Essential infrastructure (in a flood risk area for operational reasons)	Defined in SEPA guidance on vulnerability as 'essential transport infrastructure and essential utility infrastructure which may have to be located in a flood risk area for operational reasons. This includes electricity generating stations, power stations and grid and primary sub stations, water treatments works and sewage treatment works and wind turbines'.
Flood	The temporary covering by water from any source of land not normally covered by water, but not including the overflow of a sewage system.
Flood plain	The generally flat areas adjacent to a watercourse or the sea where water flows in time of flood or would flow but for the presence of flood prevention measures. The limits of a flood plain are defined by the peak water level of an appropriate return period event. See also 'Functional flood plain'.
Flood risk	The combination of the probability of a flood and the potential adverse consequences associated with a flood, for human health, the environment, cultural heritage and economic activity.
Freeboard allowance	A height added to the predicted level of a flood to take account of the height of waves or turbulence and uncertainty in estimating the probability of the flooding.
Functional flood plain	The areas of land where water flows in times of flood which should be safeguarded from further development because of their function as flood water storage areas. For planning purposes the functional floodplain will generally have a greater than 0.5% (1:200) probability of flooding in any year. See also 'Washland'.
Green infrastructure	Includes the 'green' and 'blue' (water environment) features of the natural and built environments that can provide benefits without being connected. Green features include parks, woodlands, trees, play spaces, allotments, community growing spaces, outdoor sports facilities, churchyards and cemeteries, swales, hedges, verges and gardens. Blue features include rivers, lochs, wetlands, canals, other water courses, ponds, coastal and marine areas including beaches, porous paving and sustainable urban drainage systems.

Green networks	Connected areas of green infrastructure and open space that together form an integrated and multi-functional network.
Hazardous substances	Substances and quantities as currently specified in and requiring consent under the Town and Country Planning (Hazardous Substances) (Scotland) Regulations 1993 as amended (due to be replaced in 2015 as part of the implementation of Directive 2012/18/EU).
Historic environment	Scotland's historic environment is the physical evidence for human activity that connects people with place, linked with the associations we can see, feel and understand.
Historic Marine Protected Areas	Areas designated in Scottish territorial waters (0-12 miles) under the Marine (Scotland) Act 2010 for the purpose of preserving marine historic assets of national importance.
Housing supply target	The total number of homes that will be delivered.
Hut	A simple building used intermittently as recreational accommodation (ie. not a principal residence); having an internal floor area of no more than 30m^2; constructed from low impact materials; generally not connected to mains water, electricity or sewerage; and built in such a way that it is removable with little or no trace at the end of its life. Huts may be built singly or in groups.
Major-accident hazard site	Site with or requiring hazardous substances consent.
Most vulnerable uses (in the context of flood risk and drainage)	Basement dwellings, isolated dwellings in sparsely populated areas, dwelling houses behind informal embankments, residential institutions such as residential care homes/prisons, nurseries, children's homes and educational establishments, caravans, mobile homes and park homes intended for permanent residential use, sites used for holiday or short-let caravans and camping, installations requiring hazardous substance consent.
National Nature Reserve (NNR)	An area considered to be of national importance for its nature conservation interests.
National Scenic Area (NSA)	An area which is nationally important for its scenic quality.
Open space	Space within and on the edge of settlements comprising green infrastructure and/or civic areas such as squares, market places and other paved or hard landscaped areas with a civic function. Detailed typologies of open space are included in PAN65.

Outdoor sports facilities	Uses where **sport**scotland is a statutory consultee under the Town and Country Planning (Development Management Procedure) (Scotland) Regulations 2013, which establishes 'outdoor sports facilities' as land used as: (a) an outdoor playing field extending to not less than 0.2ha used for any sport played on a pitch; (b) an outdoor athletics track; (c) a golf course; (d) an outdoor tennis court, other than those within a private dwelling, hotel or other tourist accommodation; and (e) an outdoor bowling green.
Outstanding Universal Value (OUV)	The Operational Guidelines for the Implementation of the World Heritage Convention, provided by the United Nations Educational, Scientific and Cultural Organisation (UNESCO) states that OUV means cultural and/or natural significance which is so exceptional as to transcend national boundaries and to be of common importance for present and future generations of all humanity. The Statement of OUV is the key reference for the future effective protection and management of the World Heritage Site.
PADHI	Planning Advice for Development near Hazardous Installations, issued by the Health and Safety Executive.
Prime agricultural land	Agricultural land identified as being Class 1, 2 or 3.1 in the land capability classification for agriculture developed by Macaulay Land Use Research Institute (now the James Hutton Institute).
Place	The environment in which we live; the people that inhabit these spaces; and the quality of life that comes from the interaction of people and their surroundings. Architecture, public space and landscape are central to this.
Pluvial flooding	Flooding as a result of rainfall runoff flowing or ponding over the ground before it enters a natural (e.g. watercourse) or artificial (e.g. sewer) drainage system or when it cannot enter a drainage system (e.g. because the system is already full to capacity or the drainage inlets have a limited capacity).
Ramsar sites	Wetlands designated under the Ramsar Convention on Wetlands of International Importance.
Scheduled monument	Archaeological sites, buildings or structures of national or international importance. The purpose of scheduling is to secure the long-term legal protection of the monument in the national interest, in situ and as far as possible in its existing state and within an appropriate setting.
Sensitive receptor	Aspect of the environment likely to be significantly affected by a development, which may include for example, population, fauna, flora, soil, water, air, climatic factors, material assets, landscape and the inter-relationship between these factors. In the context of planning for Zero Waste, sensitive receptors may include aerodromes and military air weapon ranges.

Setting	Is more than the immediate surroundings of a site or building, and may be related to the function or use of a place, or how it was intended to fit into the landscape of townscape, the view from it or how it is seen from areas round about, or areas that are important to the protection of the place, site or building.
Site of Special Scientific Interest (SSSI)	An area which is designated for the special interest of its flora, fauna, geology or geomorphological features.
Strategic Flood Risk Assessment	Provides an overview of flood risk in the area proposed for development. An assessment involves the collection, analysis and presentation of all existing available and readily derivable information on flood risk from all sources. SFRA applies a risk-based approach to identifying land for development and can help inform development plan flood risk policy and supplementary guidance.
Strategic Transport Nework	Includes the trunk road and rail networks. Its primary purpose is to provide the safe and efficient movement of strategic long-distance traffic between major centres, although in rural areas it also performs important local functions.
Sustainable Development	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs. The Brundtland Definition. Our Common Future, The World Commission on Environment and Development, 1987.
Sustainable Economic Growth	Building a dynamic and growing economy that will provide prosperity and opportunities for all, while ensuring that future generations can enjoy a better quality of life too.
Washland	An alternative term for the functional flood plain which carries the connotation that it floods very frequently.
Watercourse	All means of conveying water except a water main or sewer.
Windfall Sites	Sites which become available for development unexpectedly during the life of the development plan and so are not identified individually in the plan.

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www.scotland.gov.uk

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TAYplan
Strategic Development Plan

2016-2036

APPROVED OCTOBER 2017

Scotland's SusTAYnable Region

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Angus Council

Dundee City Council CHANGING FOR THE FUTURE

Fife Council

Perth & Kinross Council

LEADERSHIP AND ACTION

The decisions we make today will leave a legacy for future generations. Delivering on these decisions requires collaborative leadership and working with partners across the private and public sectors to best ensure that TAYplan is Scotland's sustainable region. We consulted on the Main Issues Report in 2014. Those comments have helped shape this Plan.

From smart-phones to shopping online, our lives don't stand still. Neither do our cities, towns and countryside. Town centres change, new supermarkets and house are built, offices replace factories. Some of these changes happen overnight; others are so gradual that you might not notice.

Change is constant, and so is planning. Planning is the way in which these changes are managed.

Everywhere in the country is covered by plans that say how land should be used in the future. Around Dundee and Perth, there are two levels of plans; the Strategic Development Plan – called TAYplan – and more detailed Local Development Plans.

TAYplan sets the overall planning vision for the next 20 years for the whole Dundee and Perth area, including North Fife and parts of Angus and Perth and Kinross. What TAYplan says will affect all our futures – where we live, work and play, where businesses and the public sector invest, and what our towns and countryside will look like in the future.

TAYplan is reviewed every 4 years to ensure that this planning framework manages change.

This Plan's vision centres on improving people's quality of life. The policies explain where development should go and how it will shape good quality places. Growing and strengthening the TAYplan economy is a key priority. Positively encouraging investment, creating new jobs and better connecting places to make it easier for people to move around, is all essential to achieve a stronger economy. Strong community empowerment can help communities to play a major role in shaping good quality places to live, work and play.

Collectively these can support healthier and more active lifestyles leading to improvements in the overall wellbeing of the population. The sustainability of these factors is also supported by measures which adapt to risks such as a changing climate and that enable us to live within the Earth's environmental limits.

The accompanying *TAYplan Action Programme* identifies the actions needed to deliver this Plan, who is responsible for delivering this and when.

Vision

By 2036, the TAYplan area will be sustainable, more attractive, competitive and vibrant without creating an unacceptable burden on our planet.

The quality of life will make it a place of first choice where more people choose to live, work, study and visit and where businesses choose to invest and create jobs.

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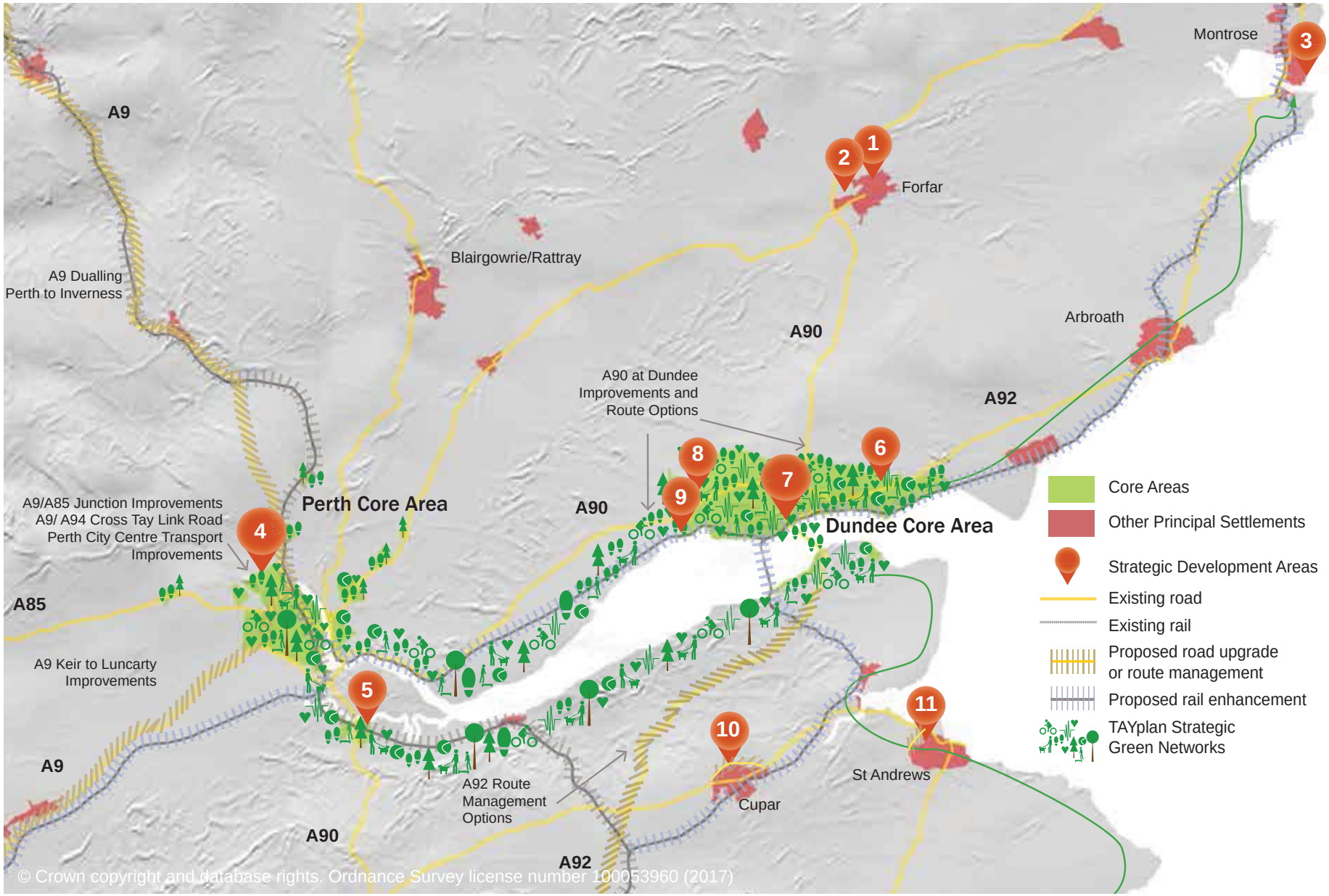
Transformational Projects - where major change will happen

Strategic Development Areas

1. Forfar Agricultural Centre
2. Orchardbank Forfar
3. Montrose Port
4. West/North West Perth
5. Oudenarde Bridge of Earn
6. Linlathen Dundee
7. Dundee Wider Waterfront
8. Dundee Western Gateway
9. James Hutton Institute
10. Cupar North
11. St Andrews West & Science Park



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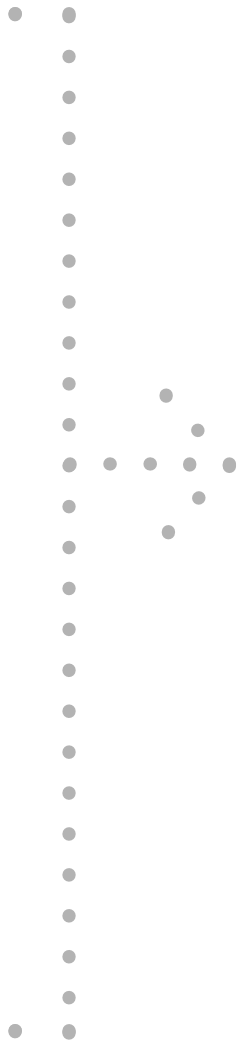
Vision:

“By 2036 the TAYplan area will be sustainable...
The quality of life will make it a place of first choice ...”

Outcomes

- more people are healthier
- through sustainable economic growth the region’s image will be enhanced
- we live, work and play in better quality environments
- we live within Earth’s environmental limits



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"Great! We can all live our whole life, from childhood to old age, in a place where we can easily access the jobs, services and facilities we all need for our everyday lives".

Peter age 76, grandad and retired from Perth and Sean age 21, grandson and student at University of Dundee

TAYplan: The location & place

Policy 1 LOCATION PRIORITIES

A. Principal Settlement Hierarchy
Strategies, plans, programmes and development proposals shall focus the majority of development in the region's principal settlements as shown on Map 1 (opposite):

Tier 1 principal settlements which have the potential to accommodate the majority of the region's additional development over the plan period and make a major contribution to the region's economy;

- Within Dundee Core Area in the principal settlements of Dundee City; including Dundee Western Gateway, and Invergowrie, Monifieth, Tayport/Newport/ Wormit, Birkhill/Muirhead; and,
- Within Perth Core Area in the principal settlements of Perth City, Scone, Almondbank, Bridge of Earn, Oudenarde, Methven, Stanley, Luncarty, Balbeggie, Perth Airport.

Tier 2 principal settlements which have the potential to make a major contribution to the regional economy but will accommodate a smaller share of the additional development; and,

Tier 3 principal settlements which have the potential to play an important but more modest role in the regional economy and will accommodate a small share of the additional development.

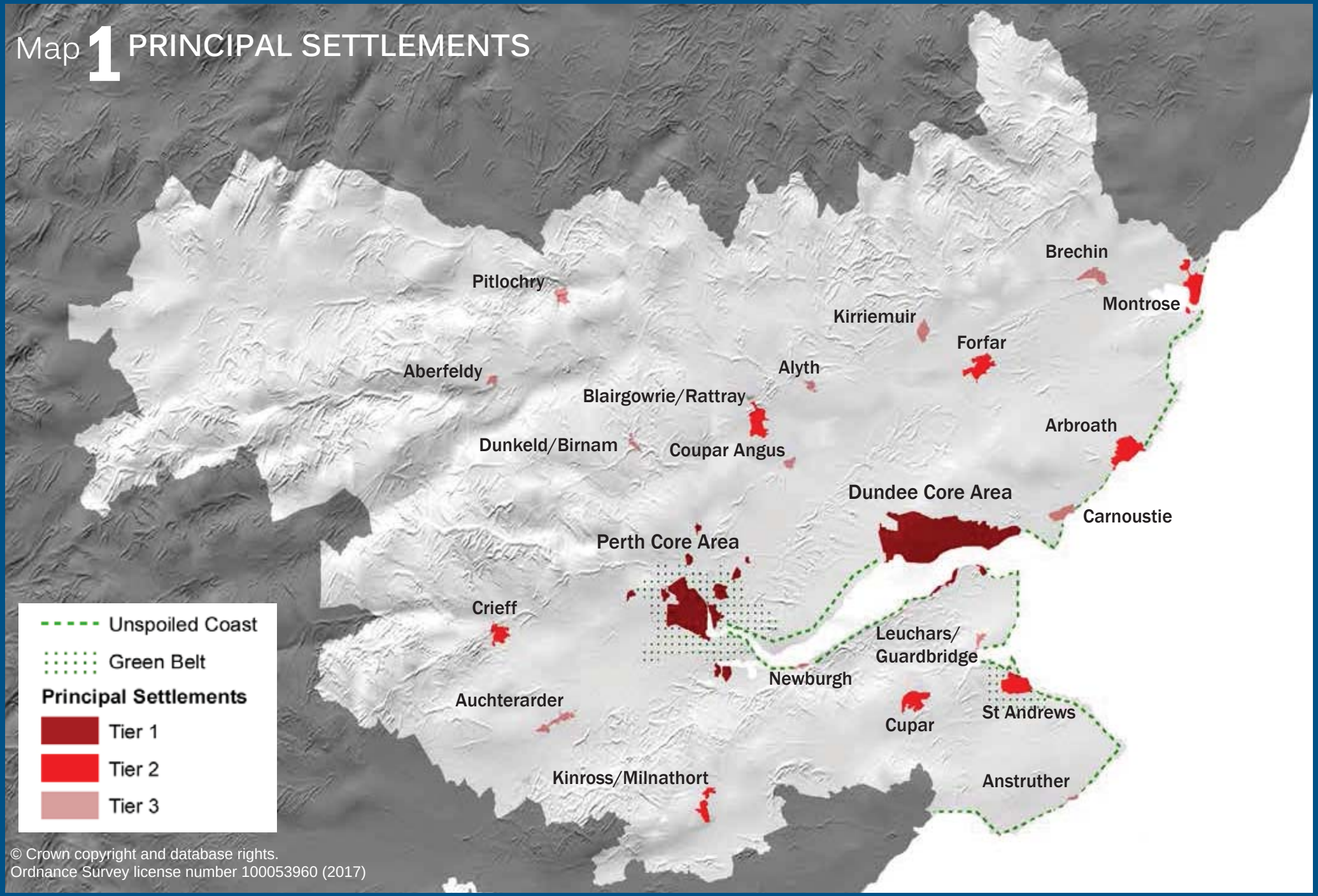
B. Sequential Approach
Strategies, plans and programmes shall prioritise land release for all principal settlements using the sequential approach in this Policy; shall prioritise within each category, as appropriate, the reuse of previously developed land and buildings (particularly listed buildings); and shall ensure that such land is effective or expected to become effective in the plan period, and that a range of sites is made available, as follows:

1. Land within principal settlements; then,
2. Land on the edge of principal settlements; then,
3. Where there is insufficient land or where the nature/scale of land use required to deliver the Plan cannot be accommodated within or on the edge of principal settlements, and where it is consistent with Part A of this policy and with Policy 2, the expansion of other settlements should be considered.

C. Outside of Principal Settlements
Local Development Plans may also provide for some development in settlements that are not defined as principal settlements (Policy 1A). This is provided that it can be accommodated and supported by the settlement, and in the countryside; that the development genuinely contributes to the outcomes of this Plan; and, it meets specific local needs or does not undermine regeneration of the cities or respective settlement. Proposals for development in the countryside should be assessed against the need to avoid suburbanisation of the countryside and unsustainable patterns of travel and development.

D. Green belts
Local Development Plans shall continue the implementation of green belt boundaries at both St Andrews and Perth to preserve their settings, views and special character including their historic cores; protect and provide access to open space; assist in safeguarding the countryside from encroachment; to manage long term planned growth including infrastructure on Map 10 and Strategic Development Areas in Policy 3; and define the types and scales of development that are appropriate within the green belt based on Scottish Planning Policy.

Map 1 PRINCIPAL SETTLEMENTS



2700

What this policy is for

Perth

This Plan sets out a spatial strategy to deliver a sustainable pattern of development which says where development should and should not go in order to deliver the vision and the outcomes which underpin it. Most new development will be built in principal settlements. These are the TAYplan area's cities and towns where most people live and most jobs, services and facilities are already located. They can have significant land and infrastructure capacity to accommodate future development.

This Plan has been informed by a range of assessments including a Strategic Environmental Assessment, Habitats Regulations Appraisal, Strategic Flood Risk Assessment, Housing Need and Demand Assessment and infrastructure capacity work.

LOCATION PRIORITIES

2701

West Sands, St Andrews

How this policy works

'Principal settlements' are where most growth will occur. Our cities, Dundee and Perth, are the key economic drivers of the region and continue to be the main focus of growth and new development. To manage this growth Policy 1 and Map 1 define 22 principal settlements. Their boundaries should be defined and reviewed regularly through the respective Local Development Plan.

A number of the principal settlements lie within what TAYplan calls 'Core Areas'. The Core Areas are centred on the cities of Dundee and Perth, essentially representing how the cities function. The majority of new development will be accommodated in the principal settlements within these Core Areas (defined in Policy 1 and Map 1).

Local Development Plans will identify appropriate effective land that is capable of delivering this sustainable pattern of development in the plan period, whilst also considering the requirements of other policies in this plan. This will provide for a mix of development, infrastructure and green space on a range of sites. Development on land within principal settlements, particularly brownfield land*, is preferable to development elsewhere.

There will be no need for any new settlements during the lifetime of this Plan.

Development outside of principal settlements (i.e. in the countryside or other settlements) is considered under Policy 1C. This balances supporting vibrant rural and coastal areas with avoiding suburbanisation of the countryside and unsustainable patterns of travel and development. This may require a varied approach to reflect the different characteristics of rural area within TAYplan. This is reinforced by Policy 4F which makes a presumption against housing proposals in areas surrounding the Dundee and Perth Core Areas, including the Carse of Gowrie, where this would adversely affect regeneration within the core areas, the delivery of Strategic Development Areas (Policy 3), or conflict with other parts of this Plan.

Greenbelts around St Andrews and Perth are defined through Local Development Plans. The unspoiled coast is illustrated on Map 1 and considered further in Policy 9. Local Development Plans will define the nature and extent of these areas, as appropriate, and the types and scale of appropriate development where necessary.

**brownfield land: land which has previously been developed, including vacant or derelict land, land occupied by redundant or unused building and developed land within the settlement boundary where further intensification of use is considered acceptable.*

Policy 2 SHAPING BETTER QUALITY PLACES

To deliver better quality development and places which respond to climate change, Local Development Plans, design frameworks masterplans/briefs and development proposals should be:

A. Place-led to deliver distinctive places by ensuring that the arrangement, layout, design, density and mix of development are shaped through incorporating and enhancing natural and historic assets*, natural processes, the multiple roles of infrastructure and networks, and local design context.

B. Active and healthy by design by ensuring that:
i. the principles of lifetime communities (p. 17) are designed-in;

ii. new development is integrated with existing community infrastructure and provides new community infrastructure/facilities where appropriate;

iii. collaborative working with other delivery bodies concentrates and co-locates new buildings, facilities and infrastructure; and,

iv. transport and land use are integrated to:

a. reduce the need to travel and improve accessibility by foot, cycle and public transport and related facilities;
b. make the best use of existing infrastructure to achieve an active travel environment combining different land uses with green space; and,
c. support land use and transport integration by transport assessments/ appraisals and travel plans where appropriate, including necessary on and off-site infrastructure.

C. Resilient and future-ready by ensuring that adaptability and resilience to a changing climate are built into the natural and built environments through:
i. a presumption against development in areas vulnerable to coastal erosion, flood risk and rising sea levels;

ii. assessing the probability of risk from all sources of flooding;

iii. the implementation of mitigation and management measures, where appropriate, to reduce flood risk; such as those envisaged by Scottish Planning Policy, Flood Risk Management Strategies and Local Flood Risk Management Plans when published;

iv. managing and enhancing the water systems within a development site to reduce surface water runoff including through use of sustainable drainage systems and storage;

v. protecting and utilising the natural water and carbon storage capacity of soils, such as peat lands, and woodland/other vegetation;

vi. Identifying, retaining and enhancing existing green networks and providing additional networks of green infrastructure (including planting in advance of development), whilst making the best use of their multiple roles; and,

vii. design-in and utilise natural and manmade ventilation and shading, green spaces/ networks, and green roofs and walls.

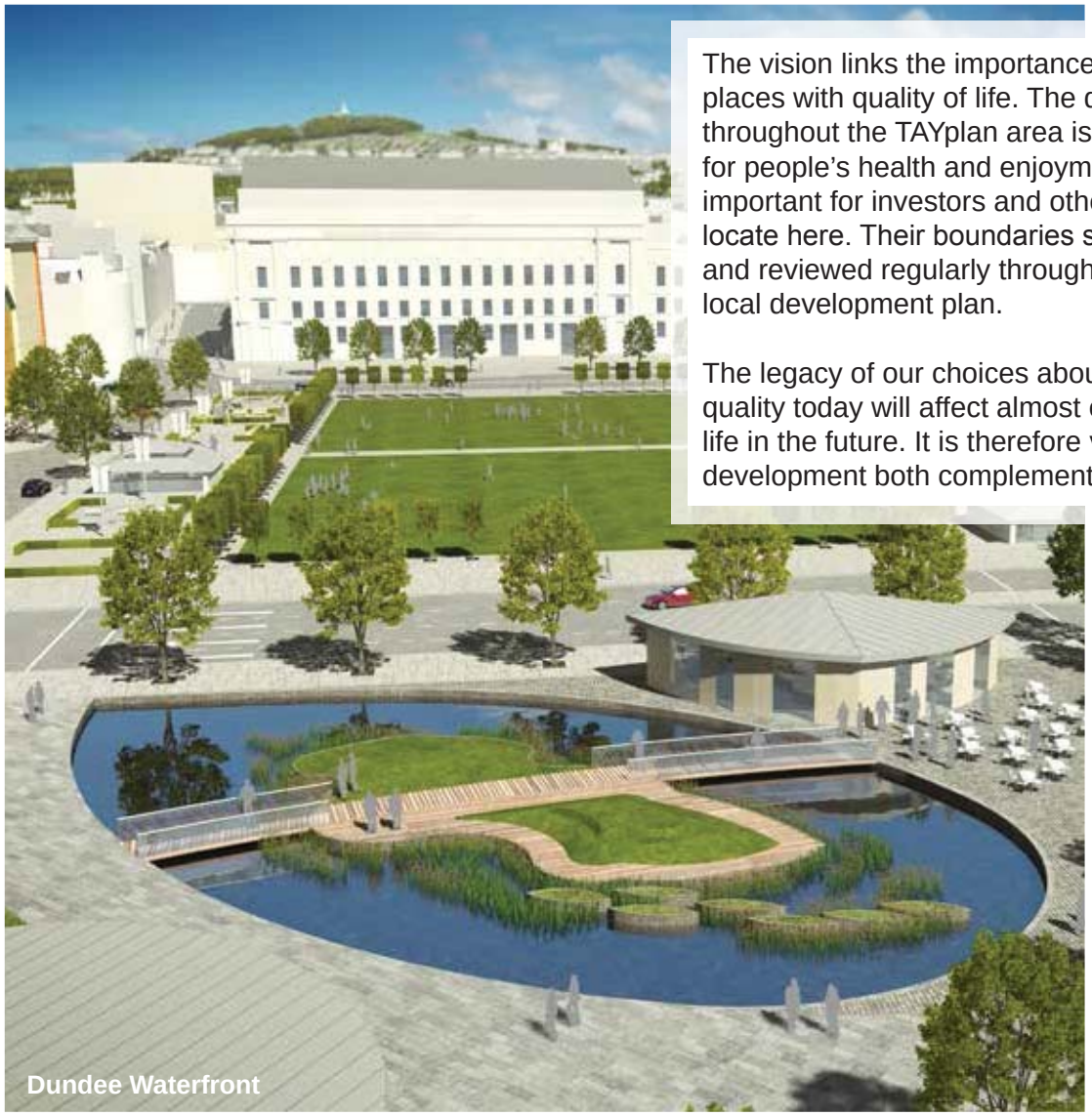
D. Efficient resource consumption by ensuring that:
i. waste management solutions are incorporated into development;

ii. high resource efficiency is incorporated within development through:

a. the orientation and design of buildings and the choice of materials to support passive standards; and,
b. the use of or designing in the capability for low/zero carbon heat and power generating technologies and storage to reduce carbon emissions and energy consumption; and,
c. the connection to heat networks or designing-in of heat network capability.

Footnotes
**Natural and historic assets: Landscapes, habitats, wildlife sites and corridors, vegetation, biodiversity, green spaces, geological features, water courses and ancient monuments, archaeological sites and landscape, historic battlefields, historic buildings, townscapes, parks, gardens and other designed landscapes, and other features (this includes but is not restricted to designated buildings or areas).*

What this policy is for



Dundee Waterfront

The vision links the importance of good quality places with quality of life. The quality of places throughout the TAYplan area is really important for people's health and enjoyment. It is also important for investors and others looking to locate here. Their boundaries should be defined and reviewed regularly through the respective local development plan.

The legacy of our choices about development quality today will affect almost every aspect of life in the future. It is therefore vital that new development both complements and enhances places and the way they function.

Local development plans will identify appropriate effective land that is capable of delivering this sustainable pattern of development in the plan period, whilst also considering the requirement of other policies in this plan. This will provide for a mix of development, infrastructure and green space on a range of sites. Good quality places can support economic prosperity by stimulating business opportunities around places where people want to live and spend time. This can improve economic competitiveness and contribute to a more inclusive economy and society. Dundee Waterfront shows how improving place quality can transform the perception and pride in a place.

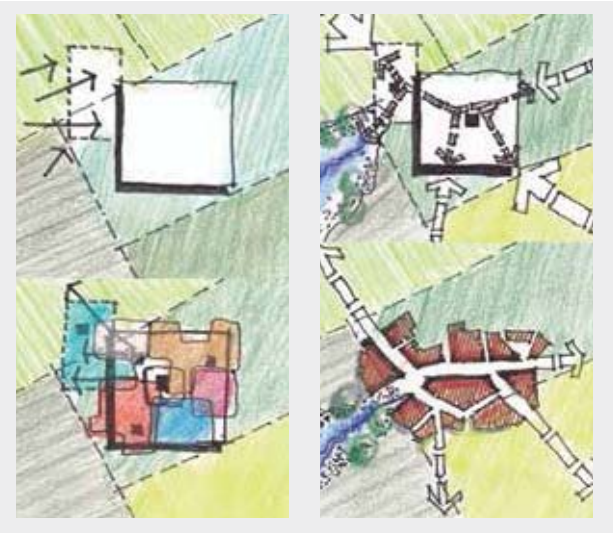
SHAPING BETTER QUALITY PLACES

2704

Place Led Approach

Outside – In
Understanding the environmental context of a site, how a site works in its wider setting and how that shapes what happens within is essential to integrating new development.

Inside – Out
Conversely, considering how the site connects from the inside-out and builds on existing features, networks and infrastructure, enhancing these through new development.



Source: TAYplan

Integrate Networks
Making it easy, safe and desirable to walk and cycle within and between neighbourhoods utilising existing green networks (e.g. green space and water networks) and enhance these areas to deliver a better quality of place and life.

Work with the grain of the place
Respecting and working with the grain of a place. This approach will help determine the size, shape and form of development and how it can respond to adaptation to help achieve future-proofing our new communities and facilities.

How this policy works

Enhancing quality of life through Policy 2 requires measures that improve place quality to be designed-in at the outset and help ensure that design contributes to preventing unnecessary spending, risk and related poor physical and mental health. This Policy applies to all scales and types of land use from new roads to green spaces, sports centres to housing, and, offices to recycling plants. It encourages innovation and place-led solutions to deliver development capable of supporting more sustainable ways of life for the people and businesses that use them.

This will mean balancing competing interests to make optimum use of the land and deliver places that allow people and businesses to thrive. This works in parallel with and is complemented by all of the other policies in this Plan.

Scottish Planning Policy considers 6 qualities of successful places which are common ingredients to all successful and sustainable places (distinctive, safe and pleasant, welcoming, adaptable, resource efficient and easy to move around and beyond). These are embedded in Policy 2. However, the specific action will vary from place to place because everywhere is different. This is not a one-size fits all approach.

Local Development Plans, design frameworks, masterplans and development briefs may specify solutions for particular places. Planning authorities will determine whether the measures proposed by developers are satisfactory.

A place-led approach ensures that the design and layout of new development will be the product of the place rather than, for example, the requirements of overly standardised development that can sometimes diminish local character. This requires new development that integrates with and complements its surroundings. This is based on understanding of the place, particularly how it functions from the inside-out and the outside-in. It also requires consideration of the natural and manmade networks and systems that the development is part of.

Good quality places need to be resilient and future-ready to cope with or adapt to hazards; including the implications of hotter summers and wetter winters. Policy 2 directs development to locations which avoid flood risk, but, where necessary ensures that solutions which mitigate unavoidable risks are designed-in. This includes water management for drought risk and all sources of flood risk; and, consideration of soil, water and climate holistically to design–in solutions at the outset.

The location, design and layout of good quality development reduces carbon emissions by reducing the need to consume energy and

resources in the first place. Solutions include passive design e.g. orientation, insulation and building materials for shelter, shade and heat retention; or other design measures. In parallel a shift to low/zero carbon heat and power generation (and storage) may involve off-grid property and community scale low/zero carbon heat and power generation and storage. It may also include electric vehicle charging points or other types of alternative fuels. Development should also be capable of accommodating/ connecting to heat network technology in the future. To fulfil the *Zero Waste Scotland Plan* (2010) new development will also need to design-in space and other appropriate measures to allow users/inhabitants to separate and store waste prior to collection.

This is part of a broader strategy where Policy 1 focuses development in principal settlements to help reduce the need to travel and reduce transport carbon emissions. Good quality places in Policy 2 enhance active travel potential, reduce consumption, shift energy generation and contribute to a circular economy through zero waste principles. Infrastructure to support the shift to low/zero carbon heat and electricity and infrastructure for waste management are considered in Policy 7.

Source: TAYplan

Policy 2 advocates lifetime communities. These are places that support independent living for all people throughout their lives. Typically they provide a range of homes, services and facilities that are easily accessible to all. This will also include active travel routes and supporting infrastructure, as well as open space and sport and recreational facilities. It may also include the co-location of health and social care facilities. As such lifetime communities support active and healthy lifestyles and reduce the need to travel. They also contribute to improving life opportunities to access jobs, services and facilities through active travel. Lifetime communities should be embedded into the location, design and layout of development at the outset. This is reinforced by the place-led approach (Policy 2A) and by green networks (Policy 8).

Shaping better quality places will also be supported by measures identified in Community Action Plans e.g. the emerging East Neuk Community Action Plan. These can focus community action around a broad range of measures that enhance quality of place but which are not all within the remit of the planning system.

“My place provides vibrant opportunities to live, learn, socialise and work, now and in the future”.

Eleanor age 21, student at the University of St Andrews

A successful and sustainable TAYplan

Policy 3 A FIRST CHOICE FOR INVESTMENT

Local Development Plans should:

A. identify and safeguard at least 5 years supply of employment land* to support the growth of the economy and a diverse range of industrial requirements;

B. identify and safeguard sites/locations for distribution and warehousing or industries with significant cargo movements adjacent/close to rail-heads and ports where appropriate;

C. further assist in growing the year-round economy including the role of the tourism and sporting and recreational sectors;

D. continue to support the development of the Strategic Development Areas set out in Map 3;

E. include (or cover in Supplementary Planning Guidance) Design Frameworks for all Strategic Development Areas where unless completed or not required. These should reflect the overall policy requirements of this Plan and from which master plans will be developed, reflecting in particular the 6 qualities of successful places advocated by Scottish Planning Policy.

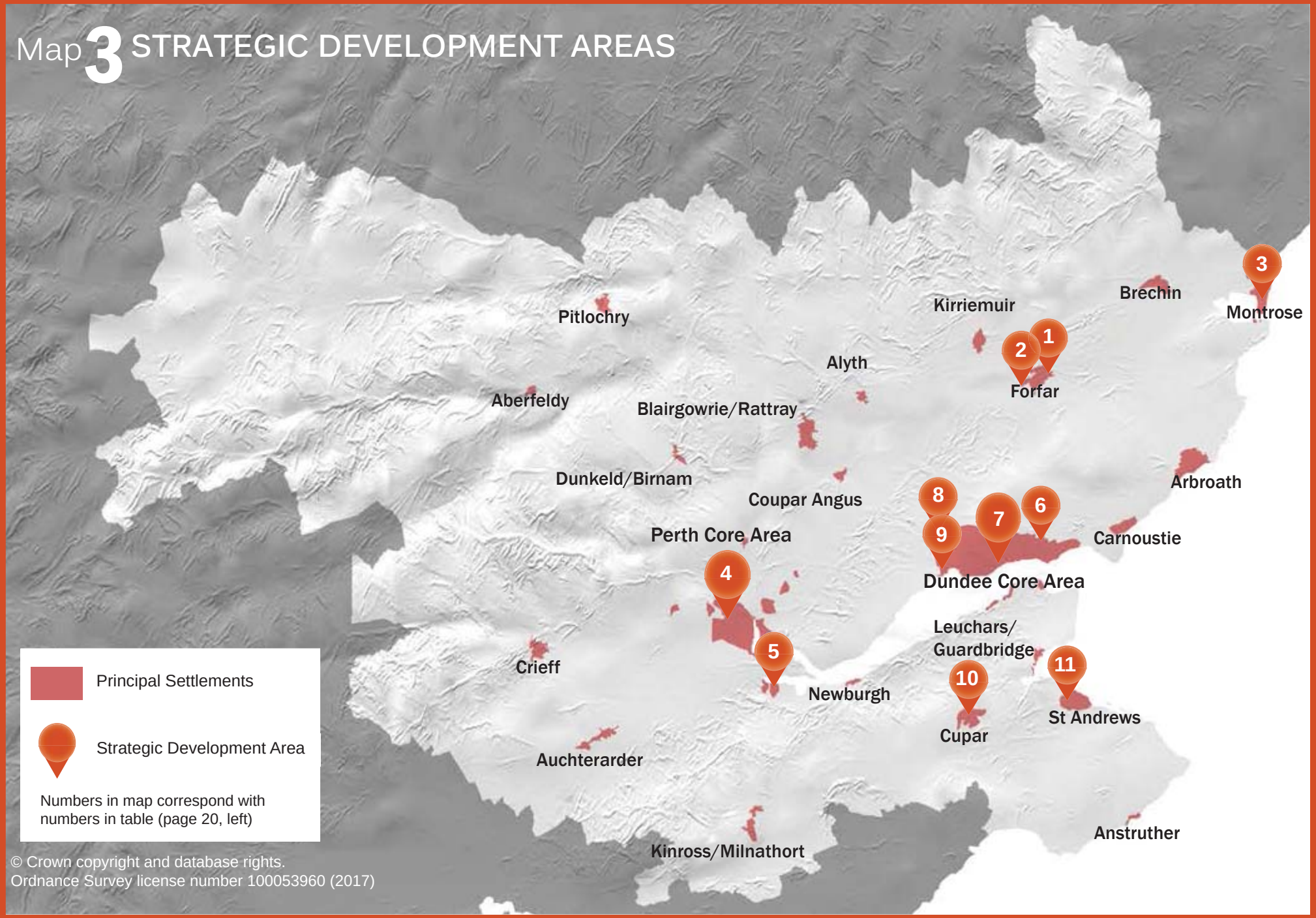
Footnotes

**Land for employment includes Classes 4 (business), 5 (General Industrial) and 6 (storage and distribution) from the Use Classes (Scotland) Order (1997). The location of some of these is considered as part of the town centres first approach in Policy 5.*

Strategic Development Areas	Proposed Uses
1. Forfar Agricultural Service Centre	Employment land for agricultural services
2. Orchardbank, Forfar	25ha of employment land
3. Montrose Port	Employment land for port related uses
4. West/North West Perth	4,000+ homes, 50 ha employment land and new roads
5. Oudenarde, Bridge of Earn	1,200+ homes and 34ha employment land
6. Linlathen, Dundee	40ha of employment land
7. Dundee Wider Waterfront	Mixed uses including business, commercial, leisure, retail, homes and port related uses
8. Dundee Western Gateway	750+ homes and 50ha of employment land
9. James Hutton Institute	5 to 10ha employment land for food and agricultural research
10. Cupar North	1,400 homes, 10ha employment land and bulky goods retail
11. St Andrews West & Science Park	1,090 homes, 5ha business park, 8ha employment land and 10ha for research and development or science park related enterprise

The numbers for the Strategic Development Areas in the table above correspond with those on Map 3 (right)

Map 3 STRATEGIC DEVELOPMENT AREAS



2709

What this policy is for

Perth Food and Drink Park

The vision is part of a wider strategy of welcoming and encouraging investment to grow a stronger economy with more jobs, improved opportunities and fewer disparities. This Plan provides a framework giving greater certainty to investors. Policy 3 is supported by Policy 2 (*shaping better quality places*) and Policy 10 (*better connecting people, places and markets*) to ensure that growth is lasting and sustainable.

TAYplan is home to some of Scotland's most important sectors including finance, renewable energy, food and drink, life sciences, creative and cultural industries and the visitor economy. The Strategic Development Areas (Policy 3) plan for a range of uses and play an important role in supporting and growing these sectors. The housing and the construction industry needs to grow out of the economic downturn and deliver the 8,500 new homes planned in these Strategic Development Areas. Dundee Waterfront, one of the largest regeneration projects in the UK, is identified as a national project in *National Planning Framework 3*. Tourism will play a major role in the TAYplan area, as envisaged by the *National Tourism Development Framework* (2013).

Dundee and Perth will continue to be major drivers of the economy. They are major visitor destinations and the transformation of Dundee, with the new V&A Museum of Design Dundee (V&A) and wider waterfront, is expected to bring further benefits to the city and beyond. Transport improvements associated with West/North West Perth are anticipated to help improve access to Perth and to visitor opportunities at Scone Palace and in Highland Perthshire and beyond.

Outdoor activities and facilities in areas such as Highland Perthshire, the Angus Glens and the coast are crucial. St Andrews, Anstruther and Arbroath are also major seaside destinations. Gleneagles at Auchterarder, St Andrews and Carnoustie host international golf competitions and are major global centres for golf-related tourism.

There are also strong links between the visitor economy and the food and drink sector such as whisky tours and food related tourism e.g. '*the taste of Angus*' which make this an important part of the visitor and investment offer. These and Perth Food and Drink Park support jobs and investment with international companies, small businesses and individual hotels, farms and estates. They have an international reputation with prominent local produce e.g. game meats, berries, bottled water and whisky that showcase the TAYplan region.

Dundee Waterfront and
V&A Museum of Design Dundee

How this policy works

Policy 3 requires Local Development Plans to identify and continue to support sustainable economic growth. All of the Strategic Development Areas are planned for in adopted Local Development Plans. West/North West Perth and Oudenarde have further capacity as supported in the Local Development Plan. Local Development Plans should have regard to the National Marine Plan, and Regional Marine Plans, where appropriate.

Design frameworks set out the main infrastructure requirement, phasing, land uses, landscaping and green networks, and where required, particular design aspects (e.g. density). These ensure that the principles of Policy 2 *shaping better quality places*, Policy 8 *Green networks,* Policy 9 *Safeguarding assets* and Policy 10 *Connecting People Places and Markets* are coordinated and put in place for Strategic Development Areas from the outset.

Dundee and Montrose Ports will play a major role in Britain's east coast energy cluster as envisaged by *National Planning Framework 3* and the *National Renewables Infrastructure Plan* (2011). They are increasingly attractive for oil, gas and wider offshore energy businesses. Dundee Port and Claverhouse Industrial Estate became Enterprise Areas in 2012 to support this growth. Both ports are protected for port related uses, including freight transhipment (Policy 10). Local Development Plans will also safeguard land at or close to ports and rail-heads for businesses that can take advantage of multi-modal freight opportunities.

Locations close to universities and hospitals continue to be important for Scotland's life sciences sector. Strategic Development Areas at James Hutton Institute; and, St Andrews West & Science Park provide additional land for commercial and academic research. Dundee Wider Waterfront includes accommodation to support digital media and its links with Abertay University.

Policy 3 does not mean all tourism, sport or recreational development is appropriate. Instead it ensures specific consideration of the visitor economy and its role in delivering the economic ambitions of the vision. Land uses that generate a significant footfall will also be subject to the town centres first approach in Policy 5.

Forfar Regional Agricultural Service Centre supports the retention and growth of agricultural services in this part of Scotland. This is not a single site but a principle supporting existing and new agricultural businesses in Forfar. The Tay Eco Valley Project supports growth of the circular economy based around the food and drink businesses in the Tay Valley from the James Hutton Institute to the Perth Food and Drink Park.

Policy 4 HOMES

Local Development Plans shall:

A. plan for the average annual housing supply targets* and housing land requirements illustrated in Map 4 to assist in the delivery of the 20 year housing supply target of 38,620 homes between 2016 and 2036. For the first 12 years up to year 2028 the total housing supply target is of 23,172 homes across TAYplan. In the period 2028 to 2036 a housing supply target in the order of 15,448 homes may be required, subject to future plan reviews. To achieve this Local Development Plans will identify sufficient land within each Housing Market Area to meet the housing land requirement.

B. identify land which is effective or expected to become effective to meet the housing land requirement in Map 4 for each housing market area up to year 10 from the predicted date of adoption. In so doing they will ensure a minimum of 5 years effective land supply at all times.

C. ensure that the mix of housing type, size and tenure meets the needs and aspirations of a range of different households throughout their lives, including the provision of an appropriate level of affordable housing based on defined local needs. For the whole of the TAYplan area this will be an approximate ratio of 25% affordable to 75% market homes but may vary between housing market areas and Local Authorities.

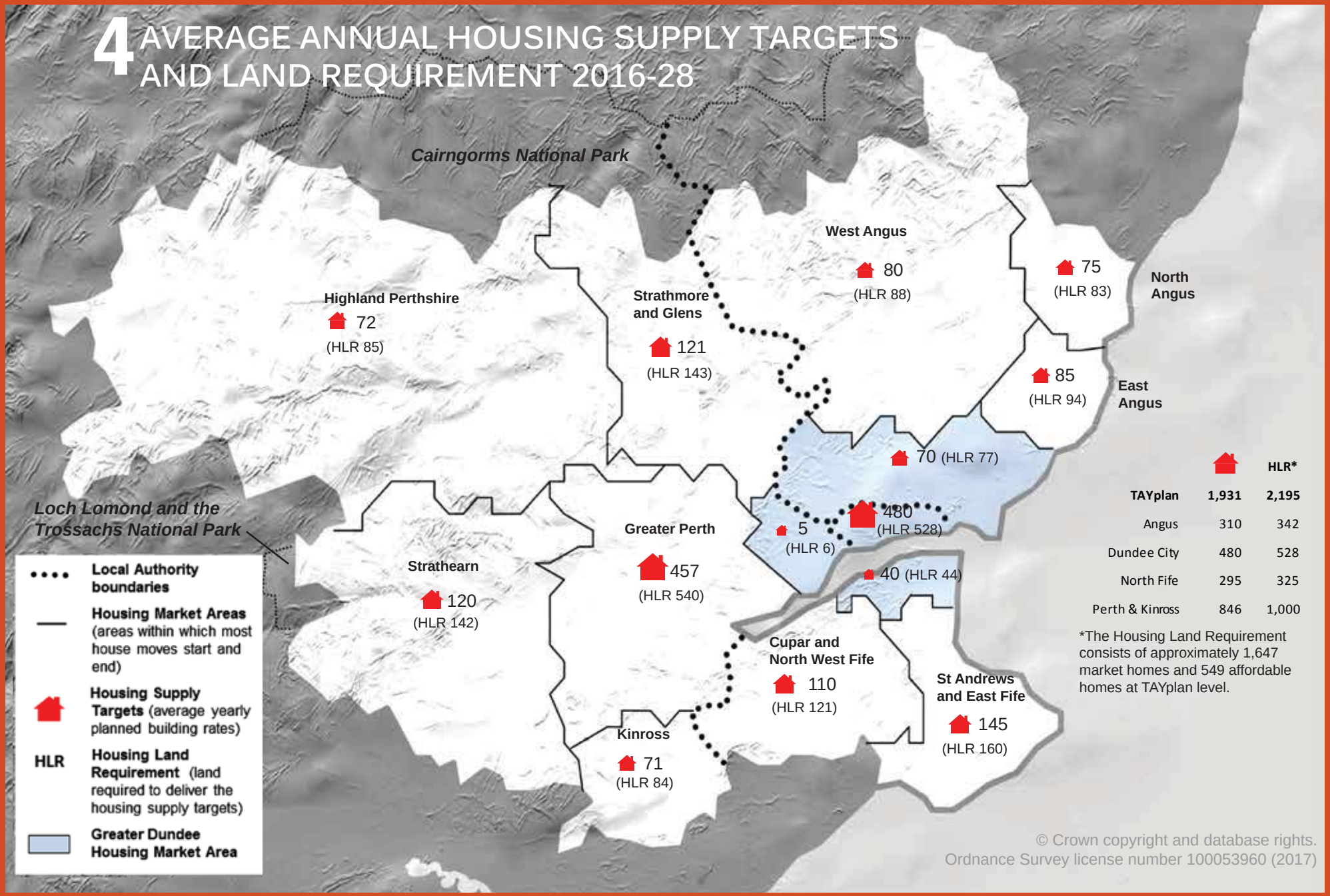
D. have the flexibility, in serious cases of appropriately evidenced environmental or infrastructure capacity constraints that cannot be practically and cost-effectively overcome, and where no suitable alternative sites exist that are compliant with the spatial strategy of this plan, to provide for up to 10% (15% for Highland Perthshire) of the housing land requirement for one market area to be shared between one or more neighbouring housing market areas within the same authority, whilst taking account of meeting needs in that housing market area.

E. for Dundee City only, have the flexibility to plan for housing numbers in excess of the housing land requirement set out in Map 4.

F. ensure there is a presumption against land releases in areas surrounding the Dundee and Perth Core Areas, including the Carse of Gowrie, where it would prejudice the delivery of Strategic Development Areas or regeneration within the core areas or conflict with other parts of this Plan.

Footnote
**Average build rates are illustrated annually to assist the understanding of what the scale of housing is for communities. These are only averages and the period in which these build rates should be achieved is over the first 12 years of the Plan, not annually. It is anticipated that within the first 12 year period build rates will be lower than the average in the early period and greater in the later period. These figures include Strategic Development Areas and affordable housing. They have been informed by the TAYplan-wide Joint Housing Need and Demand Assessment (2013) and work set out in Topic Paper 2: Growth (2015).*

4 AVERAGE ANNUAL HOUSING SUPPLY TARGETS AND LAND REQUIREMENT 2016-28

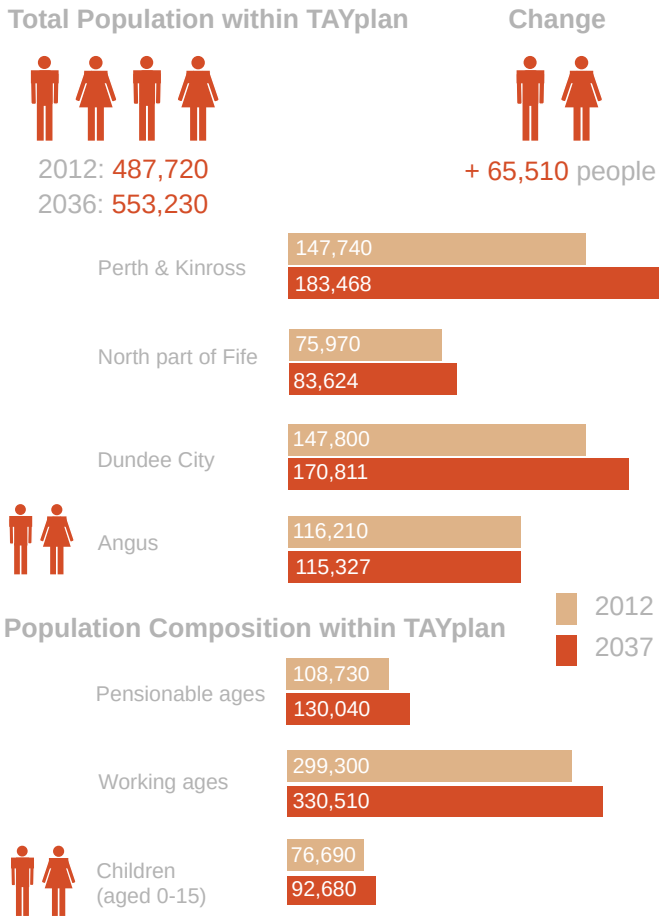


		HLR*
TAYplan	**1,931**	**2,195**
Angus	310	342
Dundee City	480	528
North Fife	295	325
Perth & Kinross	846	1,000

*The Housing Land Requirement consists of approximately 1,647 market homes and 549 affordable homes at TAYplan level.

2713

What this policy is for



Source: National Records of Scotland 2012-Based Population Projections; Principal Projection

The vision seeks a TAYplan where more people choose to live, work and study. This Plan is fundamentally about providing for good quality homes and communities to best ensure that there are homes for everyone to live in.

Developing new homes and refurbishing existing homes is important in growing TAYplan's economy. Good quality homes and communities directly affect economic competitiveness and people's health and quality of life.

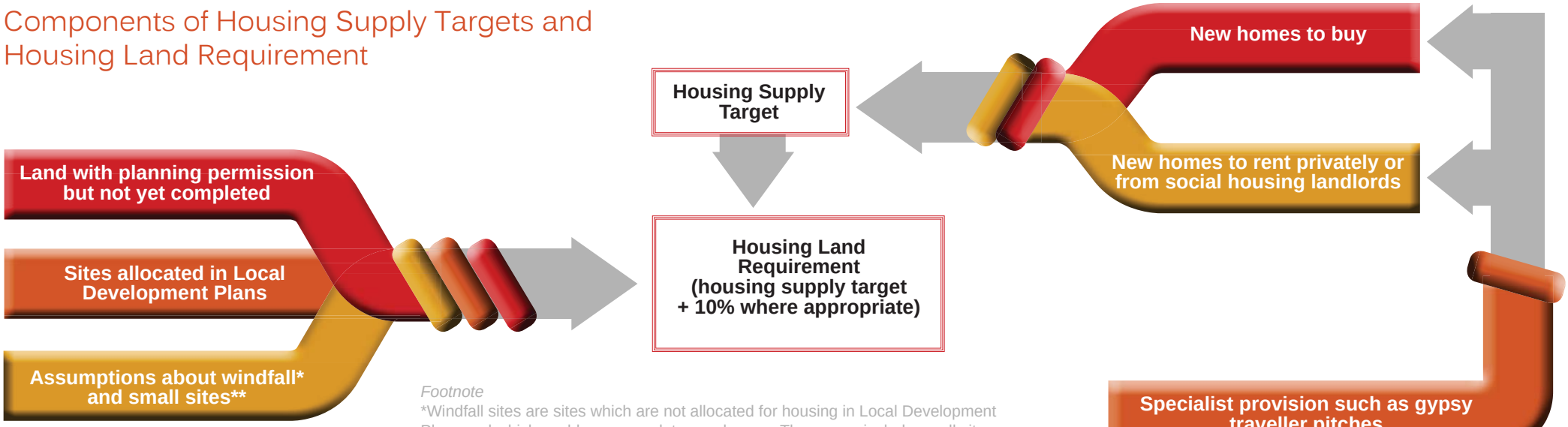
This Policy seeks to ensure that new housing is planned for in a sustainable way. It sets out a framework to be applied across council boundaries. Policies 2, 4 and 6 collectively seek good quality communities with an appropriate mix of housing type, size and tenure. This helps to meet the needs and aspirations of different people throughout their lives. Children, working age and pensionable age populations are all projected to grow and particularly significant growth is anticipated in Perth and Kinross.

Every year more people continue to move to the TAYplan area. This increase in population, combined with other factors, requires a continuous supply of housing land for new homes. Therefore it is important that the right amount of new land is identified to plan for new homes. This gives certainty to home builders and to councils, who need to identify land for house building in their Local Development Plans. The average yearly number of new homes planned for in Policy 4 is equivalent to less than 1% of the TAYplan's housing stock for the year 2012.

Policy 4/Map 4 set out the average yearly house building rates (housing supply targets) that are planned for. The housing land requirement can be larger and refers to the amount of land to be identified by Local Development Plans. This additional land represents the generosity of land supply, where required, to ensure that the housing supply targets can be met.

The housing supply targets have been informed by the *TAYplan-wide Joint Housing Need and Demand Assessment* (2013), which identified the need for 44,100 over the next 20 years. This was considered robust and credible by the Scottish Government in February 2014. Housing supply targets have also been informed by consideration of wider social, economic and environmental factors and issues of deliverability, resources and capacity. More details can be found in *Topic Paper 2 Growth Strategy* (2015).

Components of Housing Supply Targets and Housing Land Requirement



Source: TAYplan SDPA

Footnote
*Windfall sites are sites which are not allocated for housing in Local Development Plans and which could accommodate new homes. These may include small sites.
**Small sites are sites of fewer than 5 homes.

How this policy works

Policy 4/Map 4 plan for housing supply targets of 1,931 new homes per year across the TAYplan area. This is 23,172 over the first 12 years of this plan (2016-28) and approximately 38,620 homes over the whole 20 year period.

The housing land requirement provides a generous land supply equivalent to at least 10% of the respective housing supply target for each housing market area. This is to ensure flexibility and choice in delivering the housing supply target. 10% is the minimum TAYplan is required to include by the Scottish Government (Scottish Planning Policy).

The housing supply targets and housing land requirements in Map 4 will continue for the remaining 8 years of the Plan (2028-36).

However, this Plan will be kept up-to-date, reviewed and replaced at least twice before 2028. This provides the opportunity to review the Housing Need and Demand Assessment and other work that informs housing supply targets. This timing and process is appropriate to respond to any significant changes in the progress of the economic recovery.

The average yearly housing supply targets identified in Policy 4 and Map 4 are only averages and the period in which these should be achieved is within and over the 12 years from 2016 to 2028. As such if the housing supply targets are not fully met by 2028 the shortfall does not transfer to the period beyond. Similarly any surplus in build rates is not discounted from the period beyond 2028 either. However, any un-used land supply may go on to contribute to meeting the housing land requirement for the final 8 years of this Plan (2028-36).

The number of new homes for people to live in is important, but so too is where these homes are located and the quality of the homes and neighbourhoods. Poor quality housing development that fails to deliver a sustainable pattern of growth or which fails to meet the requirements of other policies in this Plan should not be allowed irrespective of its contribution to the housing supply targets.

Map 4 shows housing supply targets and housing land requirements as yearly averages at housing market area level (areas within which most house moves both start and finish). All housing market


Monifieth


Milnathort


Dundee

areas are wholly within one council area except for the Greater Dundee Housing Market Area. This covers all of Dundee City and parts of the other three council areas. Here the average yearly figures are shown for each council part of the Greater Dundee Housing Market Area to assist Local Development Plans.

Councils will continue to monitor the effectiveness of the housing land supply using annual housing land audits to ensure that in each year there is a 5 year supply of effective housing land within each housing market area based on the housing land requirement. For the Greater Dundee Housing Market Area an amalgamated audit will be published to monitor effectiveness across the areas (taken from each individual council's audit).

The housing land requirement can be made up of land from a variety of sources as described in *Scottish Planning Policy (2014) paragraph 117 (See diagram above).* It will be for Local Development Plans to determine and justify which sites will make up the housing land requirement, much of which already has permission or is allocated in existing Local Development Plans. This includes specialist housing provision.

The *TAYplan-wide Joint Housing Need and Demand Assessment* (2013) does not highlight any strategic cross-boundary issues for the accommodation of Gypsies and Travellers or Travelling Show People. Additional needs for these communities are considered through Local Development Plans and Local Housing Strategies.

Local Development Plans will identify a supply of land which is effective or expected to become effective for the period of ten years after their respective anticipated date of adoption. This land supply will be equivalent to the housing land requirement. This provides choice and flexibility to ensure that the housing supply target can be met from a range of sites. Although build rates are expected to be lower in the early part of the Plan period this approach provides flexibility to respond quickly to change.

After the economic downturn house building rates fell and have remained comparatively low because it has been more difficult for home buyers and builders to borrow money. Although the recovery is underway house building rates need to increase (in some cases threefold) to deliver the housing supply targets planned for. This transition will take time.

Local Development Plans will identify land within principal settlements to meet most of the housing land requirement to reflect Policy 1. The majority of development will be accommodated in principal settlements within the Dundee and Perth Core Areas. The boundaries of these settlements will be regularly reviewed through Local Development Plans. Policy 1 does allow some development in areas outside of principal settlements where

this meets local needs. Policy 4F operates in conjunction with Policy 1C. It restricts housing development in areas surrounding and between the Dundee and Perth Core Areas (defined in Policy 1). This is to prevent sub-urbanisation of the countryside, unsustainable travel patterns and to avoid conflict with the delivery of strategic development areas or regeneration within the core areas. Local Development Plans will not make significant land allocations for new homes in these areas and planning decisions will also be expected to reflect this priority. Therefore, significant new housing development will not be supported in these areas.

The Housing Need and Demand Assessment observed a ratio of 50:50 between housing need and demand at TAYplan level. However, it also concluded that it would be impossible to deliver this ratio of market homes (for purchase and private rent) to affordable homes (social rent and intermediate products). Further it concluded that the private rented sector will play a more prominent role in the housing market, particularly as a result of welfare reform and other market factors. This will influence the mix of housing type, size and tenure.

Policy 4 takes a pragmatic approach of planning on the basis that 75% of homes will be market homes (for purchase and private rent) and 25% will be affordable homes (social rent and intermediate products). This also increases the likelihood of delivering affordable housing as an integral part of market developments. However the exact scale and proportions may vary for each housing market area and for individual localities and sites. It is also clear from population projections that there will be growth in the numbers of children, working age adults and those of pensionable age. The highest proportional change is anticipated amongst children and adults of pensionable age. Local Development Plans and Local Housing Strategies are best placed to determine the appropriate scale and mix of housing type, size and tenure, and also the method for delivering affordable homes where these are needed.

Sometimes the housing land needed to deliver a sustainable pattern of development can experience environmental or infrastructure constraints. In response, Policy 4D provides flexibility for Local Development Plans to plan for up to 10% of the housing land requirement of one housing market area to be met in an adjoining housing market area. In Highland Perthshire housing market area this is 15% in recognition of the significant concentration of environmental designations, flood risk, topography and transport infrastructure constraints.

Policy 5 TOWN CENTRES FIRST

To protect and enhance the vitality, viability and vibrancy of city/town centres:

A. strategies, plans, programmes and development proposals should focus land uses that generate significant footfall in city/ town centres defined in the network of centres (below) ahead of other locations (including retail, commercial leisure, offices, community and cultural facilities, civic activity and, where appropriate public buildings such as libraries, education and health care facilities). Other land uses including residential, hospitality and catering, events and markets should be encouraged in town centres.

B. Local Development Plans should:
i. identify specific boundaries, where appropriate, for each city/town centre, local centre and commercial centre in the network (below); including those subsequently identified in Local Development Plans;

ii. specify the appropriate functions that can take place at individual commercial centres; and,

iii. identify any other town centres and commercial centres, as appropriate; this will be particularly likely in larger, multi-centre settlements such as Dundee, Perth and Arbroath.

C. Local Development Plans and planning decisions should recognise that hospitality, catering and leisure facilities play a prominent role in supporting the visitor function of settlements and in the daytime and evening economy of all centres. They should also support improvements to town centres that enable events, festivals or markets to take place and which improve the general maintenance, character and wellbeing of the centre.

D. planning decisions for land uses that generate significant footfall should be based on the sequential priority (below - taken from Scottish Planning Policy) and other local considerations as appropriate.

Sequential Priority	Network of Centres	Functions of centres
1. These town, city and local centres should be the first location of choice for land uses that generate significant footfall**;** **then;** 2. on their edges **then;**	**- Regional Centre:** Dundee City Centre - **Sub-regional Centre:** Perth City Centre - **Larger Town Centres:** Arbroath, Cupar, Forfar, Montrose and St Andrews - **Smaller Town Centres:** Aberfeldy, Alyth, Anstruther, Auchterarder, Blairgowrie, Brechin, Carnoustie, Coupar Angus, Crieff, Kirriemuir, Kinross, Monifieth, Newburgh and Pitlochry **- Other town centres** identified in Local Development Plans (including the 5 district centres as defined in the Dundee Local Development Plan) **- Local centres or hubs** identified in Local Development Plans	Retail (convenience, comparison and bulky goods), Commercial Leisure, Offices,Civic and community activity, Visitor uses (overnight and day trips), Hospitality and Catering, and Residential.
3. in commercial centres for uses defined in Local Development Plan **then;** 4. at appropriate out of centre locations with good foot, cycle and passenger transport links	**-Commercial Centres:** Gallagher Retail Park, Dundee Kingsway East, Dundee Kingsway West, Dundee St Catherine's Retail Park, Perth -**Other commercial centres** identified in Local Development Plans	Retail (bulky goods and convenience) and Commercial Leisure.

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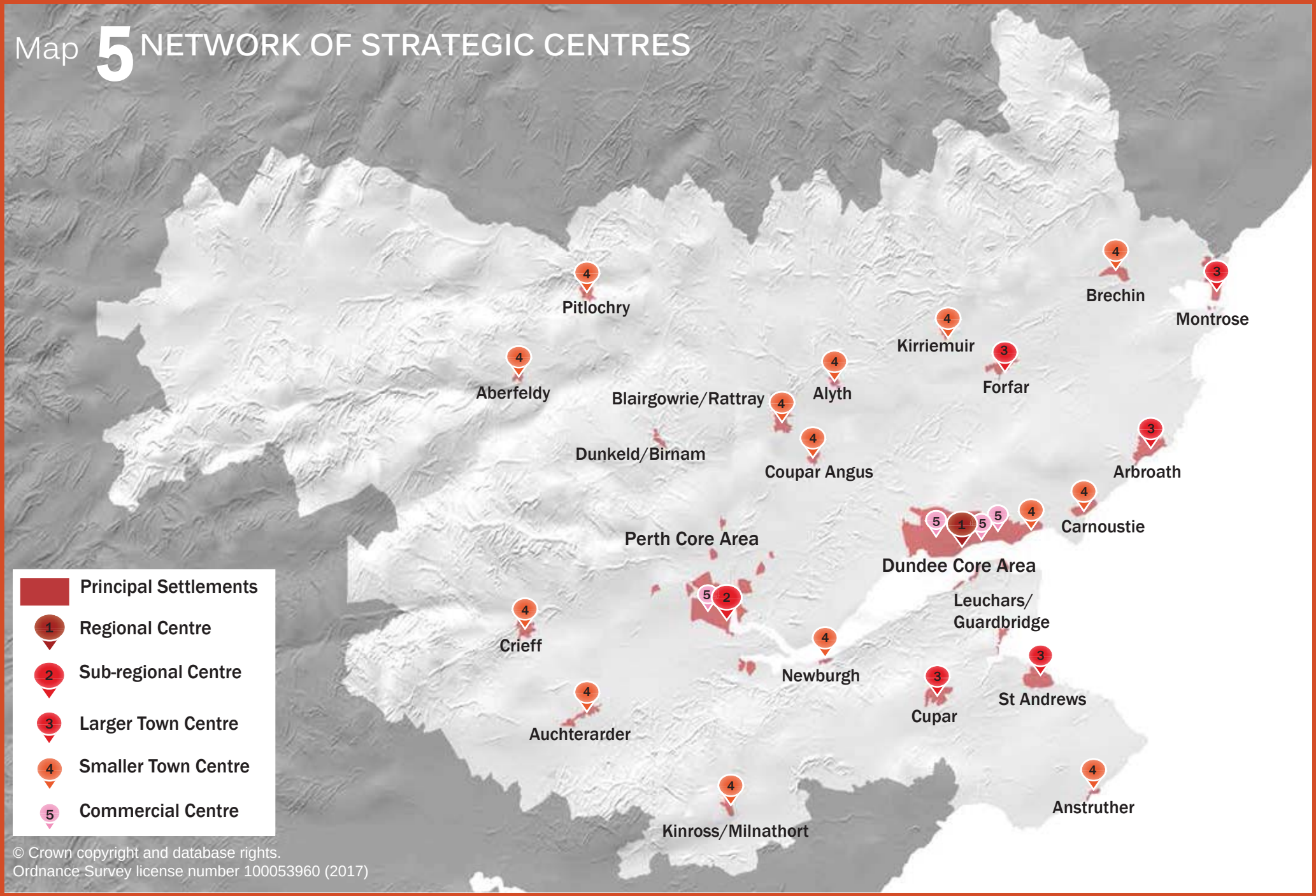
Map 5 NETWORK OF STRATEGIC CENTRES



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What this policy is for


Perth

City and town centres should be the hearts of our communities. Our best city and town centres are attractive places that offer a good choice of attractive shops, recreation, services and facilities. But changing technology and lifestyles mean that our town centres are changing and not all are of the quality that we would like them to be.

This policy focuses land uses that attract significant footfall in TAYplan's city/town centres to ensure that they provide a wide range of accessible services and facilities for use during the day time and in the evening. This contributes to the vision by making town centres vibrant places where people want to spend time and where businesses want to invest. It can also improve the image of places and generate confidence and investment opportunities for TAYplan's towns and cities. This will complement town centre strategies.

Town centres need to be places that are easy to get to and easy to get around. Policy 2 *Shaping Better Quality Places* considers safe and easy places to walk and cycle/store bikes, accessible passenger transport facilities and services, and car and coach parking. This involves thinking about flows of people and accessibility for all age groups and levels of mobility. Town centres in the TAYplan region are some of the most accessible places for everybody and therefore are often best placed to provide a range of facilities and services.

Policy 5/Map 5 define a network of centres in the TAYplan area, from Dundee being a regional centre and Perth a sub-regional centre right through to a large network of other town centres and commercial centres.

The Policy seeks to manage change to best ensure that a range of uses are located in these centres wherever possible. The city and town centres provide a mix of the functions listed in Policy 5. So too do local centres although on a smaller scale and these tend to provide local convenience shopping and other services for communities.

Commercial centres specialise in bulky goods such as DIY and furniture, commercial leisure and are often co-located with supermarkets. Some commercial centres also serve as local centres for their immediate surroundings as well as being hubs for food shoppers from other areas.

Larger settlements, such as Dundee, Perth and Arbroath, include several centres within the network.

Dundee

How this policy works

Local Development Plans will define the boundaries of the centres named in Policy 5 and any additional town, local or commercial centres they identify. This includes centres currently recognised as 'district centres', which the respective Local Development Plan will consider to be town centres or local centres as appropriate. They will also identify which specific functions in Policy 5 will be appropriate in individual commercial centres.

The different roles, scales and functions of these centres affect their significance within the network. Dundee and Perth city centres and their commercial centres have strong comparison (non-food) shopping functions and the city centres are also major office centres. Arbroath, St Andrews, Anstruther, Aberfeldy, Crieff, Dundee, Perth and Pitlochry each play a significant part in the visitor economy. This reflects their broader role as hubs for visitor activity within a wider, diverse tourism offer. It also means that catering and hospitality uses may play a strong supporting role in their city/town. Places will also change over time, for example the regeneration of Dundee waterfront and V&A bring potential for a stronger visitor offer and economic opportunities for Dundee and further afield.

Local Development Plans and planning proposals will use the *Scottish Planning Policy* (2014) sequential approach that is incorporated into Policy 5. This ensures that the city and town centres in Policy 5 are the focus for '*town centre first*' land uses that generate significant footfall e.g. retail, leisure, offices, and preferably museums, libraries, community and cultural services/facilities.

The next priority for these land uses will be locations on the edge of the city, town and local centres in Policy 5. This is followed by commercial centres in Policy 5 based on the compatibility with land uses defined for that commercial centre in the respective Local Development Plan. Finally appropriate out-of-centre locations that are well served by a choice of foot, cycle and passenger transport modes will be considered.

Residential, hospitality and catering uses are appropriate in city, town and local centres but are not subject to the town centres first approach.

Community, healthcare education and sporting facilities are best located at the heart of the communities they serve. This may mean that they form part of local centres or other hubs. These will often benefit from co-location (see Policy 2 *shaping better quality places*).

Events such as conferences, markets, concerts and festivals can bring visitors and showcase places. This will mean providing or maintaining


Alyth

space and facilities to cater for events. This may involve investment in public spaces and facilities as well as improvements to access arrangements.

The requirements associated with protecting and enhancing the built environment are set out in Scottish Planning Policy and Policies 8 and 9. There may also be a need to protect major retail locations which act as key attractors of people who then also use other services in the town centre. Local Development Plans can therefore continue to protect important retail frontage or 'active' building frontages and stipulate limitations to ground and upper floor uses in specific areas, as appropriate. They may also continue to limit the types of goods that can be sold, particularly in commercial centres.

Policy 6 DEVELOPER CONTRIBUTIONS

To ensure suitable infrastructure is in place to facilitate new development, local development plans should set out a policy framework for seeking developer contributions to mitigate any adverse impact on infrastructure, services and amenities brought about by development. This framework should specify the items for which, and the circumstances where, contributions will be sought. This may include contributions towards schools, the delivery of affordable housing, transport infrastructure and facilities (including for road, rail, walking, cycling and public transport), green infrastructure, mitigating flood risk, surface water drainage and other community facilities. Timeously produced supplementary guidance should set out detailed matters such as the level of contributions and methodologies for their calculation. All policies should be in accordance with the Scottish Government *Circular 3/2012: Planning Obligations and Good Neighbour Agreements*.

What this policy is for

Inchture Primary School

Development must work in harmony with its surroundings and contribute positively to how places function in order to deliver the vision and the outcomes which underpin it. Many of the requirements for this are set out in Policy 2 *Shaping Better Quality Places*. Policy 6 is about delivering the required infrastructure.

Infrastructure constraints have the potential to limit or prevent development taking place. Where possible, new development is planned in areas with infrastructure capacity such as schools, utilities and the transport network. In areas experiencing sustained growth this is not always possible and significant investment in infrastructure may be required to bring forward development opportunities. Often these infrastructure improvements may not be able to be delivered on-site and may be the result of the cumulative impact of a range of different developments.

Infrastructure may be required upfront of the development starting and the developer may not be able to afford this cost at the outset. Developer's funding usually comes from money released by selling properties and/or the uplift in land values after planning permission has been granted. This provides challenges to the Local Authorities, whom, in order to support the delivery of constrained development land, may be required to take a lead role through the provision of the necessary infrastructure. Investment in infrastructure by Local Authorities will generally address the cumulative impact of development and not specific site requirements.

DEVELOPER CONTRIBUTIONS

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Abernethy Primary School

How this policy works

This Plan requires a long term view of the impact of development. There will be some public investment in infrastructure but Policy 6 makes clear that developer contributions will be sought for appropriate infrastructure, service and amenity requirements resulting from development. These contributions are additional to designing-in and mitigating potential impacts from development as part of delivering Policy 2 *Shaping better quality places*, Policy 8 *Green Networks* and Policy 9 *Managing TAYplan's Assets*.

Local Development Plans should consider the infrastructure; service and amenity requirements for settlements, neighbourhoods and sites to assist in shaping better quality places (Policy 2) and a mix of housing tenure (Policy 4). It also provides certainty about the improvements necessary to support development and presents opportunities for joint investment and partnership working to bring wider benefits to an area. This can bring significant economies of scale and unlock development opportunities.

TAYplan Councils have each explored approaches including borrowing to fund necessary infrastructure upfront and through the use of developer contributions recouping an appropriate percentage of the cost from the new development which would benefit from the infrastructure. This recouped money may be reinvested in future infrastructure projects which is sometimes called a 'rolling infrastructure fund'.

The approaches described are a few of the wide range of options which can be used to support new development. A 'one size fits all' solution would not be appropriate to address every scenario and Local Authorities are best placed to determine the most appropriate approach based on local circumstances.

The use of developer contributions to fund infrastructure must meet the tests of Circular 3/2012: *Planning Obligations and Good Neighbour Agreements* and should offer operational transparency, consistency and certainty to the development industry.

The accompanying TAYplan Action Programme identifies the key actions needed to successfully deliver this Plan. It includes national infrastructure projects, those identified in Regional Transport Strategies (see Policy 10 *Connecting People, Places and Markets*) and activities for the Strategic Development Areas identified in Policy 3. Some of these actions will be delivered through Local Development Plans and planning decisions. Others will be delivered by Local Authorities, government agencies and private and voluntary sector organisations.

“We live in a place where our heat, light, energy and travel needs respect the environment”.

Sophie age 13, Sarah age 12 and Phoebe age 14, friends from Blairgowrie

A low carbon TAYplan

Policy 7 ENERGY, WASTE AND RESOURCES

To deliver a low/zero carbon future and contribute to meeting Scottish Government energy and waste targets and prudent resource consumption objectives:

A. Local Development Plans should identify areas that are suitable for different forms of energy, waste and resource management infrastructure* and policy to support this. This can include, where appropriate, locations of existing heat producers (e.g. waste management or industrial processing), renewable sources of heat and electricity, and existing waste management facilities to ensure the co-location/proximity of surplus heat producers and heat users.

B. Strategic Waste management infrastructure, beyond community or small scale facilities, is most likely to be focussed within or close to the Dundee and/or Perth Core Areas (identified in Policy 1).

C. Infrastructure associated with the extraction, transfer and distribution of liquid and gas minerals may take advantage of the locational flexibilities offered by various extraction techniques to overcome issues relating to the scale and impacts of any buffer zones and residential proximity in a manner which reflects Policy 7D and Policy 2.

D. Local Development Plans and development proposals should ensure that all areas of search, sites and routes for energy, waste and resource management infrastructure have been justified, at a minimum, on the basis of these following considerations:

i. The specific land take requirements associated with the infrastructure technology and associated statutory safety exclusion zones or buffer areas where these exist;

ii. Waste management proposals are justified against the *Scottish Government's Zero Waste Plan (2010)* to support the delivery of the waste management hierarchy, and, *Safeguarding Scotland's Resources (2013)*;

iii. Proximity of resources (e.g. geo-thermal heat, sand, gravel, gas, oil, woodland, wind or waste material); and to users/customers, grid connections and distribution networks for the heat, power or physical materials, by-products and waste that are produced, as appropriate;

iv. Anticipated effects of construction and operation on air quality, carbon emissions, noise and vibration levels, odour, surface and ground water pollution, drainage, waste disposal, leakage of hazardous substances, radar installations, navigation aids and aviation landing paths;

v. Sensitivity of landscapes, the water environment, biodiversity, geo-diversity, habitats, tourism, recreational interests and listed buildings, scheduled monuments and conservations areas;

vi. Impacts of infrastructure required for associated new grid connections and distribution or access infrastructure;

vii. Cumulative impacts of the scale and massing of multiple developments, including existing infrastructure in general but particularly in sensitive areas;

viii. The appropriate safety regimes and post-operational restoration of land, particularly for extraction of solid, liquid and gas minerals;

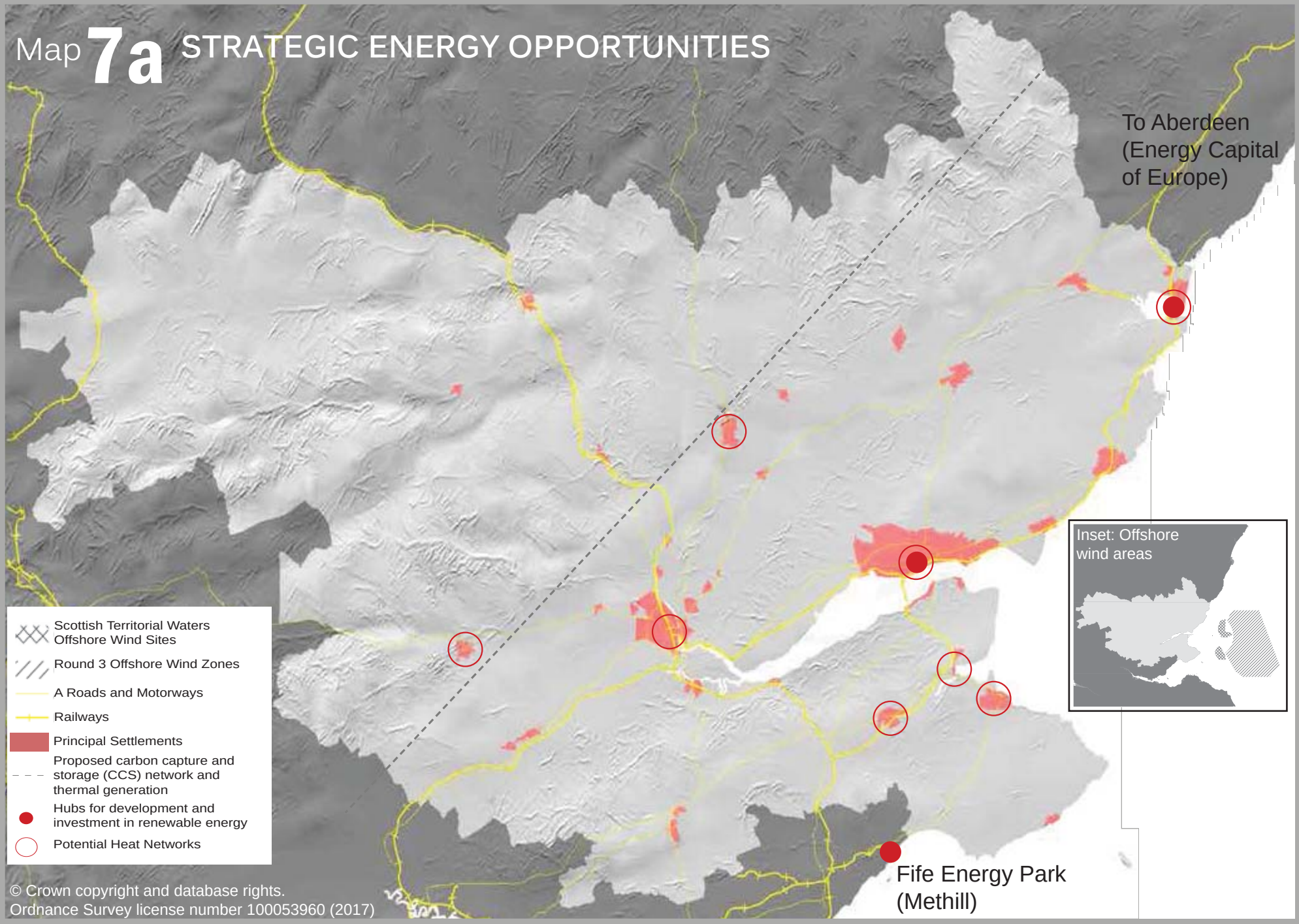
ix. Strategic cross-council boundary impacts as a result of energy proposals which may be strategically significant (as defined on page 45) including landscape, historic and environmental considerations identified in the spatial framework (Map 7b); and,

x. Consistency with the National Planning Framework and its Action Programme.

Footnote

*****Energy, waste and resource management infrastructure****: Infrastructure for heat and power generation, storage, transmission; for collection, separation, handling, transfer, processing, resource recovery and disposal of waste; and; for exploration, extraction, transfer, distribution and storage of solid, liquid or gas minerals. This includes recycling plants, biological/thermal/mechanical processing, energy from waste plants, wind turbines (including repowering), geo-thermal heat, biomass plants, combined heat and power plants, solar power, hydroelectric power plants, quarrying and mining equipment, unconventional gas and oil extraction equipment, electricity transmission lines, oil and gas pipelines (including carbon capture and storage), solid mineral sorting and transfer facilities.*

Map 7a STRATEGIC ENERGY OPPORTUNITIES



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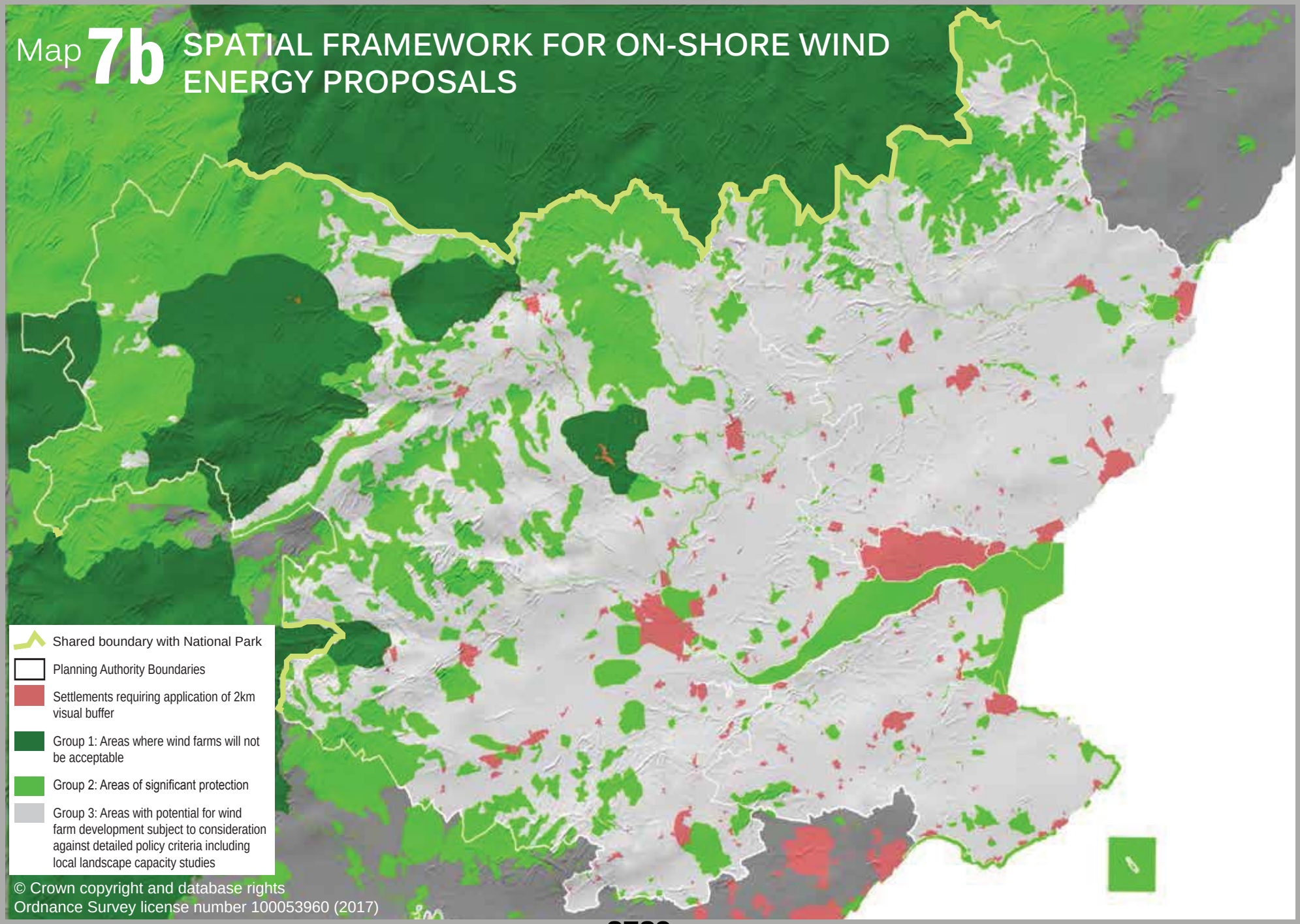
Map 7b SPATIAL FRAMEWORK FOR ON-SHORE WIND ENERGY PROPOSALS



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Drumderg wind farm

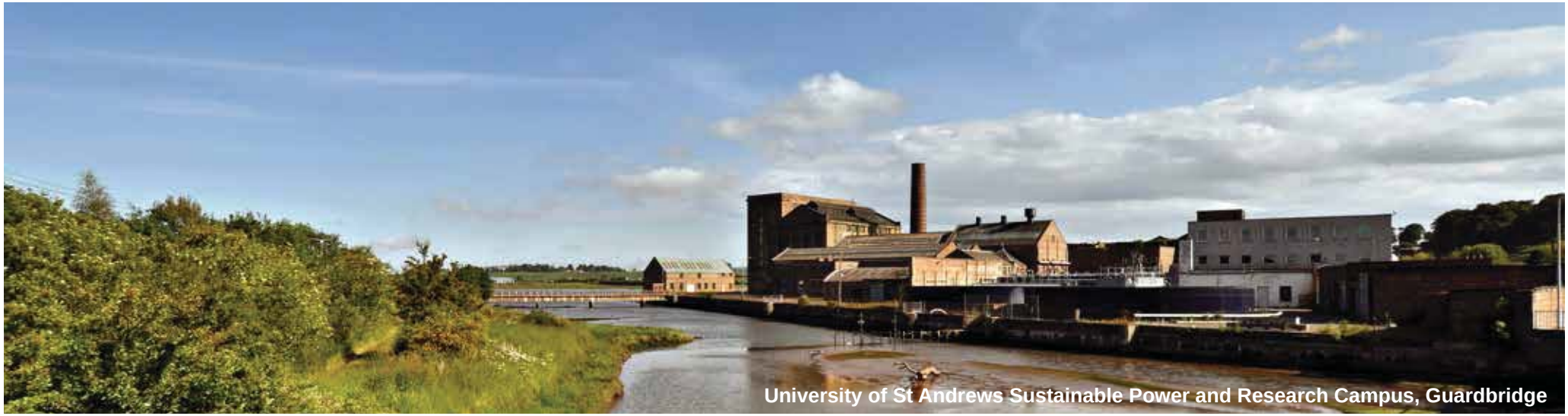
ENERGY, WASTE AND RESOURCES

The vision focuses on improving quality of life and the economy without placing unacceptable burdens on planet Earth. This Plan balances our need for heat, power and other resources with the challenges of climate change, resource and energy security and the impacts of these for future generations. There are also business and job opportunities associated with the construction, deployment and operation of this infrastructure. This should enable us to reap the social, economic and environmental rewards of living within Earth's environmental limits.

Delivering a low carbon and zero waste economy requires us to generate more power and heat from low/zero carbon sources and, where possible, to use less energy. It also requires consideration of waste and prudent resource consumption from start to finish through implementation of the waste hierarchy and the principles of a circular economy.

New networks and systems for storing and distributing surplus heat and power will play a major role in more efficient consumption, and in reducing costs and emissions. Similarly networks of installations capable of handling, treating, and, recycling or reprocessing waste into new or reusable products will be essential in their own right. They will also contribute as heat users and producers. Proposals should be justified on the basis of national objectives and the *Scottish Government Heat Policy Statement (2015)* on efficiency and heat generation.

The issue is no longer about whether infrastructure for this is needed, but instead about ensuring it is delivered in the most appropriate locations. Energy, waste and resource management infrastructure require many similar considerations and have been grouped together in Policy 7. This approach is also supported by Policies 1, 2 and 9 which use the location, design and layout of development to reduce the need to consume heat and power, reduce the need to travel and safeguard important assets.



University of St Andrews Sustainable Power and Research Campus, Guardbridge

How this policy works

Policy 7 sets out the strategic considerations for the location of energy, waste and resource management infrastructure needed to deliver the vision. It concentrates on the justification to ensure that locations or proposals are appropriate and do not lead to unacceptable consequences. Land use planning is only one of the regulatory considerations and there are many different energy, waste and resource management technologies. Policy 7 applies to all technologies and all scales of energy, waste and resource management infrastructure for all places within TAYplan.

Many of the region's existing waste management facilities have additional capacity or could be expanded in-situ. No requirement for new landfill sites has been identified before 2028 and successful implementation of the *Zero Waste Scotland Plan (2010)*, alongside expansion of existing facilities, could extend this to 2036 and beyond. New strategic waste management infrastructure will be encouraged within or close to the Dundee and Perth Core Areas reflecting the proximity of materials and customers. Policy 7 emphasises the importance of co-locating heat producers, including waste management facilities and heat users. This may have implications for locating industrial uses that benefit from surplus heat or other by-products. Collectively this will contribute to making Dundee and Perth, in particular, exemplars of low carbon living as envisaged by *National Planning Framework 3* (2014).

Policy 7 also covers minerals extraction including coal, oil, gas and aggregates (rocks, sand and gravel). This also applies to 'unconventional gas'; including extracting gas from coal-bed methane and underground coal gasification. Many of the specific requirements for these operations are covered by legislation and/or national policy. Measures that take advantage of the locational flexibilities offered by technology to help overcome localised constraints and practical issues, will need to be consistent with Policy 7D.

Scottish Planning Policy already sets out requirements for Local Development Plans to consider heat networks. This should form part of broader energy masterplanning. New development will need to be capable of linking to heat networks and these networks and storage systems could be linked across and between settlements. Although welcome in principle this will be subject to meeting Policies 2 and 7D. Policies 1, 2 and 10 aim to reduce transport carbon emissions which will make a major contribution to a low carbon TAYplan.

Policy 7D operates in conjunction with Policies 2, 8 and 9. It covers new proposals, extensions to currently or yet to be operational schemes, re-powering of existing facilities and decentralised systems. This delivers a consistent decision making framework ensuring that solutions are

Waste and Resource Management Hierarchy

Source: Environment Scotland

identified to overcome a broad range of potential implications.

Landscape capacity studies have been carried out by Angus, Fife and Perth & Kinross Councils. These indicate that because of the particular character of the landscape and the cumulative impacts of existing on-shore wind energy development, there is limited scope for further new wind farm proposals within the TAYplan area. The spatial framework (Map 7b) provides an overview of the groups of considerations defined within *Scottish Planning Policy* (2014) - *Table 1: Spatial Frameworks, p. 39.* However, Map 7b does not take into account landscape capacity and cumulative impacts.

Whilst Scottish Planning Policy requires these matters to be considered through the development management process, they are an important consideration in determining wider capacity. Therefore ensuring there is a consistent approach by constituent authorities in their approach to landscape, cumulative and cross-boundary impacts will be key, particularly for cross-council boundary sensitivities.

TAYplan will coordinate preparation of a region-wide study in 2017 on cross-boundary constraints and opportunities. This will be based on updating the existing landscape capacity studies, but working to a consistent wind energy typology.

In the interim, the criteria (right) defines where energy proposals may have strategic significance and fulfil the requirement in Scottish Planning Policy. These may be identified for wind and other energy technologies in Local Development Plans and will be considered by planning authorities through the development management process.

Energy proposals of strategic significance

An energy proposal may be considered strategically significant if it meets one or more of the criteria below. Such proposals could have significant implications for the strategic capacity of the TAYplan area to accommodate energy development when considered alongside Policy 7 and Maps 7a and 7b.

- The development and/or associated infrastructure lies across, on or within close proximity to any planning authority boundary within the TAYplan area;
- Associated infrastructure crosses any planning authority boundary within the TAYplan authority area or a neighbouring planning authority;
- For wind energy, it lies within or adjacent to any 'Group 1 or 2' areas identified within *Scottish Planning Policy* (2014) spatial framework;
- It will affect the development, operation or function of an identified Strategic Development Area or other strategic proposal within this Strategic Development Plan;
- It will significantly affect the operation, capacity or planned upgrade of energy infrastructure, including regional grid connections, carbon capture and storage networks, Carnoustie landing point for offshore grid connection or the national high voltage electricity transmission network; and,
- Landscape and visual impacts (assessed with reference to relevant Landscape Character Assessment and Capacity studies) including cumulative impacts, affecting more than one authority.

“Our natural environment provides us with lots of opportunities to enjoy our lives”.

Jonny age 8 from Perth

A natural, resilient TAYplan

Policy 8 GREEN NETWORKS

A. Strategies, Policies, Plans and Programmes shall protect and enhance green and blue networks by ensuring that:
i. development does not lead to the fragmentation of existing green networks;

ii. development incorporates new multifunctional green networks (that link with existing green networks) of appropriate quantity and quality to meet the needs arising from the nature of the development itself; and,

iii. the provision of networks of green infrastructure is a core component of any relevant design framework, development brief or masterplan.

B. Local Development Plans should identify existing key networks of green infrastructure and opportunities to enhance them to maximise the benefits they provide. Improvements should include:

i. better recreational access opportunities and active travel routes;

ii. improvements to habitat networks and green spaces;

iii. more widespread use of green infrastructure for water management; and,

iv. an overall enhancement to quality of the place.

C. In identifying opportunities to enhance green networks, Local Development Plans should focus on the following key elements of the TAYplan Green Network:

i. Strategic Development Area Green Networks
Strategic Development Areas (Policy 3) shall provide new, networked green spaces. These should be integrated with green networks in adjacent urban areas and the countryside*.

ii. Dundee and Perth Core Areas
Opportunities to use green infrastructure enhancements to improve health and access should be identified in the Core Areas including opportunities shown on Map 8.

iii. Strategic Active Travel Links
Local Development Plans and other plans and programmes should identify opportunities to improve active travel links in line with priorities identified on Map 8, and connecting with existing routes including the National Cycle Network.

Footnote
*Forfar Agricultural Service Centre is not a site specific strategic development area and so has been excluded. For other Strategic Development Areas e.g. Montrose Port and Orchardbank networks have been implemented.

Map 8 TAY GREEN NETWORK STRATEGY

Strategic Development Areas

2 - 11

Strategic Active Travel Links

12
Carse of Gowrie - Improve access networks around national cycle network 77

13
Improve links between Perth and Newburgh

14
Improve access networks around national cycle network 777 and links to Fife Coastal Path

Core Area Priorities

15
Better active travel links between West/ North West Perth and city centre

16
Better active travel links between Dundee Western Gateway, the James Hutton Institute and the city and surrounding countryside

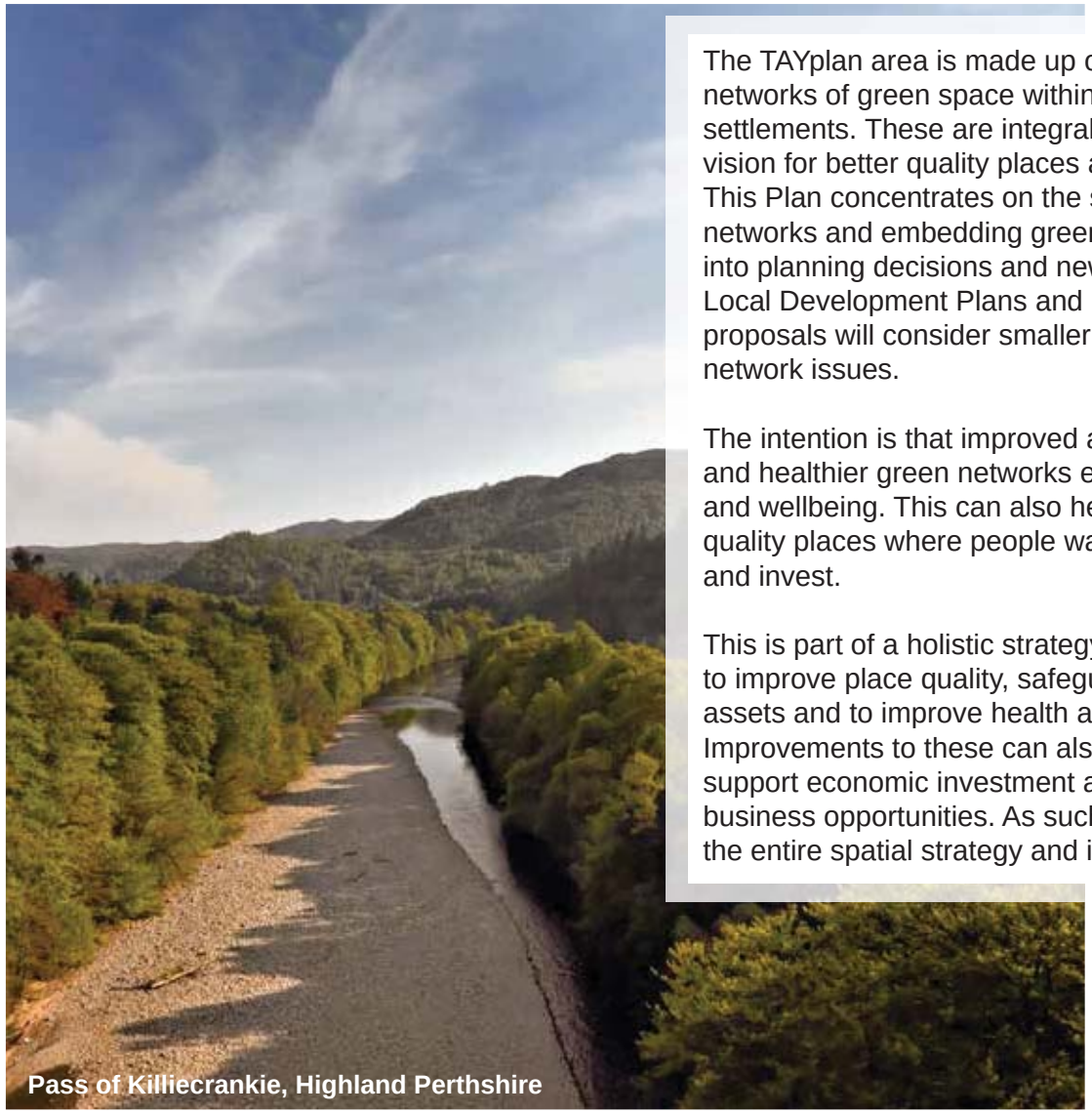
17
Dundee Wider Waterfront links

18
Dundee Waterfront - Monifieth links

19
Areas of deprivation

2735

What this policy is for


Pass of Killiecrankie, Highland Perthshire

The TAYplan area is made up of numerous networks of green space within and between settlements. These are integral to achieving the vision for better quality places and healthier lives. This Plan concentrates on the strategic green networks and embedding green network thinking into planning decisions and new development. Local Development Plans and planning proposals will consider smaller scale, local green network issues.

The intention is that improved access to stronger and healthier green networks enriches our health and wellbeing. This can also help provide good quality places where people want to live, work and invest.

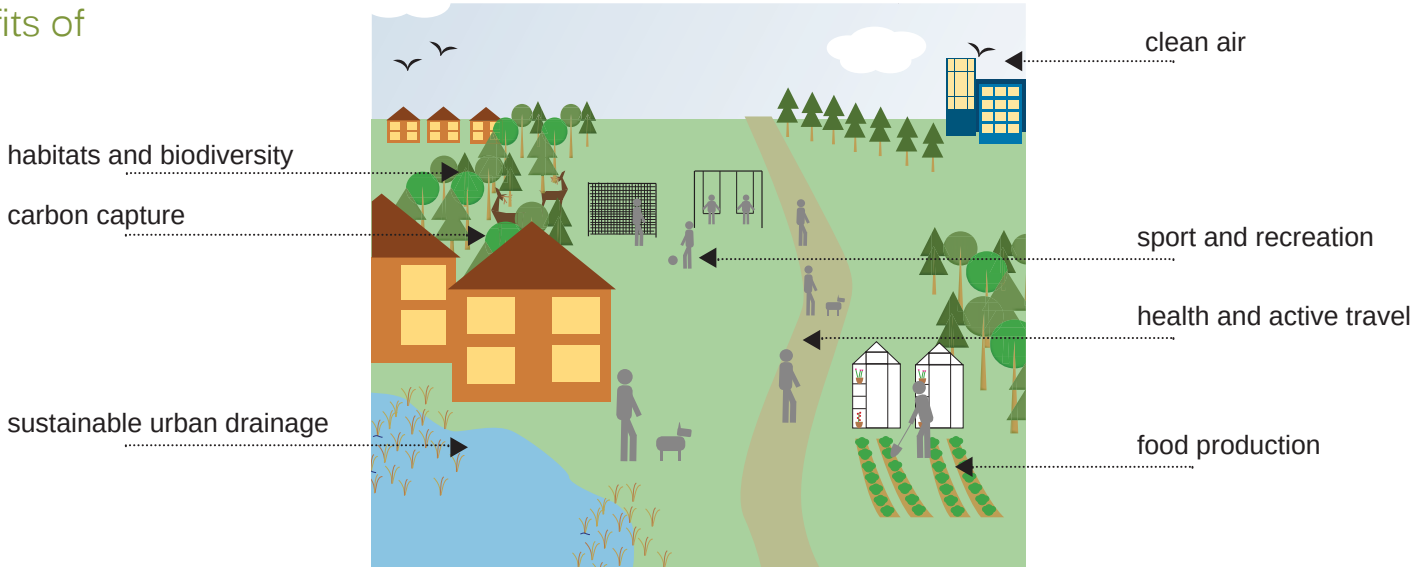
This is part of a holistic strategy in this Plan to improve place quality, safeguard important assets and to improve health and quality of life. Improvements to these can also generate or support economic investment and associated business opportunities. As such this underpins the entire spatial strategy and is integrated to form a part of the decision framework behind the locational priorities (Policy 1), assets safeguarding (Policy 9) and place shaping (Policy 2).

Green networks are connected pieces of green space (e.g. the water environment, woodland, fields, parks etc), often with connections into wider active travel routes. They include the countryside around towns and cities but also include green space within them. They are multifunctional because they provide space for lots of important activities. These include recreation, sport and exercise, active travel, habitats for plants and animals, growing food and utilising resources, water storage and natural flood storage areas, and for tourism and business opportunities. They also host important natural processes that benefit our lives, our economy and assist us in adapting to climate change.

New development and some forms of intensive land management can fragment green networks. Fragmented networks are less resilient to the impacts of climate change and provide fewer benefits for people.

GREEN NETWORKS

The multiple benefits of green networks



How this policy works

Policy 8 sets out measures to avoid the fragmentation of green networks and to maximise the benefits from them by ensuring they are an integral part of decisions about the location, design and layout of development from the outset. Map 8 shows the Tay Green Network Strategy, setting out the components of a transformational change to enhance green networks around the River Tay. This area is expected to see the greatest change from an increased population, new development and infrastructure.

Design Frameworks for Strategic Development Areas will provide an opportunity to plan for new networks of green infrastructure that link with and enhance existing green networks and active travel routes.

Local Development Plans will play a key role in planning for green networks in, and adjacent to, the Dundee and Perth Core Areas. A key priority here is to improve access and health for communities across the Core Areas, including those areas that are amongst Scotland's 20% most deprived. This is part of a broader strategy to enhance health and quality of life of those living in these areas as well as improving place quality.

For the Perth Core Area, a key priority is to plan for better links between the West/North West Perth Strategic Development Area and Perth city centre. For Dundee a key priority is to improve links between the Strategic Development Areas of Dundee Western Gateway, the city and wider countryside, including the James Hutton Institute and eastwards to the Dundee Waterfront and beyond to Broughty Ferry and Monifieth.

There are also opportunities to improve strategic active travel links in the areas between the two cities through the Carse of Gowrie. Other opportunities include better links between Oudenarde Strategic Development Area and Newburgh and links eastwards to the Fife Coastal Path. A number of organisations, including the Tay Landscape Partnership, are already working on projects.

The Tay Green Network Strategy (Map 8) provides a new focus to deliver:

- opportunities for active travel and recreation;
- better access to the countryside (including Core Paths);
- better connected habitat networks;
- improved quality of place;
- a healthier environment;
- regeneration that maximises benefits of green infrastructure;
- quality places to attract inward investment;
- more opportunities to experience nature and landscapes near where people live; and,
- better water management.

Policy 9 MANAGING TAYPLAN'S ASSETS

Land should be identified through Local Development Plans to ensure responsible management of TAYplan's assets by:

A. Finite Resources
using the location priorities set out in Policy 1 of this Plan to:

i. identify and protect known deposits of solid, liquid and gas minerals of economic importance;

ii. maintain a minimum of 10 years supply of construction aggregates at all times in all market areas;

iii. identify and protect deposits of nationally important minerals identified on the British Geological Survey's Critical List; and,

iv. protect prime agricultural land or land of lesser quality that is locally important, new and existing forestry areas, and carbon rich soils where the advantages of development do not outweigh the loss of this land.

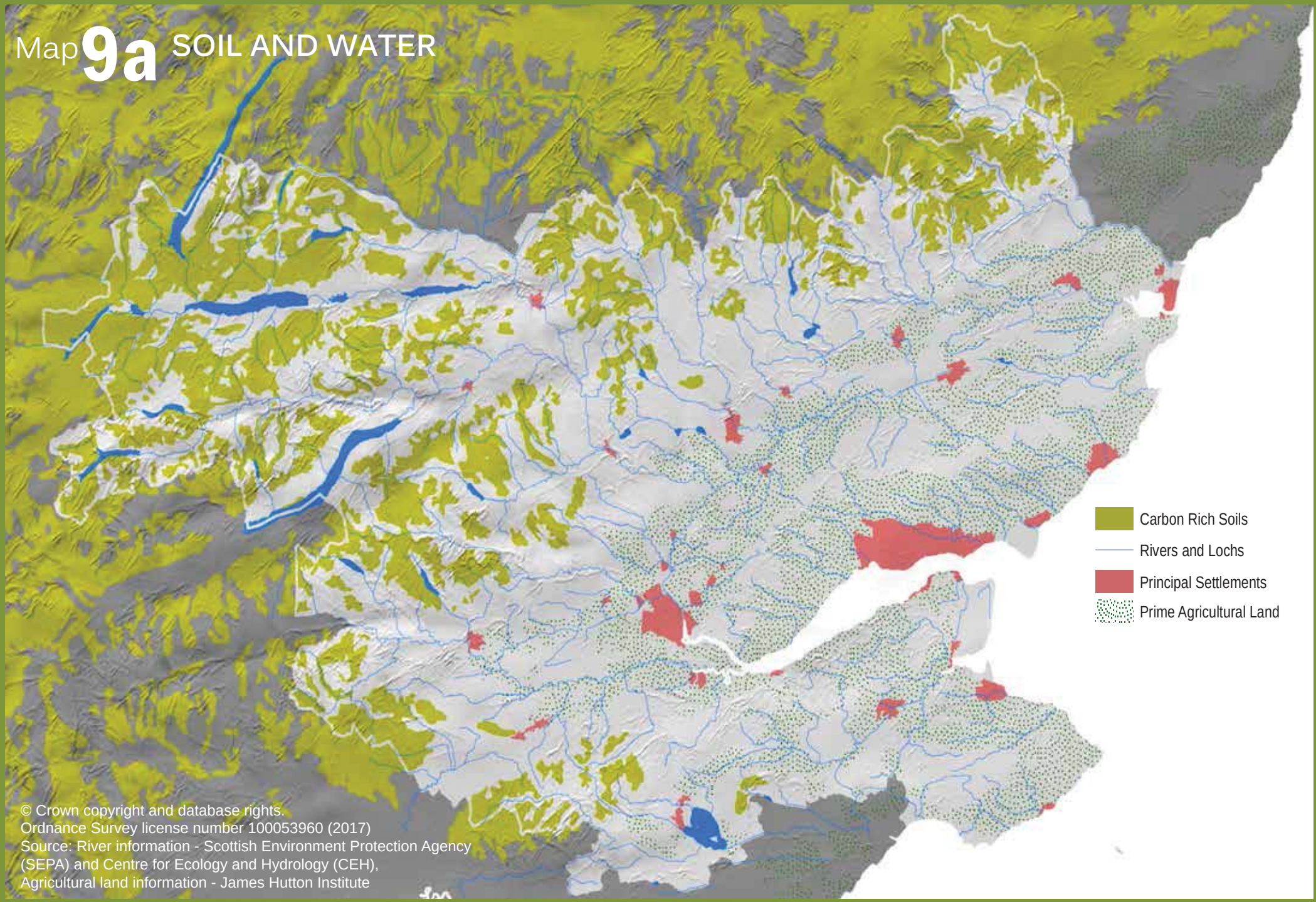
B. Protecting Natura 2000 sites
ensuring development likely to have a significant effect on a designated or proposed Natura 2000 site(s) (either alone or in combination with other sites or projects), will be subject to an appropriate assessment. Appropriate mitigation must be identified, where necessary, to ensure there will be no adverse effect on the integrity of Natura 2000 sites in accordance with Scottish Planning Policy.

C. Safeguarding the integrity of natural and historic assets
i. understanding and respecting the regional distinctiveness and scenic value of the TAYplan area through safeguarding the integrity of natural and historic assets; including habitats, wild land, sensitive green spaces, forestry, water environment, wetlands, floodplains (in-line with the Water Framework Directive), carbon sinks, species and wildlife corridors, and also geo-diversity, landscapes, parks, townscapes, archaeology, historic battlefields, historic buildings and monuments; and by allowing development where it does not adversely impact upon or preferably enhances these assets. Local Development Plans should set out the factors which will be taken into account in development management. The level of protection given to local designations should not be as high as that given to international or national designations. International, national and locally designated areas and sites should be identified and afforded the appropriate level of protection, and the reasons for local designations should be clearly explained and their function and continuing relevance considered, when preparing plans.

ii. Protecting and improving the water environment (including groundwater) in accordance with the legal requirements in the *Water Framework Directive 2000/60/EC* and the *Water Environment and Water Services (Scotland) Act 2003* which require greater integration between planning and water management through River Basin Management Plans.

D. Safeguarding the qualities of unspoiled coast
identifying and safeguarding parts of the unspoiled coastline along the River Tay Estuary and in Angus and North Fife, that are unsuitable for development. Local Development Plans should also set out policies for their management; identifying areas at risk from flooding and sea level rise and develop policies to manage retreat and realignment, as appropriate. Local Development Plans should have regard to the National Marine Plan, and Regional Marine Plans, where appropriate.

Map 9a SOIL AND WATER



Source: River information - Scottish Environment Protection Agency (SEPA) and Centre for Ecology and Hydrology (CEH), Agricultural land information - James Hutton Institute

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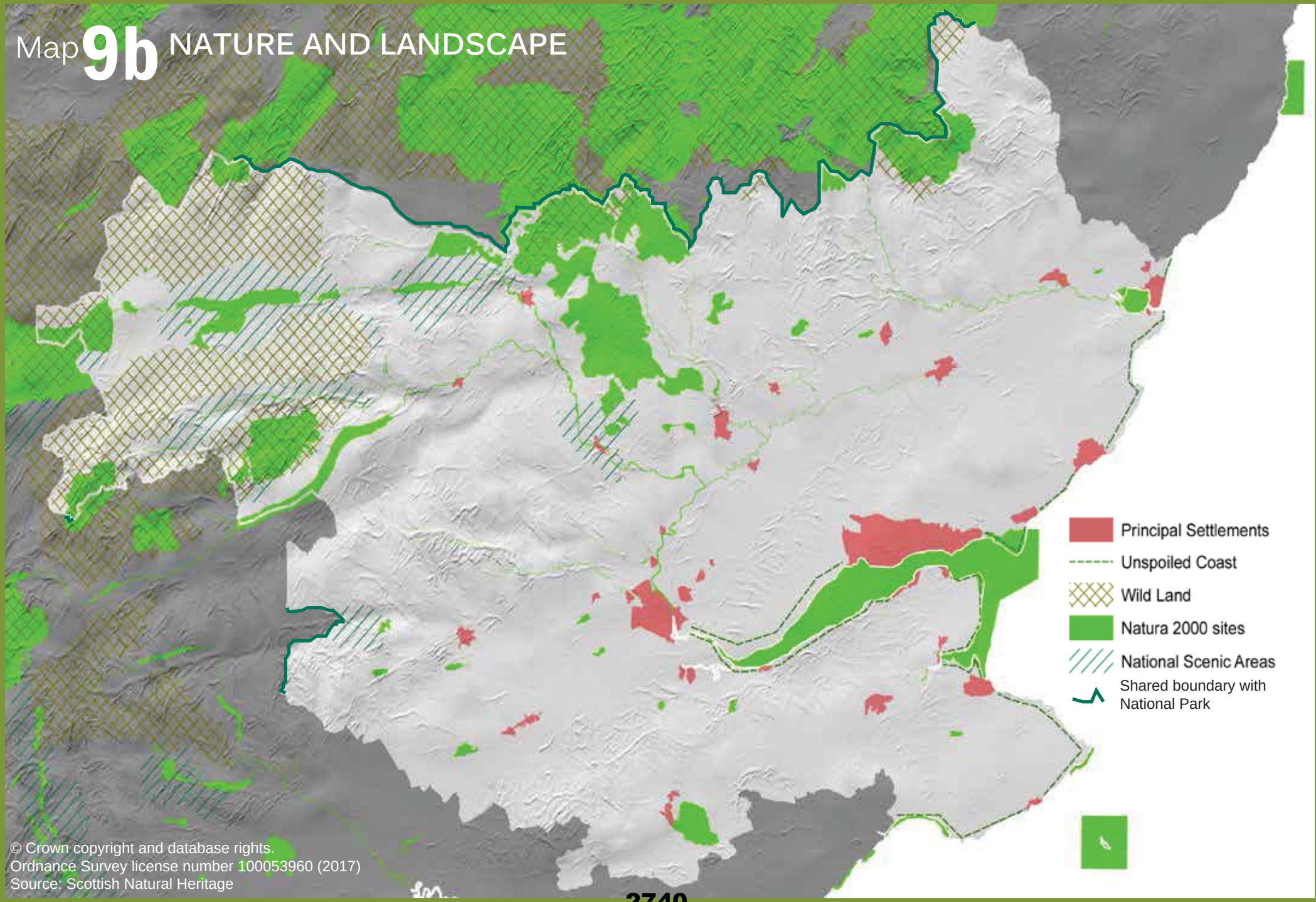
Map 9b NATURE AND LANDSCAPE



Source: Scottish Natural Heritage

2740

What this policy is for

Glamis Castle

The TAYplan area is a combination of many diverse and distinctive environments. It is characterised by some of the UK's most attractive and dramatic landscapes and is rich in history and biodiversity. It is made up of mountains, lochs and forests to the north and west with a coastal plain to the east. The majority of the region is drained by the River Tay.

These assets and resources are essential for delivering the vision because they help define our culture and identity as well as providing us with food, resources and opportunities for recreation and business. This policy is designed to protect important resources and high quality environments to be utilised and enjoyed today and also by future generations.

Development that contributes to sustainable development respects the inherent value of the finite resources, and, the natural and historic assets that enhance our quality of life. The right type of good quality development in the right places can bring social, economic and environmental benefits. Proper consideration of assets and their roles in supporting important natural processes and our needs as a society can support broader objectives of national food and resource security and growing the economy within environmental limits. This can also use existing assets to build-in resilience to limit the risks from climate change.

This requires the protection of finite resources such as minerals, forestry and prime agricultural land* as a major consideration in the prioritisation of land release for development. It also requires the protection of environmentally sensitive areas and other important natural and historic assets** where development must comply with legal requirements for protected areas and species and where there is no adverse effect on environmentally sensitive areas and other important areas such as some coastal areas, Natura 2000*** sites and other locations. These assets have their own intrinsic value, but they also provide a number of benefits and services that we depend on for our quality of life.

Scottish Planning Policy makes clear development should be refused where the nature or scale of proposed development would have an unacceptable impact on the natural environment. This also links closely with protection and enhancement of green networks (Policy 8).

Footnotes

**Prime agricultural land: Land classes 1, 2 and 3.1 – these are the most suited to arable agriculture.*

***Natural and historic assets: Green networks, landscapes, wild land, habitats, wildlife sites and corridors, vegetation, biodiversity, green spaces, geological features, water environment and ancient monuments, battlefields, archaeological sites and landscape, historic buildings, townscapes, parks, gardens and other designed landscapes, and other features (this includes but is not restricted to designated buildings or areas).*

****Natura 2000: European-wide designations to protect habitats and species – Special Protection Areas (SPAs), Ramsar sites and Special Areas of Conservation (SACs)*

MANAGING TAYPLAN'S ASSETS

2741

Crail Harbour, Fife

How this policy works

Policy 9 is part of a framework to appropriately locate new development (Policies 1, 3, 4, 5 and 7) and achieve good quality places (Policies 2 and 6) whilst safeguarding assets (Policies 8, 9 and 10). It considers important or sensitive assets and limits the range of land uses that can take place there, or the circumstance in which development can take place. This is not a blanket ban on development but a considered approach to make good decisions that take full account of the benefits these assets provide. This ensures the societal importance of land for resource extraction, food, timber, water storage and carbon storage are integral considerations ahead of development. Maps 9a and 9b show the locations of prime agricultural land, carbon rich soils, Natura 2000 sites and wild land. These are integral to delivering Policy 1 and the other policies in this Plan.

Local Development Plans will ensure that alternative land uses are directed away from areas with economically important deposits of construction aggregates; solid, liquid and gas minerals or minerals listed on the British Geological Survey Risk List; e.g. Barytes in Highland Perthshire. Policies 2 and 7 cover specific issues relating to infrastructure for extraction of solid, liquid and gas minerals.

The potential for the nomination of a UNESCO Biosphere Reserve onthe Lower Tay will be further explored with the relevant parties.

Some natural and historic assets already have statutory protection; e.g. listed buildings, and some landscape and habitat designations. Well planned and designed development can enhance these assets. For many built assets the emphasis is on preservation and enhancement through an appropriate continued use. For natural and some historic assets the emphasis is on safeguarding the asset by limiting development. Local Development Plans and planning decisions will need to consider the National Marine Plan, and subsequent regional plan, as well as considering the water environment to contribute to the objectives of the Water Framework Directive as set out in the respective River Basin Management Plans. The Scottish Planning Policy presumption against further fish farms on the east coast will contribute to protecting the Salmon fishing value of the River Tay.

Consideration of all assets will form part of the ‘place-based’ approach in Policy 2. This approach will ensure that we maximise the benefits that our natural and historic assets provide. Planning authorities will weigh up the sensitivities of natural and historic assets within the broader context of delivering the vision and outcomes of this Plan.

Opportunities for better coastal management will be explored with Scottish Natural Heritage and Marine Scotland. Unspoiled coast, where development opportunities will be limited, is shown on Maps 1 and 8. Developed coast, where commercial activity takes place, is within the principal settlements defined in Policy 1.

“We can easily go where we want to go, safely and healthily”.

Keith age 46, dad and Sarah age 12, daughter from Blairgowrie

A connected TAYplan

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Policy 10 CONNECTING PEOPLE, PLACES AND MARKETS

Local Development Plans should enhance connectivity of people, places and markets by:

A. safeguarding land at Dundee and Montrose Ports, and other harbours as appropriate, for port related uses to support sea freight, economic growth in the port, offshore renewable energy and offshore oil and gas sectors, and, maritime trade, recreation and tourism;

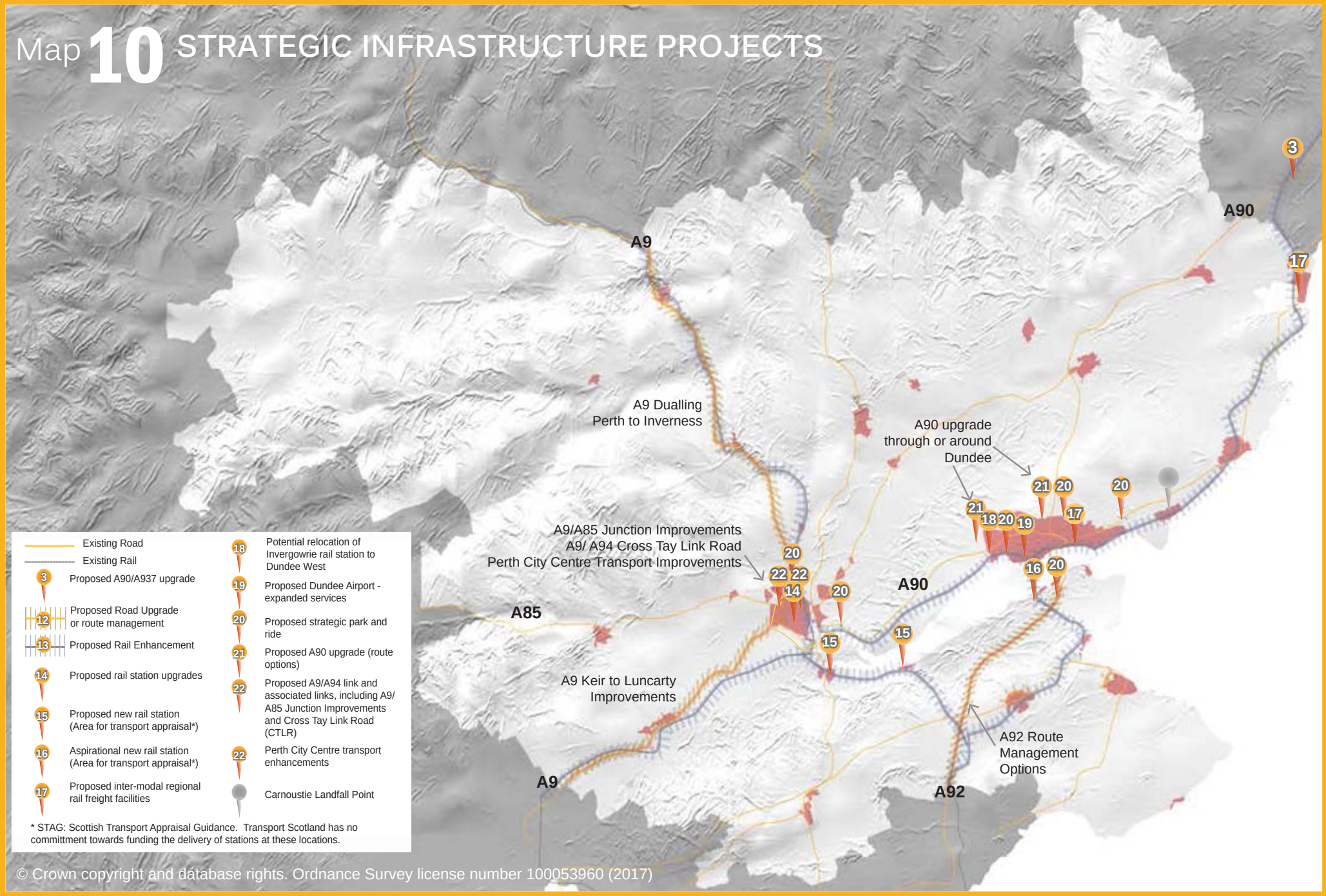
B. safeguarding business land with rail/wharf access to promote potential rail/sea freight;

C. co-locating freight transport facilities to enable transhipment of cargo between road, rail and sea;

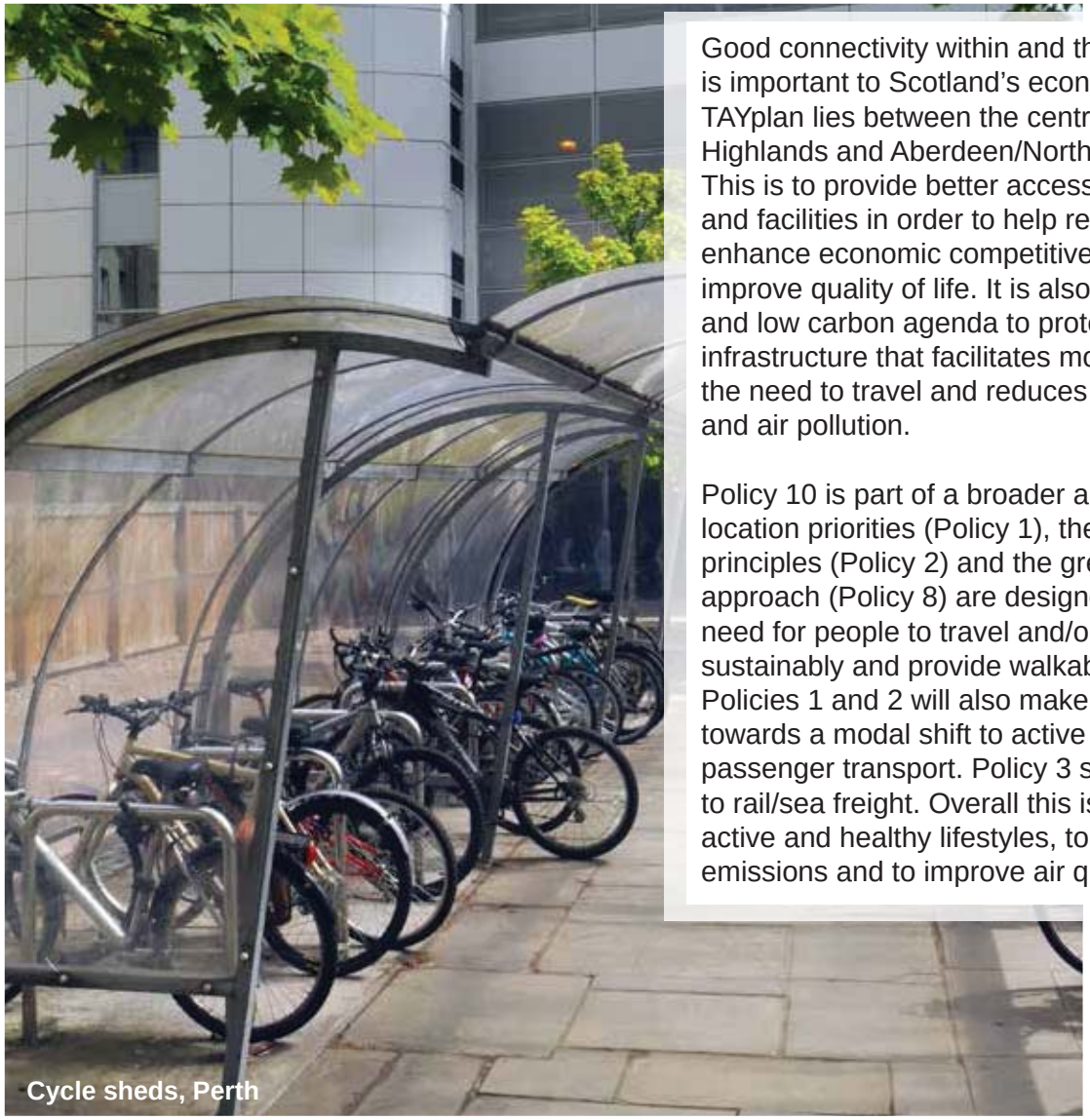
D. safeguarding land for future infrastructure provision (including routes) that are:

i. integral to the delivery of Strategic Development Areas (Policy 3);
ii. identified in the National Planning Framework, Strategic Transport Projects Review or Regional Transport Strategies covering the TAYplan area; and,
iii. other locations or routes, as appropriate, including those which are essential to support a modal shift from reliance on the car travel and road-based freight and support a reduction in carbon emissions and improvements to air quality.

Map 10 STRATEGIC INFRASTRUCTURE PROJECTS



What this policy is for



Cycle sheds, Perth

Good connectivity within and through the area is important to Scotland's economy because TAYplan lies between the central belt and the Highlands and Aberdeen/North East Scotland. This is to provide better access to jobs, services and facilities in order to help reduce disparities, enhance economic competitiveness and improve quality of life. It is also part of the health and low carbon agenda to protect/provide for infrastructure that facilitates modal shift, reduces the need to travel and reduces carbon emissions and air pollution.

Policy 10 is part of a broader approach. The location priorities (Policy 1), the place shaping principles (Policy 2) and the green networks approach (Policy 8) are designed to reduce the need for people to travel and/or travel more sustainably and provide walkable communities. Policies 1 and 2 will also make a contribution towards a modal shift to active travel and passenger transport. Policy 3 supports a shift to rail/sea freight. Overall this is to promote active and healthy lifestyles, to reduce carbon emissions and to improve air quality. Policy 10 focuses on safeguarding land and infrastructure that is capable of supporting well-connected people, places and markets. This also supports the economic ambitions of Policy 3 and place shaping principles of Policy 2. Developer contributions towards appropriate new or improved transport infrastructure are considered in Policy 6.

The Scottish Government and private companies are investing in new digital infrastructure that will change the way places function and how people access services, particularly in rural areas.

Realising the business benefits of co-locating heat users and producers together, as well as pipelines, add an important dimension to the concept of connectivity. However, the implications of energy, waste and resource management infrastructure are covered in Policy 7 and all development is covered by Policy 2.

CONNECTING PEOPLE, PLACES AND MARKETS

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Montrose Port

How this policy works

Policy 10 safeguards land for infrastructure or the infrastructure itself to ensure that it is not lost to alternative land uses. This includes land to support the delivery of the Scottish Government's *Strategic Transport Projects Review* (2008), the two Regional Transport Strategies* that cover the TAYplan area, and infrastructure required to deliver the Strategic Development Areas (Policy 3). These infrastructure and service improvements are identified on Map 10. Only some are programmed or currently have funding.

The specific land, sites or routes are required to be identified and safeguarded within Local Development Plans or detailed in design frameworks and masterplans. Development proposals and land allocations will also design-in and protect, where appropriate, land for movement to reflect place shaping principles in Policy 2 and make modal shift easy and convenient. This will require close co-operation between developers and infrastructure/service providers.

National projects include the Highland Mainline and dualling the A9, both from Perth northwards. Regional projects include improvements to port access and to rail stations and services. There is also a new Cross-Tay Link Road to improve capacity within Perth Core Area. Collectively these will improve journey times within the TAYplan region. In conjunction with the new Forth crossing and the Aberdeen Western Peripheral Route (bypass), they will also help improve journey times between the highlands/North East of Scotland, and, the Scottish Central belt and the rest of the UK. Proposed new railway stations (Map 10) are subject to *Scottish Transport Appraisal Guidance* (STAG) and Transport Scotland has no commitment towards funding the delivery of stations in these locations.

Policy 10 safeguards Dundee and Montrose ports for port-related land uses. This is to facilitate the growth in the offshore renewable energy, oil and gas sector envisaged by the *National Planning Framework 3* and *National Renewables Infrastructure Plan* (2011). This, and also safeguarding other harbours, also supports coastal fishing, tourism from cruise liners and sailing and sea freight/freight transhipment. Dundee port also has the potential to connect directly into the East Coast Mainline.

New strategic water supply and drainage infrastructure is planned through Scottish Water's Capital Programme to help deliver this Plan. Policies 2 and 9 also consider water management.

Footnotes
**Regional Transport Strategies – Tactran (2008) covering Angus, Dundee City and Perth & Kinross and SEStran (2008) covering North Fife.*

TAYplan
The Strategic Development Planning Authority
for Dundee, Perth, Angus and North Fife

TAYplan Strategic Development Planning Authority
Enterprise House, 3 Greenmarket, Dundee, DD1 4QB

01382 307180
contactus@tayplan-sdpa.gov.uk

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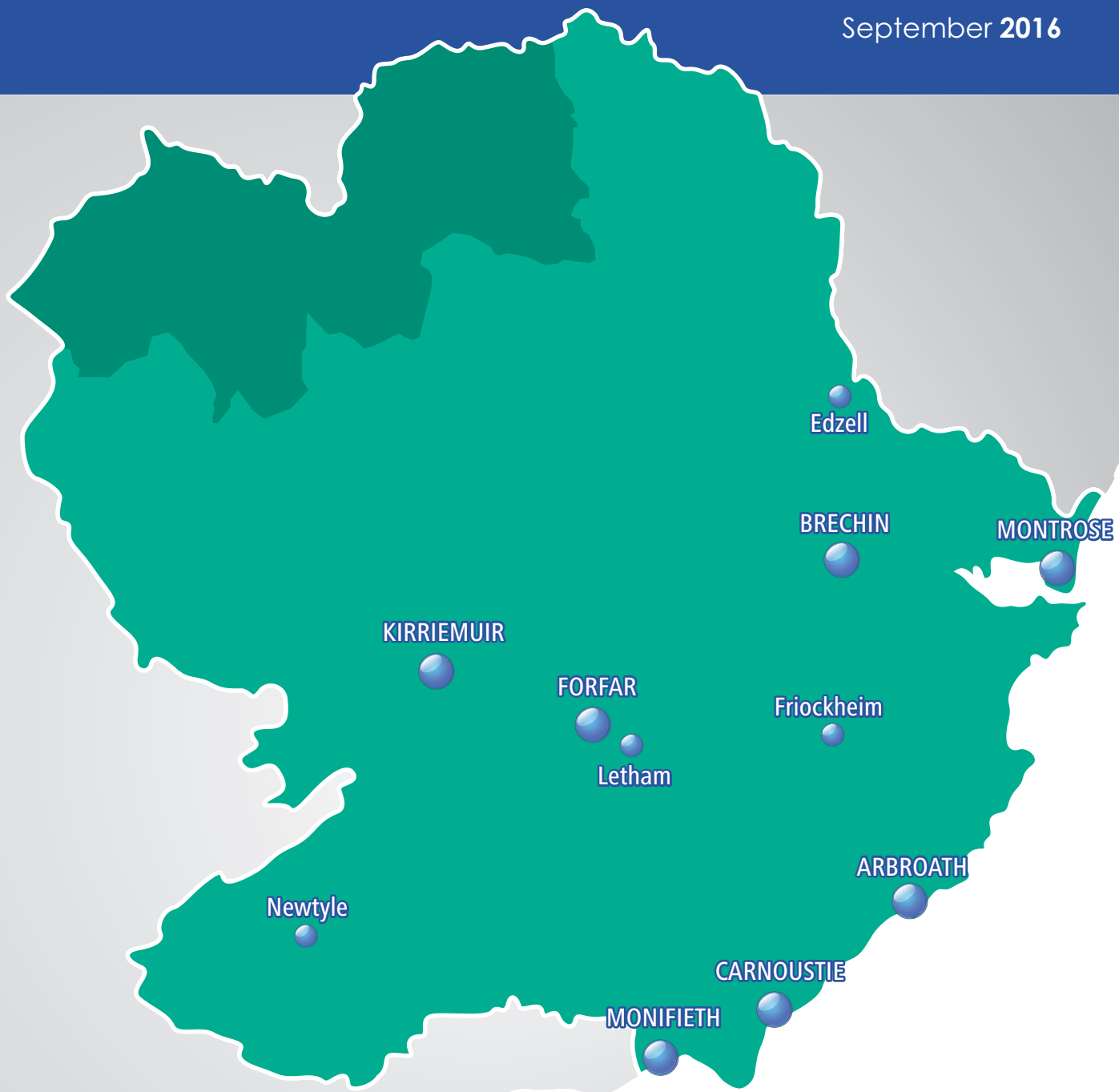
ANGUS LOCAL DEVELOPMENT PLAN

September **2016**



Angus Council

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Translation Services

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The Angus Local Development Plan was adopted by Angus Council on 23 September 2016 and sets out the Councils view on how the area should develop over the next 10 years from 2016 – 2026.

Copies of the Adopted Angus LDP and updated Environmental Report are available for inspection at all Public Libraries and ACCESS Offices across Angus and Receptions at County Buildings, Market Street, Forfar and Angus House, Orchardbank Business Park, Forfar, during normal opening hours. Alternatively the documents are available online at:
www.angus.gov.uk/info/20307/local_development_plan

For further information or assistance please contact the Environment and Development Plan Team via ACCESSLine: 03452 777 778 or by e-mail to localplan@angus.gov.uk

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CONTENTS

CONTEXT

Angus is a diverse and attractive place, with a network of interrelated communities. Seven towns and a large number of villages and smaller settlements are set in a varied rural landscape. Geographically, the area is made up of the coastal plain, the lowland of Strathmore and the Glens and upland areas that form part of the Grampian Mountains. Each of these areas makes a vital contribution to the overall character and distinctiveness of Angus.

The Development Plan for the majority of Angus consists of two documents: the Strategic Development Plan and the Local Development Plan. Supplementary Guidance will also be prepared to provide further detail and explanation of the policies and proposals of these plans. The Local Development Plan is required to be consistent with the Strategic Development Plan.

The Strategic Development Plan (SDP) covering Angus (TAYplan) was approved in June 2012, and sets out a vision to 2032, as well as policies and land requirements. TAYplan SDP provides the strategic context for the preparation of the Angus Local Development Plan. The Strategic Development Plan is required to be reviewed every five years, and as such, it is anticipated that a review of the plan will be approved in 2017, during the lifetime of this Local Development Plan.

The Angus Local Development Plan (ALDP) will guide development for ten years following adoption, up to 2026. The plan sets out where land is being allocated to meet development needs and where new development should and should not happen. The ALDP will be reviewed at five yearly intervals to ensure that an up to date plan is in place at all times and to ensure consistency with the Strategic Development Plan.

Part of upland Angus is within the Cairngorms National Park boundary, and is excluded from the TAYPlan SDP and this Local Development Plan. This area is covered by the Cairngorms National Park Local Development Plan.

FORMAT OF THE PLAN

The Angus Local Development Plan (ALDP) consists of a Written Statement and Proposals Map (including Inset Maps). The Written Statement is made up of five parts:

1. Vision and Outcomes
2. The Strategy
3. The Policy Framework
4. Settlement Statements
5. Implementation and Monitoring

The first part of the Written Statement sets out the **Vision and Outcomes** that the Angus Local Development Plan (ALDP) is seeking to deliver.

The **Strategy** sets out a presumption in favour sustainable development as well as a development strategy and overarching policies guiding investment to the right place, and promoting high quality development which minimises adverse impacts on the high quality environment of Angus. It is expected that policies set out in the ALDP Strategy will be applicable to all development in Angus.

The **Policy Framework** manages and guides sustainable development in Angus by dealing with particular land uses or issues to be considered. The framework has been structured around two broad themes:

- Thriving and Connected: making a successful, sustainable and well-connected place – supporting sustainable economic growth and regeneration, the creation of well-designed places and supporting better transport and digital connectivity.
- Protected and Valued: making a low carbon, natural and resilient place – reducing our carbon emissions, adapting to climate change and protecting and enhancing our natural and cultural assets.

Settlement Statements are place specific for the Towns and Rural Service Centres: identifying areas allocated for growth; sites which present opportunities for reuse, redevelopment and regeneration; and sites which are protected from development. The smaller settlements in the rural area are covered by a map showing the development boundary and where necessary a short statement to explain any particular site or strategy in more detail.

The **Implementation and Monitoring** section sets out how we intend to apply, assess, measure and review the performance of the Plan. This links to the implementation of the plan, as detailed in the **Action Programme** (published separately).

It is important to recognise that the plan should be read in its entirety, as there may be policies in the Strategy, Policy Framework and Settlement Strategies that are relevant to any particular proposal. **Proposals will be expected to comply with all relevant policies within the plan**, and therefore limited cross reference has been included within policies to other relevant considerations. A matrix is included in the Implementation and Monitoring section which indicates policies that may be of relevance to particular proposals.

In addition to the Written Statement and Proposals Map, the Angus Local Development Plan (ALDP) will also include Supplementary Guidance. This will be published separately, but will provide further information or detail in respect of policies or proposals set out in the Plan. The Plan includes references to where Supplementary Guidance has been or will be prepared, and where the guidance is to be prepared; timescales are set out in the Action Programme.

The Angus Local Development Plan (ALDP) is also supported by non-statutory guidance in the form of Planning Advice Notes and Development Briefs. This guidance will not form part

of the development plan, however, the Council's adoption of it will give it a degree of authorisation and it will be a material consideration in decision making.

Strategic Environmental Assessment

The development of the ALDP has been informed by the Strategic Environmental Assessment (SEA), which is required under the Environmental Assessment (Scotland) Act 2005. SEA is a method of considering and broadly evaluating the likely impact of the plan on the environment. The process of SEA can help avoid, or minimise any negative environmental impacts and enhance positive ones. The findings of the assessment are outlined in detail in the environmental Report which accompanies the ALDP, but an indication of the environmental Implications of each policy and proposal is set out in the plan for information. Site specific proposals have not been subject to SEA where they already benefit from planning permission or have been implemented in part.

The following symbols are used to illustrate the identified environmental implications:

++	Significant positive effect	?	Unknown effect
+	Positive effect	-	Negative effect
0	Neutral effect	--	Significant negative effect

VISION AND OUTCOMES

The Scottish Government's purpose of creating a more successful country through increasing sustainable economic growth is set out in the Government Economic Strategy. The Purpose is tracked by seven Purpose targets and supported by sixteen National Outcomes.

Planning is broad in scope and cross cutting in nature, but the overall ambition is to create better places. As such it contributes to a greater or lesser extent to each one of the 16 National Outcomes, and therefore to the Scottish Government's overall Purpose.

The Third National Planning Framework (NPF3) and Scottish Planning Policy (SPP) (both 2014) set out a single vision for the planning system in Scotland:

"We live in a Scotland with a growing, low carbon economy with progressively narrowing disparities in well-being and opportunity. It is growth that can be achieved whilst reducing emissions and which respects the quality of environment, place and life which makes our country so special. It is growth which increases solidarity – reducing inequalities between our regions. We live in sustainable, well-designed places and homes which meet our needs. We enjoy excellent transport and digital connections, internally and with the rest of the world."

The TAYplan Strategic Development Plan (TAYplan SDP) sets out a broad vision for what the region (including most of Angus) should be like in 20 years time. TAYplan SDP focuses on sustainable economic growth and a better quality of life through a stronger and more resilient economy, better quality places, reduced resource consumption and better resilience to climate change. The vision to guide new development is as follows:

"By 2032 the TAYplan region will be sustainable, more attractive, competitive and vibrant without creating an unacceptable burden on our planet. The quality of life will make it a place of first choice where more people will choose to live, work, study and visit, and where businesses choose to invest and create jobs."

This vision is carried through to the local level to guide future development across Angus. The Angus Local Development Plan (ALDP) must also take account of the Council's and Community's own vision for the area which is stated in the Angus Community plan and Single Outcome Agreement 2013 – 2016:

"Angus is a place where a first class quality of life can be enjoyed by all."

The strategy and policies of the Angus Local Development Plan (ALDP) should help to achieve these complementary visions by focusing on the national and local outcomes to which they can contribute.

SPP (2014) identifies four planning outcomes which contribute to the national vision and the Community Planning Partnership identifies five priorities supported by a number of more detailed outcomes that will help to achieve the stated local vision.

Using these priorities and outcomes to determine the structure of the ALDP and guide its contents will mean that the links between planning decisions based on ALDP policy, the national planning outcomes and the Community Planning Partnership's priorities are more explicit.

VISION AND OUTCOMES

<table>
<tr><td rowspan="2">SPP Planning Outcomes</td><td>Planning makes Scotland a <u>successful, sustainable place</u> – supporting sustainable economic growth and regeneration and the creation of well-designed places</td><td>Planning makes Scotland a <u>low carbon place</u> – reducing our carbon emissions and adapting to climate change.</td></tr>
<tr><td>Planning makes Scotland a <u>connected place</u> – supporting better transport and digital connectivity</td><td>Planning makes Scotland a <u>natural, resilient place</u> – helping to protect and enhance our natural and cultural assets and facilitating their sustainable use.</td></tr>
<tr><td rowspan="2">Community Plan Priority areas</td><td>Learning & Supportive</td><td>Safe & Strong</td><td>Sustainable</td></tr>
<tr><td>Caring & Healthy</td><td>Prosperous & Fair</td><td></td></tr>
<tr><td rowspan="3">Angus Local Development Plan (ALDP)</td><td colspan="2">ALDP Strategy</td></tr>
<tr><td>Thriving and Connected:
Housing
Services
Connectivity
Employment
Tourism & Leisure
Town Centres</td><td>Protected and Valued:
Natural Environment
Built Environment
Heat and Energy Networks
Water Environment
Resources</td></tr>
<tr><td colspan="2">Settlement Statements</td></tr>
</table>

The Angus Local Development Plan (ALDP) Strategy has 3 elements to it:

PART 1. A presumption in favour of sustainable development

PART 2. Directing the right development to the right place

PART 3. Creating high quality places

Each element is set out below.

PART 1. A PRESUMPTION IN FAVOUR OF SUSTAINABLE DEVELOPMENT

The planning system should support economically, environmentally and socially sustainable places by enabling development that balances the costs and benefits of a proposal over the longer term.

Enshrined in the ALDP is a **presumption in favour of sustainable development**. This means that The Council will take a positive approach when considering development proposals and will work proactively with applicants to find solutions which mean that proposals that will, on balance, improve the economic, social and environmental conditions in the area can be supported.

Planning applications that accord with the policies in the ALDP will be considered acceptable in principle and considerations should focus on the detailed matters arising.

PART 2. DIRECTING THE RIGHT DEVELOPMENT TO THE RIGHT PLACE

TAYPLAN STRATEGIC DEVELOPMENT PLAN

The TAYplan SDP establishes the high level spatial strategy for development in the region – setting out principles of the scale of development and where it should and should not go. It is for Local Development Plans to provide further details on the scale and distribution of development including housing and employment land.

TAYplan SDP requires that the majority of new development takes place within principal settlements, with a focus on previously developed land and buildings. More specifically for Angus, the TAYplan SDP sets out a settlement hierarchy which includes Arbroath, Brechin, Carnoustie, Forfar, Kirriemuir, Monifieth and Montrose.

In the rural area outwith the towns, TAYplan SDP sets out an approach which balances the importance of sustaining the rural economy with the need to protect the countryside. A level of new housing and other appropriate development may be provided in the countryside and small settlements, but only where this meets specific local needs or supports regeneration of the local economy.

ANGUS

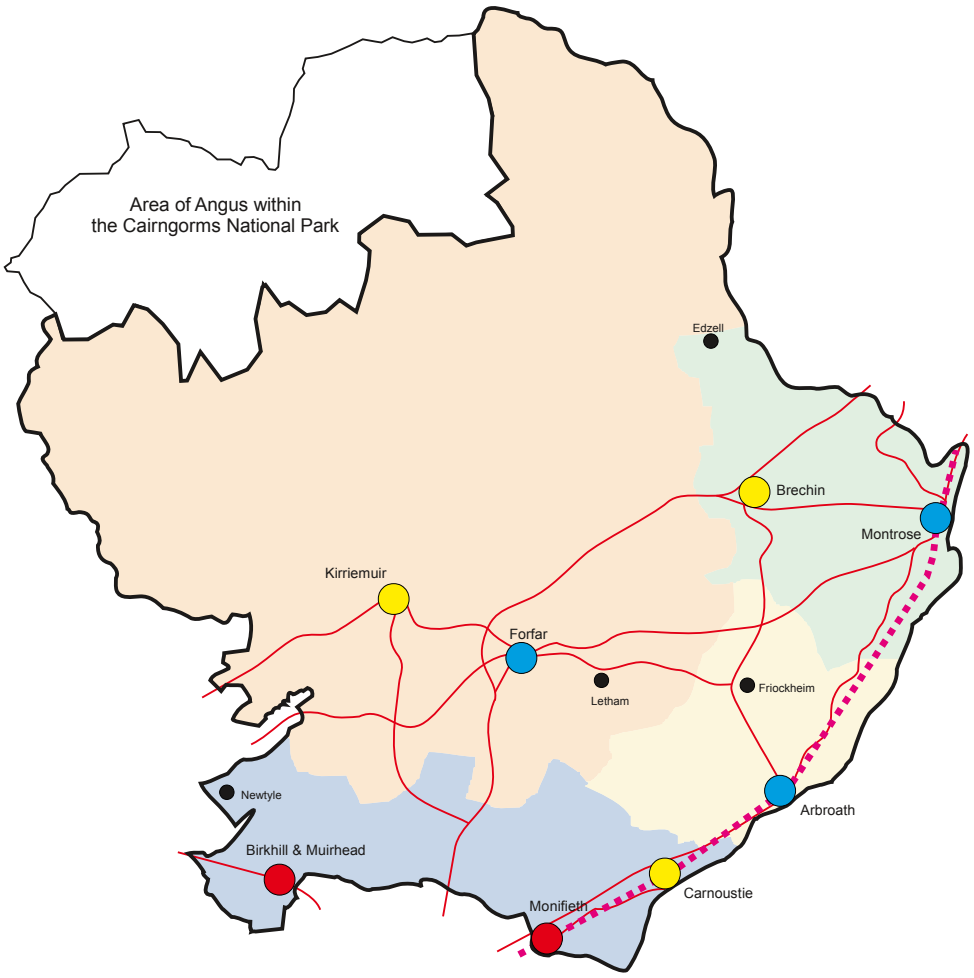
Previous Local Plans in Angus have established a strategy of guiding the majority of new development to the Angus towns, whilst enabling a range of rural development for local needs, tourism and leisure. Monitoring of these plans has shown that this strategy has been successful in supporting the development of our largest settlements, and it has also enabled employment, tourist and leisure facilities, together with a reasonable amount of new housing, to be developed in the rural area.

It is therefore appropriate to continue this development strategy: seeking to meet the growth and regeneration needs of the area and at the same time securing the creation of high quality places and the protection of the wider environment.

The Development Strategy of the Angus Local Development Plan (ALDP) draws from and builds on the inherent strengths of the close network of Angus towns and villages. The Strategy seeks to:

- **guide the majority of development, including local housing and employment opportunities, to locations within the towns that have the capacity to accommodate new development well integrated with existing infrastructure, and which serve as locally accessible centres serving a diverse rural hinterland;**
- **maintain and protect the diversity and quality of the rural area and encourage local development which supports the population and services of local communities;**
- **provide opportunities for appropriate diversification of the rural economy; and**
- **maintain the quality of valued landscapes, the natural, built and historic environment, and biodiversity.**

Figure 1: ALDP Development Strategy.



Principal Settlements
Tier 1
Tier 2
Tier 3
Rural Service Centres
Major Roads
East Coast Railway Line
East Angus HMA
North Angus HMA
South Angus HMA
West Angus HMA

THE TOWNS

In accordance with the TAYplan SDP (and because of the success of the current development strategy), the Angus Local Development Plan (ALDP) will continue to focus new development in the towns of Arbroath, Brechin, Carnoustie, Forfar, Kirriemuir, Monifieth and Montrose. This means that these towns will continue to be the preferred location for the majority of new housing and employment-related development, together with the majority of associated new infrastructure.

Most new development will be directed to the larger towns of Arbroath, Forfar and Montrose. The towns of Brechin, Carnoustie and Kirriemuir will also be a focus for new homes and businesses during the ALDP period commensurate with their role as smaller centres of population and economic activity.

Monifieth lies within the Dundee Core Area and the South Angus Housing Market Area, which itself is part of the Greater Dundee Housing Market Area. Because the town has a similar range of services and facilities to the other towns in Angus, it is considered an appropriate location to accommodate growth and future development opportunity over the ALDP period, as part of a sustainable settlement strategy for Angus. Focusing some development in this location would be in accordance with TAYplan SDP Location Priorities and would contribute to meeting the housing need in South Angus.

TAYplan SDP requires new housing developments in and around Dundee not to prejudice the Western Gateway development within the city (which has been identified as a Strategic Development Area). In order to avoid conflicts with TAYplan SDP and the Dundee Local Development Plan which focuses new development primarily on brownfield sites and on a limited number of greenfield sites within the city, the remainder of land in Angus which is part of the Dundee Core Area will not be considered for significant greenfield release during the ALDP period. The ALDP does not therefore seek to allocate greenfield land outwith the development boundaries for Birkhill / Muirhead or in other locations outside the principal settlements but within the Dundee Core Area.

RURAL ANGUS

The rural area of Angus is defined as the area outwith the development boundaries of the seven towns named above. It comprises the four Rural Service Centres (RSCs) (Edzell, Friockheim, Letham and Newtyle), a range of other smaller settlements and the open countryside (which is the area outwith any defined development boundaries).

Rural Angus is not a single homogenous area, varying significantly in character, land use, population levels and availability of and access to a range of services and facilities. The ALDP aims to maintain this diversity by supporting new development in appropriate locations and by encouraging people to live and work in rural communities.

There is a long-established strategy of supporting the retention of population and services by providing opportunities for new homes in the rural area including the Rural Service Centres (RSCs), smaller settlements and the open countryside. New employment related development has been supported where proposals make a positive contribution to the rural economy and are of a scale and nature appropriate to the intended location. This strategy is consistent with TAYplan SDP and it is appropriate that the ALDP continues this approach.

Development in the rural area will be focused on supporting the RSCs of Edzell, Friockheim, Letham and Newtyle. These settlements have the most significant number and range of services and already have relatively large resident populations. The Local Development Plan

will allocate small-scale development sites for housing in these locations to help to support and maintain services and facilities, and reduce the need to travel. To support and maintain population levels the ALDP makes provision for development of up to 50 houses in each Rural Service Centre over the life of the plan.

In pursuing a strategy promoting development in accessible locations in settlements with access to a range of services and facilities, the Local Development Plan does not allocate sites for residential development outwith the seven towns and four Rural Service Centres. Below Rural Service Centre level appropriate infill or redevelopment proposals will be supported in those settlements and villages with development boundaries, and on appropriate sites in the open countryside.

At Ballumbie, Letham Grange and Piperdam, a substantial number of houses have been developed alongside and in support of golf course, leisure and tourist based developments. Although larger than many settlements, these standalone developments include no community infrastructure (e.g. shops, primary school, health care facilities) requiring residents to travel for virtually all their needs. Further residential development at Ballumbie and Piperdam would promote an unsustainable pattern of development and is therefore not supported. At Letham Grange additional housing development will only be considered where it is required to cross-subsidise tourism and recreation development. This is outlined in statements for these settlements.

The Angus countryside is divided into Category 1 and 2 Rural Settlement Units. In Category 1 areas (which are areas that are not remote from towns) the opportunity for new development outwith settlements will be more restricted, as development should be directed towards existing settlements. In Category 2 areas (which are remote rural areas), the emphasis will be on maintaining and growing communities by encouraging diversity in the rural economy and enabling new housing development which can support important rural services.

PART 3. CREATING HIGH QUALITY PLACES

Development Principles

Angus Council has defined development boundaries to protect the landscape setting of Angus towns and villages and prevent the uncontrolled spread of development. These development boundaries provide the definition between built up areas and the open countryside and may include peripheral areas of open space that are important to the settlement's setting and character. Although sites within development boundaries are the preferred location for most development, this does not mean that all land within boundaries has development potential.

New land allocations made in the ALDP have been accommodated within development boundaries where possible. Where this has not been possible, and where it is appropriate, development boundaries have been extended to include greenfield land allocations.

The development boundaries shown on the Proposals Map have been brought forward from previous plans and have not been the subject of review apart from where significant greenfield allocations are proposed as extensions. A review of the development boundaries will be a priority in the review of the ALDP to ensure they remain robust and reflect current circumstances.

Wherever development is proposed, it is important to ensure that all opportunities are taken to re-use or re-develop brownfield land before development takes place on greenfield sites.

To optimise the use of existing resource capacities and to ensure the impact of development on the wider environment and landscape is minimised, development proposals in the countryside should also ensure that they have investigated all possibilities of locating adjacent to existing development or groups of buildings.

Policy DS1 Development Boundaries and Priorities

All proposals will be expected to support delivery of the Development Strategy.

The focus of development will be sites allocated or otherwise identified for development within the Angus Local Development Plan, which will be safeguarded for the use(s) set out. Proposals for alternative uses will only be acceptable if they do not undermine the provision of a range of sites to meet the development needs of the plan area.

Proposals on sites not allocated or otherwise identified for development, but within development boundaries will be supported where they are of an appropriate scale and nature and are in accordance with relevant policies of the ALDP.

Proposals for sites outwith but contiguous* with a development boundary will only be acceptable where it is in the public interest and social, economic, environmental or operational considerations confirm there is a need for the proposed development that cannot be met within a development boundary.

Outwith development boundaries proposals will be supported where they are of a scale and nature appropriate to their location and where they are in accordance with relevant policies of the ALDP.

In all locations, proposals that re-use or make better use of vacant, derelict or under-used brownfield land or buildings will be supported where they are in accordance with relevant policies of the ALDP.

Development of greenfield sites (with the exception of sites allocated, identified or considered appropriate for development by policies in the ALDP) will only be supported where there are no suitable and available brownfield sites capable of accommodating the proposed development.

Development proposals should not result in adverse impacts, either alone or in combination with other proposals or projects, on the integrity of any European designated site, in accordance with Policy PV4 Sites Designated for Natural Heritage and Biodiversity Value.

**Sharing an edge or boundary, neighbouring or adjacent*

Policy DS1 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
?	++	+	+/?	?	+	?	?	+/?	?

Accessibility

A key element in the creation of sustainable communities is how well new development is integrated with the existing form of development and transport networks. The ALDP Development Strategy supports development within the Towns and Rural Service Centres and allocates land for new development in locations that are well related to the existing form and pattern of development and therefore the existing transport network.

In some areas the transport network will require improvement to roads infrastructure, public transport and path networks to support and enable future development. Where appropriate, site allocation policies and development briefs will specify where infrastructure requirements or improvements are known. The exact nature of improvements will be negotiated at the time of application.

National and regional planning policies seek to promote sustainable transport and active travel, giving priority to walking and cycling for local journeys and to public transport in preference to travel by car. The publication of the Scottish Government policy document "Designing Streets" signals the government's resolve to move away from a standards based approach to street design and to put place and people before the movement of motor vehicles. The ALDP takes account of "Designing Streets" and supports development which is accessible by a choice of transport modes including walking, cycling and public transport.

Development proposals should seek to maintain and improve linkages between residential, employment, recreation and other facilities to help support an integrated sustainable transport network and opportunities for active travel.

Path networks including Core Paths and Rights of Way also form an important recreational resource enabling outdoor access around settlements and to the countryside. Policy PV3 Access and Informal Recreation seeks to protect and enhance public access and paths in this context. They are also important elements of green infrastructure providing linkages to the wider green network. The ALDP seeks to protect and enhance the role of path networks in this respect under Policies PV1 Green Networks and Green Infrastructure and PV2 Open Space Protection and Provision within settlements.

Appendix 2 gives guidance as to when a Transport Assessment may be required. Angus Council agreed to adopt the National Roads Development Circular as the new roads standard document for use on all new development in Angus in August 2014. The new national document was produced as a collaborative project undertaken by Scotland's local authorities through the Society of Chief Officers of Transportation in Scotland (SCOTS) and embraces current Scottish Government Policy documents, in particular "Designing Streets".

Policy DS2 Accessible Development

Development proposals will require to demonstrate, according to scale, type and location, that they:

- **are or can be made accessible to existing or proposed public transport networks;**
- **make provision for suitably located public transport infrastructure such as bus stops, shelters, lay-bys, turning areas which minimise walking distances;**
- **allow easy access for people with restricted mobility;**
- **provide and/or enhance safe and pleasant paths for walking and cycling which are suitable for use by all, and link existing and proposed path networks; and**
- **are located where there is adequate local road network capacity or where capacity can be made available.**

Where proposals involve significant travel generation by road, rail, bus, foot and/or cycle, Angus Council will require:

- **the submission of a Travel Plan and/or a Transport Assessment.**
- **appropriate planning obligations in line with Policy DS5 Developer Contributions.**

Policy DS2 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
0	+	+	0	0	+	+	0	0	0

Design Quality & Placemaking

The publication of Scottish Government policy documents "Designing Places", "Designing Streets" and "Creating Places – A Policy Statement on Architecture and Place for Scotland" seek to raise the design quality of new development and create better quality places.

The creation of successful, well-designed sustainable places is an objective of the Angus Community Plan and Single Outcome Agreement (2013-2016), and is key to delivering the Council's vision that "*Angus is a place where a first class quality of life can be enjoyed by all*".

Good design delivers benefits for everyone in Angus. For its residents it can reduce energy costs, improve health and wellbeing, improve safety, engender civic pride and promote social inclusion. The creation of well-designed places where people want to live and visit can also attract economic development and can help developers by increasing the value of their investment.

The document "Designing Places" identifies six qualities of a successful place - ensuring development is well connected, has a strong sense of character and identity, is a safe and pleasant place to be in, makes good use of resources and is able to adapt to changing community needs.

The aim of Policy DS3 Design Quality and Placemaking is to ensure that development proposals in Angus are of a high quality which reflects the six qualities of a successful place.

The scale of development ranges from the creation of new neighbourhoods in towns and villages, to individual buildings in settlements and the countryside, and the alteration or adaptation of existing buildings or spaces. The policy will be supported by Supplementary Guidance on Design Quality which will reflect these different contexts and how proposals will be assessed against the six qualities of successful places.

Securing an appropriate design solution is particularly important for large scale development proposals, and for those in sensitive locations that are visually prominent from a public place or where the scale or nature of the proposal would have a significant impact on the locality. In such circumstances a Design Statement will be required. This will also be required for certain developments within conservation areas or where development would affect a listed building or its setting.

Design Statements should be prepared using the guidance set out in Planning Advice Note (PAN) 68: Design Statements and clearly explain the design process and the proposed design solution.

Policy DS3 Design Quality and Placemaking

Development proposals should deliver a high design standard and draw upon those aspects of landscape or townscape that contribute positively to the character and sense of place of the area in which they are to be located. Development proposals should create buildings and places which are:

- **Distinct in Character and Identity: Where development fits with the character and pattern of development in the surrounding area, provides a coherent structure of streets, spaces and buildings and retains and sensitively integrates important townscape and landscape features.**
- **Safe and Pleasant: Where all buildings, public spaces and routes are designed to be accessible, safe and attractive, where public and private spaces are clearly defined and appropriate new areas of landscaping and open space are incorporated and linked to existing green space wherever possible.**
- **Well Connected: Where development connects pedestrians, cyclists and vehicles with the surrounding area and public transport, the access and parking requirements of the Roads Authority are met and the principles set out in 'Designing Streets' are addressed.**
- **Adaptable: Where development is designed to support a mix of compatible uses and accommodate changing needs.**
- **Resource Efficient: Where development makes good use of existing resources and is sited and designed to minimise environmental impacts and maximise the use of local climate and landform.**

Supplementary guidance will set out the principles expected in all development, more detailed guidance on the design aspects of different proposals and how to achieve the qualities set out above. Further details on the type of developments requiring a design statement and the issues that should be addressed will also be set out in supplementary guidance.

Policy DS3 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+	++	+	0	0	+	+	++	+	++

Amenity

The stewardship of natural resources is key to sustainable development and the ALDP has a role in avoiding over-development, protecting the amenity of new and existing development and considering the implications of development for air quality. There is also a need to safeguard the amenity of future occupiers, or existing properties near to development as well as the wider area. Where it is considered that development has an impact, appropriate mitigation or compensatory measures will be secured through conditions or planning obligations. Specific impacts relating to the water environment, geodiversity and minerals resource are covered by policies elsewhere within the Plan.

Policy DS4 Amenity

All proposed development must have full regard to opportunities for maintaining and improving environmental quality. Development will not be permitted where there is an unacceptable adverse impact on the surrounding area or the environment or amenity of existing or future occupiers of adjoining or nearby properties.

Angus Council will consider the impacts of development on:

- **Air quality;**
- **Noise and vibration levels and times when such disturbances are likely to occur;**
- **Levels of light pollution;**
- **Levels of odours, fumes and dust;**
- **Suitable provision for refuse collection / storage and recycling;**
- **The effect and timing of traffic movement to, from and within the site, car parking and impacts on highway safety; and**
- **Residential amenity in relation to overlooking and loss of privacy, outlook, sunlight, daylight and overshadowing.**

Angus Council may support development which is considered to have an impact on such considerations, if the use of conditions or planning obligations will ensure that appropriate mitigation and / or compensatory measures are secured.

Applicants may be required to submit detailed assessments in relation to any of the above criteria to the Council for consideration.

Where a site is known or suspected to be contaminated, applicants will be required to undertake investigation and, where appropriate, remediation measures relevant to the current or proposed use to prevent unacceptable risks to human health.

Policy DS4 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
0	+	++	0	0	+	0	0	+	0

Developer Contributions

New development has an important role in funding measures to mitigate any adverse impacts in a way that is consistent with the delivery of wider planning and environmental objectives. Circular 3/2012 sets out that planning obligations can be used to overcome obstacles to the grant of planning permission. This means that development can be permitted and potentially negative impacts on land use, the environment and infrastructure can be reduced, eliminated or compensated for.

Planning obligations will only be sought where they meet the tests set out in Circular 3/2012, including: necessity, planning purpose, being related to the proposed development, scale and kind and reasonableness. It is recognised that developers and landowners would like certainty about the likely scale and nature of developer contributions that will be sought by the Council. The site allocations made in the ALDP identify contributions where they are currently known, but it is important to recognise that additional contributions may be required and in all cases the scale and nature of contributions will be negotiated and agreed as part of the planning application process. In such negotiations, the details of a contribution will be based on the most up to date information at the time in respect of

infrastructure provision and consideration by the Council of any abnormal development costs identified by the developer.

Policy DS5 Developer Contributions

Developer contributions may be sought from all types of development where proposals individually or in combination result in a need for new, extended or improved public services, community facilities and infrastructure.

Contributions may be financial or in-kind, and will be proportionate in scale to the proposed development and the tests set out in national policy and guidance.

Where contributions cannot be secured through a planning condition, a Section 75 agreement or other legal agreement will be required.

Contributions may be sought for the following:

- **Open Space, biodiversity enhancement and green infrastructure, including infrastructure relating to the water environment and flood management;**
- **Education;**
- **Community Facilities;**
- **Waste Management Infrastructure; and**
- **Transport Infrastructure.**

The Council will consider the potential cumulative effect of developer contributions on the economic viability of individual proposals.

Supplementary Guidance will be prepared, consistent with requirements of Scottish Government policy on planning obligations currently set out in Circular 3/2012, to provide additional information and guidance on how developer contributions will be identified and secured. This will include the levels of contribution or methodologies for their calculation, including thresholds, exemptions and viability considerations. Whilst the exact nature of contributions will be negotiated at the time of application, potential areas of contribution are highlighted in site allocation policies where known.

Policy DS5 SEA Implications

Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+	++	0	0	0	0	0	0	+	+

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THE POLICY FRAMEWORK – PART 1

THRIVING & CONNECTED

HOUSING

Good quality housing is a key component of mixed and sustainable communities and access to such housing contributes to the quality of life enjoyed by people. Angus Council aims to ensure that at all times an effective supply of housing land is available that is capable of providing choice in the type, size, tenure and affordability of housing in accessible and sustainable locations across Angus.

The ALDP seeks to promote and sustain successful communities and create quality residential environments by helping to deliver new housing and by managing changes to existing housing across Angus.

Housing Land Supply

The ALDP identifies sites to meet the full housing land requirement established by the TAYplan SDP for the North, East and West Housing Market Areas (HMAs) and the South Angus part of the Greater Dundee Housing Market Area.

Table 1 below summarises the housing land supply position for each Housing Market Area and sets out the additional land requirement to be addressed by the ALDP. Where appropriate sites are phased for release over two phases of the ALDP period: 2016-21 and 2021-26. In some instances it is anticipated that development of larger sites may extend beyond 2026. Details of sites allocated for housing development are set out in the individual settlement strategies.

In line with the Development Strategy the ALDP has focussed the allocation of housing land in the towns of Arbroath, Brechin, Carnoustie, Forfar, Kirriemuir, Monifieth and Montrose giving priority to the reuse, redevelopment and regeneration of brownfield sites. Where necessary to assist in meeting the housing land requirements and provide an element of choice across each HMA greenfield sites have been allocated. These additional land allocations augment the existing supply of housing land on sites with planning permission and those which are currently under development. To ensure that Angus Council maintains a 7 year effective land supply, the continued effectiveness of and progress in the delivery of the housing land supply is monitored through the annual Angus Housing Land Audit (HLA).

The housing capacity figures specified for individual allocations are indicative and have been calculated using either an average figure of 25 dwellings per hectare or, by looking at the density of development in the surrounding area. These figures are given as a guide and may change as proposals are brought forward subject to achievement of a design solution which provides a satisfactory residential environment and has regard for the amenity, character, appearance and pattern of development of the surrounding area. Appendix 3 provides a summary of all housing sites (existing sites with planning permission, site allocations continued from the Angus Local Plan Review 2009 (ALPR) and new allocations) which combine to meet the housing land requirements.

In addition to allocated sites and existing sites with planning permission there may be other currently unidentified sites suitable for residential development. To provide additional flexibility in the Housing Land Supply the ALDP supports appropriate "windfall" sites within development boundaries to come forward.

Sites allocated for housing and windfall/opportunity sites which come forward will be expected to deliver a mix of house types and tenures to meet the housing needs of the area.

Where appropriate, developers will be encouraged to make provision for affordable and special needs housing. Specific requirements will be assessed on a site by site basis as part of the development management process. Sites allocated for housing or other windfall sites that emerge through the life of the ALDP may be suitable for a mix of complementary uses. This would support the creation of more sustainable communities through co-location of compatible uses, potentially reducing the need to travel.

Where specified, further guidance on the development of allocated sites will be prepared in the form of a Development Brief setting out development phasing, housing mix (type and tenure including affordable housing requirement), potential mix of uses, infrastructure requirements, site layout and design. Where appropriate the Development Brief will also indicate requirements for vehicular, pedestrian and cycle access; landscape and open space requirements (including extension of or connection to existing green networks); related community facilities and developer contributions. Where existing sites or allocated sites carried forward from the ALPR already have a Council approved Development Brief it will be updated to take account of revised policy guidance provided by Scottish Planning Policy (SPP) (2014) and the ALDP. The timetable for preparation of new and updating of existing Development Briefs is set out in the ALDP Action Programme.

Policy TC1 Housing Land Supply / Release

The Angus Local Development Plan allocates land to meet the housing land requirements set out in the TAYplan Strategic Development Plan for the period to 2026. Where appropriate, sites are released over two phases of the plan: 2016-21 and 2021-26. However, land allocated in the latter phase of this plan (2021-2026) may be released for earlier development, unless a delay is justified.

The scale and distribution of housing land release across the four Angus Housing Market Areas is set out in Table 1 (below). A schedule of all sites identified by the Angus Local Development Plan which contribute to meeting the housing requirements set out in TAYplan Strategic Development Plan is included in Appendix 3.

To support delivery of a generous supply of effective housing sites and introduce additional flexibility Angus Council will support proposed residential development on appropriate sites as set out in Policy TC2 Residential Development Principles.

To ensure that a 7 year effective land supply is maintained at all times, land identified for residential development will be safeguarded from development for other uses. The continued effectiveness of sites will be monitored through the annual Housing Land Audit process.

Where the annual housing land audit identifies a shortfall in either the five years' or the seven years' effective housing land supply, the council will work with landowners, developers and infrastructure providers to bring forward additional housing land. The early release of sites planned for later phases of the plan, as well as sites identified as constrained or non-effective in the audit, will be considered first. If the shortfall is not met from existing sites, proposals for housing development on other housing sites may be supported where they are consistent with the policies of the plan.

Policy TC1 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
0/?	++	0/?	?/+	0/?	0/?	0/?	0/?	+/?	0/?

Table 1: Housing Land Supply – 2016-2026 (on sites of 5 or more houses):

	a	b	c	d	e	f
Housing Market Area	**TAYplan SDP Requirement 2012-26**	Actual & Programmed Completions 2012-16	**Remaining Requirement 2016–26 (a-b)**	Programmed Completions 2016-26	LDP Allocations 2016-26	**Total Plan Provision 2016–2026 (d+e)**
North Angus	**1120**	208	**912**	60[1]	930[2]	**990**
East Angus	**1120**	286	**834**	491	430	**921**
South Angus	**1120**	113	**1007**	277[3]	780	**1057**
West Angus	**1260**	274	**986**	417[4]	810	**1227**
ANGUS TOTAL	**4620**	881	**3739**	1245	2950	**4195**

[1] Excludes yield from sites at:
- Dubton, Brechin
- Brechin Road, Montrose

Sites being progressed by phased release through ALDP allocations.

[2] Includes Phased allocations at:
- Dubton, Brechin (250)
- Brechin Road, Montrose (300)

[3] Excludes yield from part of Ashludie Hospital (25). Site now being progressed as part of whole hospital site and not as a separate development site. Whole site (130) included as a single allocation in column e.

[4] Includes 33 units approved on site at Cortachy Road, Kirriemuir added to the 349 from 2014 Audit Programming from 2016 – 21 period.

Policy TC2 Residential Development

All proposals for new residential development*, including the conversion of non-residential buildings must:

- **be compatible with current and proposed land uses in the surrounding area;**
- **provide a satisfactory residential environment for the proposed dwelling(s);**
- **not result in unacceptable impact on the built and natural environment, surrounding amenity, access and infrastructure; and**
- **include as appropriate a mix of house sizes, types and tenures and provision for affordable housing in accordance with Policy TC3 Affordable Housing.**

Within development boundaries Angus Council will support proposals for new residential development where:

- **the site is not allocated or protected for another use; and**
- **the proposal is consistent with the character and pattern of development in the surrounding area.**

In countryside locations Angus Council will support proposals for the development of houses which fall into at least one of the following categories:

- **retention, renovation or acceptable replacement of existing houses;**
- **conversion of non-residential buildings;**
- **regeneration or redevelopment of a brownfield site that delivers significant visual or environmental improvement through the removal of derelict buildings, contamination or an incompatible land use;**
- **single new houses where development would:**
  - **round off an established building group of 3 or more existing dwellings; or**
  - **meet an essential worker requirement for the management of land or other rural business.**
  - **in Rural Settlement Units (RSUs)**, fill a gap between the curtilages of two houses, or the curtilage of one house and a metalled road, or between the curtilage of one house and an existing substantial building such as a church, a shop or a community facility; and**
- **in Category 2 Rural Settlement Units (RSUs), as shown on the Proposals Map, gap sites (as defined in the Glossary) may be developed for up to two houses.**

Further information and guidance on the detailed application of the policy on new residential development in countryside locations will be provided in supplementary planning guidance, and will address:

- **the types of other buildings which could be considered suitable in identifying appropriate gap sites for the development of single houses in Category 1 Rural Settlement Units, or for the development of up to two houses in Category 2 Rural Settlement Units.**
- **the restoration or replacement of traditional buildings.**
- **the development of new large country houses.**

**includes houses in multiple occupation, non-mainstream housing for people with particular needs, such as specialist housing for the elderly, people with disabilities, supported housing care and nursing homes.*

***Rural Settlement Units are defined in the Glossary and their role is further explained on Page 9.*

Policy TC2 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+/?	++	+	+/?	+	+	?	+	+	?/+

Affordable Housing

The provision of choice in the housing market is essential to support the delivery of sustainable and mixed communities. The supply of housing land on a variety of well-located and accessible sites allows the market to deliver a range of house sizes, types and tenures to meet the housing needs and aspirations of the people of Angus. However the general housing market does not always meet the housing needs of everyone. There is restricted availability of affordable housing for rent or sale across Angus.

The Scottish Government defines affordable housing as: "*housing of a reasonable quality that is affordable to people on modest incomes. Affordable Housing can be provided in the form of social rented accommodation (Council and Registered Social Landlords), mid-market rented accommodation, shared ownership housing, shared equity housing, housing sold at a discount (including plots for sale) and low cost housing without subsidy*".

The most up-to-date assessment of the requirement for affordable housing across Angus is provided by the TAYplan Housing Need and Demand Assessment (HNDA) (December 2013). This identified a substantial backlog of need for affordable housing across the 4 Angus Housing Market Areas (HMAs). In line with Scottish Planning Policy (SPP) (2014) Angus Council will seek to secure delivery of a maximum of 25% affordable housing across all 4 HMAs, although this will not meet all identified need over the plan period.

Policy TC3 Affordable Housing sets out the requirement for affordable housing which will be applied to all qualifying allocated, housing opportunity and windfall sites. The policy will be supported by an updated and revised Affordable Housing Implementation Guide which will establish a framework and best practice to support delivery of affordable housing.

In rural areas proposals for affordable housing on sites outwith but contiguous with development boundaries will be considered in the context of DS1 Development Boundaries and Priorities.

Effective partnership working between Angus Council, developers, Registered Social Landlords and the Scottish Government will be key to securing the delivery of appropriate and well located affordable housing across Angus.

Policy TC3 Affordable Housing

Angus Council will seek to secure the delivery of affordable housing equivalent to 25% of the total number of residential units proposed on all residential sites of 10 or more units, or where a site is equal to or exceeds 0.5ha.

Where a qualifying site is being developed in phases of less than 10 units or less than 0.5 hectares the affordable housing requirement will be applied based on the overall capacity of the site.

Angus Council will work in partnership with developers and consider innovative and flexible approaches to secure delivery of an appropriate affordable housing contribution. Where appropriate, Section 75 or other legal agreements may be used.

Details of the scale and nature of the affordable housing contribution sought from individual sites, including tenure, house size and type, will be subject to agreement between the applicant and Angus Council taking into account:

- **local housing needs (set out in the current Housing Needs and Demand Assessment);**
- **physical characteristics of the site;**
- **development viability; and**
- **availability of public sector funding.**

The Affordable Housing Policy Implementation Guide sets out how the Council will implement this policy and secure the delivery of Affordable Housing in line with the provisions of Scottish Planning Policy and guidance.

Policy TC3 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
0	+	0	0	0	0	0	0	0	0

Householder / Domestic Development

Houses generally benefit from permitted development rights which allow for a degree of alteration, extension and development within the curtilage without the need for planning permission. Although more limited, flatted properties also benefit from a range of permitted development rights. There are still instances where certain householder / domestic development will require planning permission, and this policy aims to ensure that a satisfactory residential environment is maintained.

Angus Council recognise that there is a need to allow for the adaptation and extension of existing properties to meet the changing needs and demands of residents. This may include alterations/extensions to houses and flats, development within the curtilage of houses and flats, means of enclosure, satellite antenna and domestic scale microgeneration.

Proposals for domestic or householder development require careful consideration for their potential impact on the character and appearance of the property and surrounding area and the residential amenity enjoyed by both the house and surrounding domestic properties. A Planning Advice Note will be prepared to provide advice and best practice on the design, scale and location of householder development.

Policy TC4 Householder / Domestic Development

Proposals for householder development (including alterations/extensions to houses and flats, development within the curtilage of houses and flats, means of enclosure, satellite antenna and domestic scale microgeneration) will be supported where the siting, design, scale or massing of the proposal, does not:

- **adversely affect the residential amenity enjoyed by the house or surrounding domestic properties including, in the case of microgeneration, through noise or shadow flicker;**
- **detrimentally affect the character and/or appearance of the building, site or surrounding area; and**
- **result in the overdevelopment of the plot or a loss of garden ground, parking or bin storage.**

Further guidance on householder development will be set out in a Householder Development Planning Advice Note.

Policy TC4 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
0	+	0	0	0	0	++	+	++	+

Accommodation for Seasonal or Transient Workers

Changes in the nature and operation of agriculture (including horticulture) across Angus have seen growth in the use of seasonal and transient workers, including increased numbers of foreign migrant workers. This has resulted in an increased requirement for temporary accommodation associated with the place of employment, normally an agricultural unit or business.

Agriculture is an important component of the Angus economy and Angus Council recognise the important role the provision of suitable temporary accommodation for seasonal and transient workers has in supporting agricultural activity.

Wherever possible such accommodation should be located adjacent to public transport routes to provide access to shops and other essential services. All such development should be designed and located to minimise adverse impacts on local amenity, access, infrastructure and local landscape character.

Policy TC5 Seasonal or Transient Worker Accommodation

Proposals for the development of temporary accommodation (including residential caravans and mobile homes) for seasonal or transient workers will only be permitted where:

- **there is a functional and essential economic need for the amount and type of accommodation proposed that cannot be reasonably met elsewhere in the locality;**
- **the accommodation is required to house seasonal or transient workers employed on the agricultural unit;**
- **the proposal involves the conversion, reuse or redevelopment of suitable vacant buildings or brownfield land on, or adjoining, the agricultural unit or it can be demonstrated that there are no such buildings or sites capable of accommodating the proposed development;**
- **the proposed site will provide a good residential environment with adequate access to facilities;**
- **the scale and nature of the development is in keeping with local landscape character and pattern of development; and**
- **there is no unacceptable impact on the built and natural environment, surrounding amenity, access and infrastructure.**

Planning permission will not normally be granted for more than 5 years when the requirement for seasonal or transient worker accommodation can be reviewed. Temporary structures, including residential caravans, must be removed when the need for them ceases or the planning permission expires, whichever is sooner.

Policy TC5 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+	+	+	+	+	+	+	+	+	+

Gypsies and Travellers and Travelling Showpeople

In line with Scottish Planning Policy (SPP) (2014) Angus Council recognise the need to support the provision of appropriate sites to address the accommodation needs of Gypsies and Travellers and Travelling Showpeople through the ALDP and Local Housing Strategy (LHS). There are no known requirements in Angus for overwintering sites for Travelling Showpeople.

The current supply of permanent managed sites in Angus is limited to the local authority managed sites for Gypsies and Travellers at Tayock, Montrose and at Petterden, Tealing. There are currently no privately owned licensed sites in Angus.

While the Angus Housing Needs and Demand Assessment (HNDA) identified an under provision of pitches for Gypsies and Travellers in Angus there is currently limited understanding of the geographic distribution of need/demand for both permanent pitches and transit sites (including any cross boundary implications with neighbouring authorities). To plan for the accommodation needs of groups effectively Angus Council require to undertake additional research as part of the Angus LHS Review process to identify specific areas of need and inform development of a strategy and policy approach to meeting the complex needs of these communities.

The Angus LHS seeks to address the accommodation needs of gypsy/travellers through direct liaison with these groups, provision of additional spaces and where appropriate access to housing.

While the ALDP does not identify areas of search or allocate specific sites the policy is intended to establish a framework for assessing proposals to establish new, or extend existing sites.

Policy TC6 Gypsies and Travellers and Travelling Showpeople

Gypsies and Travellers and Travelling Showpeople will be encouraged to stay at authorised sites (publicly or privately owned and managed). Existing authorised Gypsies and Travellers and Travelling Showpeople sites will be protected and there will be a presumption against their redevelopment or conversion to other uses unless it can be demonstrated to the satisfaction of Angus Council that there is a surplus of accommodation to meet identified needs.

Proposals for new or extended permanent sites and temporary "short stay" sites for Gypsies and Travellers will only be supported where:

- **the site will contribute to satisfying a local need identified in the Local Housing Strategy and is consistent with Angus Council's strategy for meeting the accommodation needs of these client groups;**
- **the development is designed and located to minimise adverse effects on the landscape, established amenity, character and built or natural heritage interests of the surrounding area;**
- **the proposed site will provide a good residential amenity for residents and has adequate access to community, education and health services and facilities; and**
- **the proposed development would not set a precedent or open up other areas for similar development.**

Policy TC6 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+/?	++	?	?	?	?	0	++	?	+

Residential Caravans and Mobile Homes

Angus Council recognise the need for temporary occupation of residential caravans or mobile homes whilst a permanent dwelling is being renovated or built. It is not considered appropriate to support their use for permanent occupation.

Policy TC7 Residential Caravans and Mobile Homes

Proposals to site a residential caravan or mobile home will only be acceptable where it is required to provide temporary accommodation to allow a permanent dwelling to be renovated or built in accordance with the housing policies of the Angus Local Development Plan. Planning permission will be granted for a maximum of 2 years. Residential caravans or mobile homes must be removed when the need for them ceases or the planning permission expires, whichever is sooner.

Proposals for the development of sites for individual, or groups of residential caravans and/or mobile homes for permanent occupation will not be supported.

Policy TC7 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
0	++	0	+	0	0	0	0	+	0

SERVICES

Community Facilities and Services

Public community facilities such as schools, healthcare, libraries, museums, halls and leisure facilities are important assets playing a key role in terms of quality of life and attractiveness of Angus as a place to live work and visit. The rural area is particularly vulnerable to the loss of rural services such as shops, hotels, public houses and petrol filling stations. These facilities and services often play an important social and practical role in the local community and can also contribute to the local economy.

The ALDP aims to retain and enhance the sustainability and viability of all Angus communities by protecting existing public community facilities and important rural services. It also seeks to ensure that new facilities are accessible and of an appropriate scale and nature for their location in accordance with Policy TC19 Retail and Town Centre Uses. The implementation of Policy DS5 Developer Contributions, masterplans and development briefs referred to in the settlement statements will be key to delivering new facilities resulting from development proposals.

The Councils Community Asset Transfer Policy (CATP) allows for appropriate Council buildings to be retained for wider community benefit. This includes opportunity for surplus or under-performing facilities or land to be transferred to suitable community groups prior to disposal recognising the valuable role this can play in sustaining local communities and their contribution to Angus Council's local outcomes.

Policy TC8 Community Facilities and Services

The Council will encourage the retention and improvement of public facilities and rural services.

Proposals resulting in the loss of existing public community facilities will only be supported where it can be demonstrated that:

- **the proposal would result in the provision of alternative facilities of equivalent community benefit and accessibility; or**
- **the loss of the facility would not have an adverse impact on the community; or**
- **the existing use is surplus to requirements or no longer viable; and**
- **no suitable alternative community uses can be found for the buildings and land in question.**

The Council will seek to safeguard rural services that serve a valuable local community function such as local convenience shops, hotels, public houses, restaurants and petrol stations. Proposals for alternative uses will only be acceptable where it can be demonstrated that:

- **the existing business is no longer viable and has been actively marketed for sale as a going concern at a reasonable price/rent for a reasonable period of time;**
- **the building is incapable of being reused for its existing purpose or redeveloped for an appropriate local community or tourism use; or**
- **equivalent alternative facilities exist elsewhere in the local community.**

New community facilities should be accessible and of an appropriate scale and nature for the location. In the towns of Angus, and where appropriate to the type of facility, a town centre first approach should be applied to identifying a suitable location.

Policy TC8 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
0	++	0/+	0	0	+	0	0	0	0

Cemetery Provision

A number of locations across Angus require additional cemetery provision during the ALDP period. These areas are identified in the ALDP to safeguard the land from alternative uses. Land allocations in relation to Arbroath, Brechin, Carnoustie, Forfar, Kirriemuir and Montrose are specified in the relevant Settlement Strategies. Detailed consideration remains to be given to the use of the land for such purposes and to matters relating to access, site preparation and boundary treatment. At Dunnichen the cemetery extension will be into the field to the north of the existing facility and will require boundary treatment as part of site preparation.

Policy TC9 Safeguard of land for Cemetery Use

Land is reserved for cemetery purposes at Aberlemno, Dunnichen Cemetery, Kirkton of Auchterhouse, Liff and Panbride. With the exception of Dunnichen, the areas are detailed on the relevant village boundary maps.

Development of the safeguarded land at Aberlemno, Kirkton of Auchterhouse, Liff and Panbride should be subject to a developer requirement for a prior intrusive ground investigation to be carried out in accordance with the Scottish Environment Protection Agency's guidance note, while a flood risk assessment will also be required for the land at Liff.

Policy TC9 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
0/?	+	0	0/?	?	0	0	0	0	0/?

CONNECTIVITY

Scottish Planning Policy (SPP) (2014) specifies that planning authorities should support development that optimises the use of existing infrastructure, reduces the need to travel by car, facilitates safe and convenient travel by walking, cycling and public transport and enables integrated transport modes and freight movement by rail and water.

Angus is served by and connected to other parts of the country and beyond by a transport network comprising road, rail and sea. Key elements of the transport network in Angus include the A90(T) and A92 roads; the east coast rail line with railway stations at Carnoustie, Arbroath, Monifieth and Montrose as well as Montrose Port (see Policy M6) and Arbroath Harbour. The area is also well-connected by a network of walking and cycling routes and a range of bus services.

The Development Strategy for the ALDP continues to guide the majority of development to the towns in Angus. In terms of connectivity, this prioritises development located in accessible locations, encouraging development to locate in proximity to local facilities, improving the transport network, encouraging sustainable transport and reducing the need to travel.

As part of the process of preparing the ALDP, the Council has undertaken a Transport Appraisal in conjunction with Transport Scotland. This process assessed the impact of the ALDP on the transport network.

Roadside Facilities

A90(T)

Scottish Planning Policy (SPP) (2014) and Planning Advice Note 75: Planning for Transport (PAN 75) establish the background definitions and circumstances where development can be classified as roadside facilities on the strategic road network.

In Angus, the A90(T) Dundee to Aberdeen route forms part of the strategic road network to which the guidance in SPP and PAN 75 applies. Existing roadside facilities on the A90(T) in Angus are located at Forfar (on the east side of the A94 Orchardbank/Glamis Road junction), Finavon, Balnabreich and Stracathro. Since adoption of the Angus Local Plan

Review (2009), additional facilities have been built for road user at Forfar including a further fast food outlet and a pub/restaurant. The range of facilities available to road users at these locations is further complemented by facilities available in the towns of Forfar and Brechin.

Proposals for additional facilities on the A90(T) will only be permitted where existing services are already located and where access can be achieved from a grade separated junction. The existing facilities at Brechin, Forfar and Stracathro have grade separated access therefore proposals to improve and extend the range of existing services provided at these locations is supported where these also accord with other policies in this Local Development Plan.

In terms of the existing facilities at Finavon and Balnabreich, these locations are not accessed from the A90(T) by grade separated junctions and therefore proposals for additional roadside facilities would not be appropriate at these sites. The facilities at Brechin Castle Centre serve as a tourist and visitor destination as well as providing services for road users.

A92

The A92 coastal tourist route through Angus extends from Monifieth to Lower North Water Bridge, north of Montrose. A number of improvements have been made to the A92, including the upgrading of the road between Dundee to Arbroath to dual carriageway standard and the improvement of junctions and linkages to Carnoustie and Monifieth. In addition, more recent route improvements north of Arbroath have been undertaken.

Within the coastal corridor a range of facilities providing for the needs of tourists and long distance travellers are located adjacent to the A92 or within existing towns and villages all of which are easily accessible from the A92.

On the 11 mile (17 km) stretch between Monifieth and Arbroath, existing facilities are located at Ethiebeaton Park, whilst a range of other facilities are located within Monifieth, Carnoustie and Arbroath. Between Arbroath and Lower North Water Bridge facilities are generally located within the communities at Inverkeilor and Montrose. The ALDP seeks to support facilities within existing communities adjacent to the A92 by directing proposals for new facilities to locations within development boundaries in preference to the development of facilities in the open countryside.

Policy TC10 Roadside Facilities

The provision of roadside facilities to meet the needs of road users will only be acceptable where they extend the range and quality of existing facilities.

On the A90(T), extended roadside facilities, including the provision for overnight lorry parking, will only be supported at the following existing facilities:

- **Brechin Castle Centre, which has direct access from the A935 to and from the A90(T);**
- **Orchardbank Business Park, Forfar, at the junction with the A94; or**
- **Stracathro Services.**

New roadside facilities serving the A92 should be accommodated within existing development boundaries. Proposals in the open countryside will not be supported.

Policy TC10 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
0	0	0	+	0	0	0	0	+	+/?

Park and Ride Facilities

In the Regional Transport Strategy 2008 – 2023 (RTS) TACTRAN identified a number of projects with direct reference to Angus, including park and ride/multi-modal interchange facilities at Brechin, Forfar and Monifieth. Whilst no specific sites have been identified in the RTS and operator demand is unknown, the ALDP acknowledges and sets out support for these facilities with additional site specific criteria.

Policy TC11 Park & Ride Facilities

Angus Council will support proposals for park & ride schemes at Brechin, Forfar and Monifieth.

Proposals for park and ride facilities may incorporate lorry parking and will be supported where they:

- **are located for convenient access to the local/strategic road network;**
- **are or can be made accessible to the existing or proposed public transport network;**
- **are designed to minimise any adverse impact on the amenity of neighbouring land uses, such as impact of floodlighting and noise; and**
- **provide landscaping to minimise potential visual impact.**

Policy TC11 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
?	0	+	?	0	+	+	?	?	?

Freight Facilities

The ALDP seeks to encourage the movement of freight by rail or sea as a reasonable alternative to road-based transport.

Sites for rail freight use are safeguarded at Montrose Railway Station and at Helen Street Goods Yard in Arbroath. Montrose Port has an important role in the Angus economy and provides an important link to the wider transport network. As such it is safeguarded for port related uses. As the port provides modern facilities for the handling and storage of commercial and oil related cargoes and imports/exports significant volumes of freight per year and this could include freight facilities.

Where appropriate these sites are identified in more detail in the Settlement Statements.

Policy TC12 Freight Facilities

Angus Council will encourage a modal shift from road-based freight to rail and sea.

The Railway Sidings at Montrose Railway Station and Helen Street Goods Yard, Arbroath are safeguarded for rail related activities. There is a requirement for the developer to undertake a flood risk assessment of Montrose railway sidings prior to the consideration of the development of that land.

In addition, Policy M6 safeguards Montrose Port for port related uses which could include sea freight facilities. Development proposals at Montrose Port should not result in adverse impacts, either alone or in combination with other proposals or projects, on the integrity of any European designated site, in accordance with Policy PV4 Sites Designated for Natural Heritage and Biodiversity Value.

Outwith these locations, proposals for freight related activities should be located on or adjacent to land identified for Class 6 (storage or distribution) use and where possible be well connected to the strategic/local road network, rail network and / or port facilities.

Proposals must demonstrate that they will have no detrimental impact on adjacent land uses and be in accordance with Policy DS4 Amenity.

Policy TC12 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
?	0	+	0/+	?	+	0/+	?	+	?

Digital Connectivity & Telecommunications Infrastructure

The Third National Planning Framework (NPF3) (2014) highlights the importance of digital infrastructure across towns and cities, and in particular the more remote rural areas. Scottish Planning Policy (SPP) (2014) specifies that planning authorities should support development which helps deliver the Scottish Government's commitment to world-class digital connectivity; allowing networks to evolve and respond to technology improvements and new services; encouraging the provision of digital infrastructure in new homes and business premises and providing opportunity for new digital infrastructure which is sited and designed to keep environmental impacts to a minimum.

Policy TC13 Digital Connectivity & Telecommunications Infrastructure

Proposals for telecommunications development will be permitted provided that the following criteria are met:

- **The siting and appearance of the proposed apparatus and associated structures should seek to minimise impact on the visual amenity, character or appearance of the surrounding area;**
- **If on a building, apparatus and associated structures should be sited and designed in order to seek to minimise impact to the external appearance of the host building;**
- **If proposing a new mast, it should be demonstrated that the applicant has explored the possibility of erecting apparatus on existing buildings, masts or other structures. Such evidence should accompany any application made to the planning authority.**
- **If the proposed location is within a sensitive area or on a sensitive site or building, such as areas of ecological interest, areas of landscape importance, archaeological sites, conservation areas or listed buildings, it should be demonstrated that the development would not have any unacceptable effects.**

When considering applications for telecommunications development, the planning authority will also have regard to the operational requirements of telecommunications networks and the technical limitations of the technology.

Policy TC13 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
++	+	+	0	0	+	0	+	0	+

EMPLOYMENT

Sustainable economic growth is a key element of the ALDP and can be successfully achieved through the creation of an environment where existing businesses can thrive, expand and diversify and where new businesses will be attracted into the area. The Economic Development Strategy for Angus emphasises the need for sustainable prosperity; providing support which will nurture and develop new and existing businesses which is essential in creating employment opportunities, sustainable jobs and supporting the economy.

An essential component for the success of businesses is a suitable location from which to operate and the Council provides business parks across Angus and in partnership with the private sector as in Forfar. These developments are important to the Angus economy by providing the infrastructure to support local business growth and helping to secure investment. The ALDP also encourages further growth through private sector investment and development.

Employment Land Allocations and Existing Employment Areas

In order to support sustainable economic growth, it is important that the ALDP provides a range of sites capable of meeting the changing needs of businesses throughout the plan period and beyond. In accordance with TAYplan SDP and the ALDP Development Strategy,

provision is made in the towns of Arbroath, Brechin, Carnoustie, Forfar, Kirriemuir and Montrose. No provision is made in Monifieth which is part of the Dundee Core Area. The identification of long-term allocations of employment land will provide sufficient flexibility to cope with any increase in demand which may accompany an upturn in the economy.

Policy TC14 directs Class 4 (Business), Class 5 (General Industry) and Class 6 (Storage and Distribution) uses to employment land allocations and existing employment areas where infrastructure, connectivity, accessibility to transport networks by walking, cycling and public transport, and workforce are most readily available. Safeguarding employment land allocations and existing employment areas for Class 4, Class 5 and Class 6 uses will ensure that suitable locations for employment related developments are provided whilst also helping to protect local employment opportunities.

In order to provide flexibility throughout the plan period and to meet emerging employment needs, Policy TC14 recognises that there may be circumstances which would require consideration of other uses on employment allocations or existing employment areas.

Policy TC14 Employment Allocations and Existing Employment Areas

Within employment land allocations and existing employment areas, planning permission will be granted for Class 4 (Business), Class 5 (General Industry) and Class 6 (Storage and Distribution) uses. In these locations, other uses may be supported if it is demonstrated that:

1. **The proposal is complementary or ancillary to an existing or proposed employment use; or**
2. **The loss of the site would not undermine the provision of employment land in Angus, or land which may be important to retain due to its individual characteristics, regardless of the amount of employment land available; and**
3. **The proposal would not undermine the operation of existing or proposed employment uses on the whole allocation or existing employment area; and**
4. **There is no unacceptable impact on the built and natural environment, surrounding amenity, access and infrastructure; and**
5. **If relevant, the proposal is in accordance with Policy TC19 Retail and Town Centre Uses.**

To meet the requirements of points 1, 2 and 3, evidence shall be submitted with the planning application to identify the length of time the site has been marketed for employment use; the forms of marketing undertaken; the inter-relationship of the site with adjacent employment land, and with strategic and local transportation infrastructure; and potential impacts of the future use and occupation of adjacent employment land.

Policy TC14 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
0/+	+	+	0/+	0	+	0	0	+	+/?

Employment Development

The ALDP acknowledges that for a variety of reasons not all employment development, consisting of Class 4 (Business), Class 5 (General Industry) and Class 6 (Storage and

Distribution) uses, will be located within employment land allocations or existing employment areas. All employment development proposals situated outwith an employment land allocation or an existing employment area, but within the development boundaries of the towns will be supported subject to the proposal being considered acceptable against the criteria identified within Policy TC15.

The ALDP also recognises that some employment development proposals require to be located within the rural area. Angus has a large rural area ranging from coastal lowlands to upland moors. The rural economy is traditionally based on the natural resources – farming, fishing, forestry and minerals – and this has influenced the character, land use and population distribution across Angus. The rural economy remains important as a source of wealth and employment, increasingly supplemented by tourism, recreation and energy generation.

The ALDP supports development opportunities throughout the rural area where the location, use, scale and nature are appropriate and would not have unacceptable adverse impacts on the environment. In many cases proposals will involve the re-use of existing buildings or will be developed because of a particular locational need or advantage. There is also scope to develop integrated living/working accommodation, where this accords with the housing policies in the ALDP.

Policy TC15 Employment Development

Proposals for new employment development (consisting of Class 4, 5, or 6) will be directed to employment land allocations or existing employment areas within development boundaries, subject to the application of the sequential approach required by Policy TC19 Retail and Town Centre Uses for office developments of over 1,000 square metres gross floorspace.

Proposals for employment development outside of employment land allocations or existing employment areas, but within the development boundaries of the towns and the settlements within the rural area will be supported where:

- **there are no suitable or viable sites available within an employment land allocation or existing employment area; or**
- **the use is considered to be acceptable in that location; and**
- **there is no unacceptable impact on the built and natural environment, surrounding amenity, access and infrastructure.**

Proposals for employment development (consisting of Class 4, 5, or 6) outwith development boundaries will only be supported where:

- **the criteria relating to employment development within development boundaries are met;**
- **the scale and nature of the development is in keeping with the character of the local landscape and pattern of development; and**
- **the proposal constitutes rural diversification where:**
  - **the development is to be used directly for agricultural, equestrian, horticultural or forestry operations, or for uses which by their nature are appropriate to the rural character of the area; or**
  - **the development is to be used for other business or employment generating uses, provided that the Council is satisfied that there is an economic and/or operational need for the location.**

Policy TC15 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+/?	+	+	+/?	?	+	+	+	+	+/?

TOURISM

Angus is an exciting and vibrant region, offering a highly varied tourism sector which includes its scenery and natural environment, its culture and heritage, and its opportunities for a range of sports and leisure activities. The tourism sector constitutes an important part of the Angus economy as it provides a major source of income, employment and in particular supports rural areas.

The aim of this Policy is to encourage and support opportunities for new or improved tourist related facilities and accommodation within Angus in order to satisfy visitor aspirations. In particular, it is important that Angus provides a range and quality of tourist accommodation to maintain and extend the length of the tourist season. However, whilst encouraging and supporting new tourism related development, it is essential that they are sensitively located and designed to ensure that the environmental qualities which attracted people to Angus in the first instance are not undermined.

Tourism developments can generate large amounts of visitors and should be located in areas and locations which are accessible by public transport and, where available, other modes such as cycling and walking.

Policy TC16 Tourism Development

Proposals for new or improved tourism related facilities and tourist accommodation will be directed to sites within development boundaries. Such facilities will be supported in these locations where the development is of an appropriate scale and nature and is in keeping with the townscape and pattern of development.

Outwith development boundaries, proposals for new or improved tourism related facilities and accommodation will be supported where:

- **it has been demonstrated that the proposals cannot be located within a development boundary; or**
- **there is a justifiable locational requirement for the development; and**
- **the scale and nature of the development is in keeping with the character of the local landscape and pattern of development; and**
- **there is no unacceptable impact on the built and natural environment, surrounding amenity, traffic levels, access or infrastructure.**

Angus Council will attach occupancy conditions to prevent tourist accommodation being occupied as permanent residential accommodation. Applications to remove such occupancy conditions will not be supported.

Proposals to change the use or redevelop existing leisure or tourist facilities will only be supported where it is demonstrated:

- **that the existing business is no longer viable and there is no requirement for alternative tourist facilities in the location; and**
- **that the existing business has been actively marketed for sale or lease as a going concern for a reasonable period at a reasonable market price.**

Policy TC16 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+	0	+/?	+/?	0	?/+	0	+	+/?	+/?

TOWN CENTRES

The Angus towns contribute to the character, vitality and prosperity of the region and their centres also make an important contribution to sustainable economic development by providing opportunities for people to access goods and services and employment. The individual character of each town adds to its social and community role, creating a sense of place and belonging for many people. The central areas provide a focus for transport and are often the most accessible part of the town, making them the best location for a wide range of activities and services – shopping, work, leisure, health and welfare and personal services such as banking.

During a period of increasing centralisation and competition, the role of the Angus town centres is being affected by pressures such as; the national rise in internet-based shopping, the expansion of large out-of-centre retail development, greater personal mobility, ease of access to larger centres such as Dundee and Aberdeen and, the rationalisation of both public and private organisations. The Angus town centres must respond to the pressures facing them in order to continue contributing to the character, vitality and prosperity of the region.

In accordance Scottish Planning Policy (SPP)(2014) Angus Council will apply a town centre first policy to support the primacy of town centres as the most appropriate location for a mix of uses including retail, commercial leisure, offices, community and cultural facilities. Directing such a mix of uses to sites situated within town centres will support the vibrancy, vitality and viability of town centres throughout the day and into the evening. Town centre boundaries are defined on the Proposals Maps.

The seven town centres within Angus are diverse in character, with each one having its own strengths and weaknesses as outlined in the Angus Council Town Centre Health Check 2010. SPP (2014) advocates the use of town centre strategies, which identify and address the challenges faced by town centres and provide a framework for coordinated action to improve them. Angus Council will support the preparation of town centre strategies developed in partnership with the local community through the Community Planning process. The formulation of town centre strategies are included within the ALDP Action Programme. Future Local Development Plans will then reflect relevant outcomes from these in policies and proposals specific to each town.

Network of Centres

SPP (2014) states that Local Development Plans should identify a network of centres and explain how they can complement each other. There is a clear network of centres within Angus and the scale and function of each centre is set out in Table 2.

Policy TC17 Network of Centres

Angus Council will seek to protect and enhance the scale and function of the centres as set out in Table 2 below.

A town centre first policy is applied to uses including retail, commercial leisure, offices, community and cultural facilities that attract significant numbers of people. Support will be given to development proposals in town centres which are in keeping with the townscape and pattern of development and which conform with the character, scale and function of the town centres.

All development proposals within a Commercial Centre will have to satisfy criteria within Policy TC19 Retail and Town Centre Uses.

Policy TC17 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
0	+	+	+	0	+	0	+	+	+

Table 2: Network of Centres

Network of Centres	Scale and Function	Appropriate Use Classes* within Town Centres outwith defined Core Retail Areas
Larger Town Centres **a) Arbroath** **b) Forfar** **c) Montrose**	These centres provide the location for larger scale developments and the main comparison shops whilst also providing local services, community facilities and convenience shops which serve local communities.	1, 2, 3, 4, 7, 8, 9, 10 and 11.
Smaller Town Centres **a) Brechin** **b) Carnoustie** **c) Kirriemuir** **d) Monifieth**	These centres provide the location for smaller scale developments whilst also providing local services, community facilities and convenience shops which serve local communities.	1, 2, 3, 4, 7, 8, 9, 10 and 11.
Commercial Centres **a) Ethiebeaton Park (Monifieth)**	This centre is situated in an out-of-town location and is an established comparison retail, leisure and visitor attraction. The centre comprises a garden centre, units retailing products that cater for the tourist market, gym and leisure centre, hotel, restaurant/pub and a drive-thru restaurant**.	1, 3, 7 and 11.

b) Westway Retail Park (Arbroath)	This centre is situated in an out-of-centre location and is an established retail destination. The centre comprises a supermarket and petrol filling station, retail warehouse units, car valeting and sales and drive-thru restaurants**.	1, 3, 7 and 11

** Identifying acceptable uses within each Centre does not imply permitted change between those uses. Any change of use proposal, along with potentially ancillary uses, will be subject to assessment against national and strategic legislation as applicable and other relevant policies within the Local Development Plan.*

*** The type of retail uses and range of goods which can be retailed are restricted to those identified in associated legal agreement(s) and conditions attached to planning permissions.*

Town Centre Retail Frontages

Core Retail Areas are identified on the Proposals Maps in the town centres and accommodate a concentration of retailers which attract shoppers and visitors to these areas. This in turn, contributes to the economy of each particular town centre but also to Angus as a whole. Angus Council recognises that there is a requirement to ensure that the vitality and visual appeal of the Core Retail Areas is not diluted by an over-representation of non-retail businesses. Non-retail businesses can often lack the shopper and visitor attraction potential of retail uses and can lead to less active frontages causing the Core Retail Area to fragment and change character.

Active use of premises above ground floor level adds to the visual and economic attractiveness of Core Retail Areas and town centres as a whole. Development proposals for upper floor premises could add to the vibrancy, vitality and viability of the Core Retail Areas of the town centre by encouraging investment and attracting more people.

The aim of this policy is to ensure that Core Retail Areas maintain the prime retail function.

Policy TC18 Core Retail Areas

Within the Core Retail Areas as identified within the Proposals Maps, development proposals for retail uses (Class 1) which are appropriate to the character, scale and function of the town centre will be supported.

Development proposals seeking the change of use of existing ground floor retail premises (Class 1) will be acceptable where the proposed use is a restaurant or café (Class 3) or where:

- **it can be demonstrated that the existing business is no longer viable and the property has been marketed for sale or lease as a going concern for a reasonable period at a reasonable market price; or**
- **at least 10% of the total number of retail units within the Core Retail Area are vacant.**

Where development proposals satisfy the above criteria the following will also apply:

- **ground floor development should include an appropriate active frontage; and**
- **a condition may be applied to restrict the permission to the use specified.**

Within the Core Retail Areas, development proposals for residential and non-residential uses will be supported within the upper floors subject to the proposal according with other relevant policies within the Local Development Plan. Residential use on ground floors will not be supported.

Policy TC18 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
0	+	0	0	0	0	0	0	0	+

Retail and Town Centre Uses

Retailing and other town centre uses, including commercial leisure, offices, community and cultural facilities, form an important part of the local economy by providing employment, local facilities and support to the historic town centres in Angus. The town centres rely on their ability to offer a wide range of services in order to support their vibrancy, vitality and viability throughout the day and evening.

Policy TC19 aims to ensure that town centres continue to be the focus for retail and other town centre uses. In accordance with SPP (2014), the ALDP will apply a sequential approach when assessing proposals for retail and town centre uses, giving priority to sites within the defined town centre before edge of centre, commercial centre or out of centre sites. Out of centre sites will only be supported where the proposal satisfies the sequential approach and where there will be no significant impact on the vibrancy, vitality and viability of any town centre.

Policy TC19 Retail and Town Centre Uses

Proposals for retail and other town centre uses* over 1000 m² gross floorspace (including extensions) on the edge of or outside of defined town centres (including in out of town locations) will be required to submit relevant assessments (including retail/town centre impact and transport assessments) and demonstrate that the proposal:

- **has followed a sequential approach to site selection, giving priority to sites within the defined town centre before edge of centre, commercial centre or out of centre sites which are, or can be made accessible;**
- **does not individually or cumulatively undermine the vibrancy, vitality and viability of any of the town centres identified in Table 2 in Angus;**
- **tackles deficiencies in existing provision, in qualitative or quantitative terms; and**
- **is compatible with surrounding land uses and there is no unacceptable impact on the built and natural environment, surrounding amenity, access and infrastructure.**

Proposals for retail and other town centre uses[8] under 1000 m² gross floorspace (including extensions) on the edge of or outside of defined town centres may be required to submit relevant assessments (including retail / town centre impact, transport and sequential assessments) where it is considered that the proposal may have a significant impact on the vibrancy, vitality and viability of any of the town centres in Angus.

**Town centre uses include commercial leisure, offices, community and cultural facilities.*

Policy TC19 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+	+	+	0/+	0	+	0	+	0/+	+/?

Outwith the defined town centres but within development boundaries, local convenience shops in towns and villages play an important role in communities. Local convenience shops within rural villages have faced pressures resulting in closures despite financial support being available through Angus Council's Rural Shops and Community Post Office Grant.

Policy TC20 aims to support the development of local convenience shops that complement town centres in recognition that provision of a local convenience store contributes to sustainability by reducing the need to travel for day to day requirements. When such facilities are created or where they already exist in the rural area, they are afforded protection by Policy TC8 Community Facilities and Services.

The ALDP recognises that some small scale retail development proposals require to be located within the rural area, whilst also recognising the need to protect and enhance the area's distinctiveness and natural and cultural heritage.

Policy TC20 Local Convenience Shops and Small Scale Retail

Within development boundaries, proposals for the development and improvement of local convenience shops* will not be subject to the sequential approach. Such proposals will be supported where they are not detrimental to the surrounding amenity and are in keeping with the townscape and pattern of development. Preference will be given to development proposals which effectively reuse or redevelop vacant or derelict land.

Outwith development boundaries, proposals for small scale retail development (around 500 m^2) will only be supported where the proposal constitutes rural diversification and is ancillary to tourism, agricultural, equestrian, horticultural or forestry operations and where the proposal:

- **does not individually or cumulatively undermine the vibrancy, vitality and viability of any of the town centres identified in Table 2 in Angus;**
- **is of a scale and nature in keeping with the character of the local landscape and pattern of development; and**
- **is compatible with surrounding land uses and there is no unacceptable impact on the built and natural environment, surrounding amenity, traffic levels, access or infrastructure.**

Where planning permission is granted, conditions may be attached limiting the range of goods which can be sold.

**A local convenience shop is broadly defined as retailing drinks, tobacco, newspapers, magazines, food and confectionary which are purchased regularly for relative immediate consumption and measure 500 m^2 gross floorspace or less and are located outwith defined town centre boundaries as identified within the Proposals Maps.*

Policy TC20 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+	++	+	+	0	?/+	+	+	+	++

THE POLICY FRAMEWORK – PART 2

PROTECTED & VALUED

THE POLICY FRAMEWORK – PART 2
PROTECTED AND VALUED

The natural, built and cultural heritage of Angus underpins the character of the area and the quality of life for its residents. It provides opportunity for economic and leisure activity, which brings with it the responsibility to protect these assets for current and future generations.

New development can and should help to support our heritage, maintaining its relevance and purpose through time. Opportunity exists to enhance the built, cultural and natural environment, putting right past errors and creating a better place for future generations.

NATURAL ENVIRONMENT

Green Networks

Green Infrastructure is the green and blue (water) features of natural and built environments. Green Networks consist of a network of green infrastructure and open space within and around towns, with links into the open countryside. They contribute towards the quality of life, health and well-being and identity of an area, provide opportunities for wildlife and nature conservation and play an important environmental role in helping adapt to climate change.

Angus already has a high quality Green Network comprising:

- formal and informal greenspace in and around its settlements;
- areas of woodland, hedgerows and individual trees;
- natural and semi natural habitats;
- water bodies; and
- path networks providing opportunities for physical activity and access to the outdoors.

Some of these features are protected by specific policies in the plan for their nature conservation or landscape importance (See Policies PV4 Sites Designated for Natural Heritage and Biodiversity Value and PV7 Woodland, Trees and Hedges) or as important access routes (Policy PV3 Access and Informal Recreation). All these features deliver particular benefits to the area but when they function together their potential and habitat value is greatly enhanced.

The aim of Policy PV1 is to protect and enhance the functionality and connectivity of existing Green Networks within settlements and across Angus. The policy also aims to promote and support developments that are designed to enhance Green Networks. The implementation of Policy DS3 Design Quality and Placemaking will also ensure that the provision of green infrastructure within new development is based on "a design led approach" which takes cognisance of links to the wider Green Network.

The development of brownfield sites as temporary greenspace such as community growing spaces can deliver a range of social, environmental and economic benefits. Proposals for the temporary greening of vacant and derelict sites are encouraged as an opportunity to enhance the visual amenity and environmental quality of these areas and potential contribution towards Green Networks.

The identification of the Angus Green Network will be developed during the plan period. Detailed guidance on how Green Networks can be extended and enhanced including opportunities for improved connectivity will be brought forward through the preparation of a Planning Advice Note on Green Networks.

THE POLICY FRAMEWORK – PART 2
PROTECTED AND VALUED

Policy PV1 Green Networks and Green Infrastructure

Angus Council will seek to protect, enhance and extend the wildlife, recreational, amenity, landscape, access and flood management value of the Green Network. Development proposals that are likely to erode or have a damaging effect on the connectivity and functionality of the Green Network will not be permitted unless appropriate mitigation or replacement can be secured. In some cases a developer contribution towards enhancement of the wider Green Network may be appropriate.

Green infrastructure (including open space) will require to be provided as part of new development. Proposals should identify the location and nature of the green network in the area and seek to enhance linkages wherever possible.

The location and function of green networks in Angus will be mapped in a Planning Advice Note.

Policy PV1 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
++	++	+	0	0	+	+	0	0	++

Open Space within Settlements

Open spaces within our settlements are part of the Green Network, contribute towards the amenity and character of an area and are an important sporting, recreational and social resource.

Angus Council is undertaking an audit of the quantity, quality and accessibility of open space in the Angus towns which will identify existing levels of open space provision and deficiencies at a local level. This will form the basis of an Open Space Strategy which will establish standards for the provision of open space in new development and identify opportunities for improving and extending green networks in and around the Angus towns.

Policy PV2 (below) seeks to protect open spaces within settlements (based on the typology of open spaces set out in the Scottish Government's Planning Advice Note 65) from development which might erode the function or characteristics for which they are valued. The policy aims to ensure that where development is proposed the loss is justified and that compensatory provision is made.

Whilst the ALDP identifies principal open spaces on the Proposals Maps, the policy will apply to all open space areas within development boundaries including other smaller spaces which may not be shown on a map.

The policy also seeks to ensure that new development is accompanied by an appropriate level and type of open space and that it is considered as an integral part of the overall design of new development to deliver better quality places as set out in Policy DS3 Design Quality and Placemaking. The amount and type of open space to be provided will be dependent upon existing provision in the locality and the nature of development proposed. In circumstances where on site provision is unnecessary or inappropriate a financial contribution towards the improvement of existing provision may be required as set out in Policy DS5 – Developer Contributions.

Standards for the provision of open space in new development will be established through the Councils Open Space Audit and Strategy and reflected in future plans.

Policy PV2 Open Space Protection and Provision within Settlements

Angus Council will seek to protect and enhance existing outdoor sports facilities and areas of open space of sporting, recreational, landscape, wildlife, amenity, food production, access and flood management value. Development involving the loss of open space (including smaller spaces not identified on the Proposals Map) will only be permitted where:

- **the proposed development is ancillary to the principal use of the site as a recreational resource; or**
- **it is demonstrated that there is an identified excess of open space of that type (backed up through an open space audit and strategy) to meet existing and future requirements taking account of the sporting, recreational and amenity value of the site; or**
- **the retention or enhancement of existing facilities in the area can best be achieved by the redevelopment of part of the site where this would not affect its sporting, recreational, amenity or biodiversity value, its contribution to a green network, or compromise its setting; or**
- **replacement open space of a similar type and of at least equal quality, community benefit and accessibility to that being lost will be provided within the local area.**

Development proposals for 10 or more residential units or a site equal to or exceeding 0.5 hectares will be required to provide and /or enhance open space and make provision for its future maintenance. Other types of development may also need to contribute towards open space provision.

Angus Council will seek to ensure that 2.43 hectares of open space per 1000 head of population is provided*. The specific requirements of any development will be assessed on a site by site basis and this standard may be relaxed taking account of the level, quality and location of existing provision in the local area. In circumstances where open space provision is not made on site in accordance with the relevant standards, a financial contribution in line with Policy DS5 Developer Contributions may be required.

All new open spaces should incorporate the principles of Policy DS3 Design Quality and Placemaking, be publicly accessible and contribute to the enhancement and connectivity of the wider Green Network wherever possible.

**In line with the Six Acre Standard (National Playing Fields Association)*

Policy PV2 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+	++	+	0	0	+	+	0	0	+

Access and Informal Recreation

Access to the outdoors for informal recreation and physical activity contributes to health and well-being and everyday quality of life. While access to the outdoors can help make Angus an attractive place to live and work, well managed access can also assist land management and contribute to an appreciation of the wider environment.

Opportunities for outdoor access in Angus include core paths, path networks around settlements, active travel routes, public rights of way, other paths, and access rights over areas such as hills, woodland, farmland and inland water. Core paths in the part of Angus outwith the Cairngorms National Park are identified in the Angus Council Core Paths Plan, Adopted 23 November 2010. The Plan identifies a basic framework of paths throughout Angus. Core Paths in the National Park are identified in the Cairngorms National Park Core Paths Plan. The Angus Countryside Access Strategy 2007-2012 sets out priorities for the provision of access to the Countryside in Angus.

It is important that opportunities for outdoor access are protected and enhanced as this will facilitate opportunities for recreation, physical activity and active travel. The Land Reform (Scotland) Act 2003 established a statutory right of access to most land and inland water. Local authorities have duties to protect access rights and public rights of way

Policy PV3 Access and Informal Recreation

New development should not compromise the integrity or amenity of existing recreational access opportunities including access rights, core paths and rights of way. Existing access routes should be retained, and where this is not possible alternative provision should be made.

New development should incorporate provision for public access including, where possible, links to green space, path networks, green networks and the wider countryside.

Where adequate provision cannot be made on site, and where the development results in a loss of existing access opportunities or an increased need for recreational access, a financial contribution may be sought for alternative provision.

Policy PV3 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
0	0	+	0	0	+	0	0	0	++

Natural Heritage and Biodiversity

The natural heritage of Angus is a major contributor to the biodiversity value of the nation and is recognised in the protection of sites and species across the plan area. It contributes to the well-being of residents and underpins a significant part of the local economy including tourism, food and drink. The protection and enhancement of the natural environment and its biodiversity is vital to the long term health and wealth of the area.

Policy PV4 Sites Designated for Natural Heritage and Biodiversity Value

Angus Council will work with partner agencies and developers to protect and enhance habitats of natural heritage value. Development proposals which are likely to affect protected sites will be assessed to ensure compatibility with the appropriate regulatory regime.

<u>International Designations</u>

Development proposals or land use change which alone or in combination with other proposals could have a significant effect on a Ramsar site or a site designated or proposed under the Birds or Habitats Directive (Special Areas for Conservation and Special Protection

Areas) and which is not directly connected with or necessary to the management of the site, will only be permitted where:

- **an appropriate assessment demonstrates the proposal will not adversely affect the integrity of the site; or**
- **there are no alternative solutions; and**
- **there are imperative reasons of overriding public interest, including those of social or economic nature; and**
- **compensatory measures are provided to ensure that the overall coherence of the Natura Network is protected.**

The Council will seek to protect and enhance the nature conservation interests within the River Tay and River South Esk Catchment areas. In order to ensure no adverse effects on the River Tay SAC or the River South Esk SAC, development proposals should take account of the detailed advice* on the types of appropriate information and safeguards to be provided in support of planning applications.

National Designations

Development proposals which affect Sites of Special Scientific Interest will only be permitted where:

- **the proposed development will not adversely affect the integrity of the area or the reasons for which it was designated either individually or in combination with other proposals; or**
- **any adverse effects on the qualities of any designated site are outweighed by social, environmental or economic benefits of national significance; and**
- **mitigation and restoration measures are provided.**

Development affecting sites and species protected by national or international legislation may require to be accompanied by an Environmental Impact Assessment and/or a Habitats Regulation Appraisal.

Further information on protected sites and species and their influence on proposed development will be set out in a Planning Advice Note.

** "River Tay Special Area of Conservation (2011)" and "River South Esk Special Area of Conservation (2011)" guidance produced jointly by SNH, Angus Council and SEPA, available on SNH website at www.snh.gov.uk*

Policy PV4 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
++	0	0	0/+	+	0/+	0	0	0/+	0/+

A full list of designated sites can be found in Appendix 4.

Policy PV5 Protected Species

Angus Council will work with partner agencies and developers to protect and enhance all wildlife including its habitats, important roost or nesting places. Development proposals which are likely to affect protected species will be assessed to ensure compatibility with the appropriate regulatory regime.

<u>European Protected Species</u>
Development proposals that would, either individually or cumulatively, be likely to have an unacceptable adverse impact on European protected species as defined by Annex 1V of the Habitats Directive (Directive 92/24/EEC) will only be permitted where it can be demonstrated to the satisfaction of Angus Council as planning authority that:

- **there is no satisfactory alternative; and**
- **there are imperative reasons of overriding public health and/or safety, nature, social or economic interest and beneficial consequences for the environment, and**
- **the development would not be detrimental to the maintenance of the population of a European protected species at a favourable conservation status in its natural range.**

<u>Other Protected Species</u>
Development proposals that would be likely to have an unacceptable adverse effect on protected species unless justified in accordance with relevant species legislation (Wildlife and Countryside Act 1981 and the Protection of Badgers Act 1992) subject to any consequent amendment or replacement.

Further information on protected sites and species and their influence on proposed development will be set out in a Planning Advice Note.

Policy PV5 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
++	0	0	0	0	0	0	0	0	0

Landscape
Safeguarding and enhancing landscape character is an important planning objective. As well as the protection of designated sites, policy and guidance will seek to retain and enhance the distinctive landscape character of Angus. Development and landscape change should be a positive process – enhancing degraded landscapes; delivering quality design within a local landscape setting and the wider landscape; and identifying and protecting areas where sensitive landscapes have little or no capacity to accommodate development.

The landscape setting of the towns and villages is an important consideration in the location of development sites and is reflected in the identification and application of development boundaries. The integration of new development on the edge of towns and villages into the landscape and creation of new green infrastructure should reflect principles and policies established within the plan.

Policy PV6 Development in the Landscape

Angus Council will seek to protect and enhance the quality of the landscape in Angus, its diversity (including coastal, agricultural lowlands, the foothills and mountains), its distinctive local characteristics, and its important views and landmarks.

Capacity to accept new development will be considered within the context of the Tayside Landscape Character Assessment, relevant landscape capacity studies, any formal designations and special landscape areas to be identified within Angus. Within the areas shown on the proposals map as being part of 'wild land', as identified in maps published by Scottish Natural Heritage in 2014, development proposals will be considered in the context of Scottish Planning Policy's provisions in relation to safeguarding the character of wild land.

Development which has an adverse effect on landscape will only be permitted where:

- **the site selected is capable of accommodating the proposed development;**
- **the siting and design integrate with the landscape context and minimise adverse impacts on the local landscape;**
- **potential cumulative effects with any other relevant proposal are considered to be acceptable; and**
- **mitigation measures and/or reinstatement are proposed where appropriate.**

Landscape impact of specific types of development is addressed in more detail in other policies in this plan and work involving development which is required for the maintenance of strategic transport and communications infrastructure should avoid, minimise or mitigate any adverse impact on the landscape.

Further information on development in the landscape, including identification of special landscape and conservation areas in Angus will be set out in a Planning Advice Note.

Policy PV6 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+	0	0	0	0	0	0	++	0	+

Woodland, Trees and Hedges

Woodland, trees and hedges are an important part of both the townscape of Angus and the rural area. They contribute to the visual landscape, and are an economic asset. Most importantly, however they provide habitats, absorb carbon dioxide and contribute to water management through the take up and release of water. Such assets underpin much of the green network.

Whilst larger and older areas of woodland have the greatest biodiversity value, new planting contributes most to management of greenhouse gas emissions. Trees and hedges contribute to the green network, often in conjunction with watercourses and provide opportunity for wildlife to flourish, locations for recreation and are a valuable contribution to the scenic quality of Angus.

Policy PV7 Woodland, Trees and Hedges

Ancient semi-natural woodland is an irreplaceable resource and should be protected from removal and potential adverse impacts of development. The council will identify and seek to enhance woodlands of high nature conservation value. Individual trees, especially veteran trees or small groups of trees which contribute to landscape and townscape settings may be protected through the application of Tree Preservation Orders (TPO).

Woodland, trees and hedges that contribute to the nature conservation, heritage, amenity, townscape or landscape value of Angus will be protected and enhanced. Development and planting proposals should:

- **protect and retain woodland, trees and hedges to avoid fragmentation of existing provision;**
- **be considered within the context of the Angus Woodland and Forestry Framework where woodland planting and management is planned;**
- **ensure new planting enhances biodiversity and landscape value through integration with and contribution to improving connectivity with existing and proposed green infrastructure and use appropriate species;**
- **ensure new woodland is established in advance of major developments;**
- **undertake a Tree Survey where appropriate; and**
- **identify and agree appropriate mitigation, implementation of an approved woodland management plan and re-instatement or alternative planting.**

Angus Council will follow the Scottish Government Control of Woodland Removal Policy when considering proposals for the felling of woodland.

Policy PV7 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
++	++	0	0	0	0	0	++	0	++

BUILT ENVIRONMENT

The built and cultural heritage of Angus is rich and varied. Built development, both historic and modern contributes to the character of the towns, villages and countryside of the area. Angus Council aims to protect and enhance the built environment and to improve on the general standard of design thus protecting and complementing buildings, sites and their settings. The cultural heritage and historic environment are no less important, leaving evidence of past lives and activities within the landscape as archaeological features from farming systems to military and industrial complexes. Some of these assets are recorded and protected but others are still not identified or fully explored and should be protected for future generations.

There are varying degrees of protection afforded to specific sites depending on their significance, but many smaller and more domestic examples contribute to the local character and diversity of Angus. This overall character should not only be respected, but enhanced by well-designed new buildings and conversions which will be the built heritage of future generations. The ALDP will safeguard protected sites, buildings and properties from inappropriate development and encourage development which enhances the built and cultural heritage of Angus.

Policy PV8 Built and Cultural Heritage

Angus Council will work with partner agencies and developers to protect and enhance areas designated for their built and cultural heritage value. Development proposals which are likely to affect protected sites, their setting or the integrity of their designation will be assessed within the context of the appropriate regulatory regime.

<u>National Sites</u>
Development proposals which affect Scheduled Monuments, Listed Buildings and Inventory Gardens and Designed Landscapes will only be supported where:

- **the proposed development will not adversely affect the integrity of the site or the reasons for which it was designated;**
- **any significant adverse effects on the site or its setting are significantly outweighed by social, environmental and/or economic benefits; and**
- **appropriate measures are provided to mitigate any identified adverse impacts.**

Proposals for enabling development which is necessary to secure the preservation of a listed building may be acceptable where it can be clearly shown to be the only means of preventing its loss and securing its long term future. Any development should be the minimum necessary to achieve these aims. The resultant development should be designed and sited carefully in order to preserve or enhance the character and setting of the listed building.

<u>Regional and Local Sites</u>
Development proposals which affect local historic environment sites as identified by Angus Council (such as Conservation Areas, sites of archaeological interest) will only be permitted where:

- **supporting information commensurate with the site's status demonstrates that the integrity of the historic environment value of the site will not be compromised; or**
- **the economic and social benefits significantly outweigh the historic environment value of the site.**

Angus Council will continue to review Conservation Area boundaries and will include Conservation Area Appraisals and further information on planning and the built and cultural heritage in a Planning Advice Note.

Policy PV8 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
++	0	0	0	0	0	0	++	++	++

HEAT AND ENERGY NETWORKS

The Scottish Government is committed to moving towards a low carbon economy and identifies planning as having a key role in delivering this and in meeting its objectives and targets, which include:

- 100% equivalent to Scottish electricity demand generated from renewable sources by 2020
- a largely decarbonised electricity generation sector by 2030; and,
- a largely decarbonised heat sector by 2050 with significant progress by 2030.

There has been major investment in renewable energy generation and the Scottish Government's focus and actions to reduce energy consumption, make better use of energy and heat and to address transport as a user of fossil fuels and producer of emissions. The planning system has an important role in this process: focusing development at sustainable locations which minimise the need to travel by car; guiding energy generation proposals to appropriate locations; identifying and promoting opportunities from heat maps and in site allocations for district heating and combined heat and power installations; and supporting energy efficient design and construction.

Energy generation and use is a dynamic sector and the ALDP policies aim to establish robust locational guidance. Supplementary Guidance will further develop a locational framework for wind energy and detailed locational guidance for other forms of generation, setting out where supporting information will be required and highlighting other relevant policy and sources of guidance.

Renewable and Low Carbon Energy Development
Opportunities exist across Angus to generate energy from renewable and low carbon sources contributing to a reduction in the output of greenhouse gases; sustainable economic growth; and a largely decarbonised society. This will have long term environmental benefits and help maintain residents' quality of life in the future.

The ALDP can contribute to these aims through policies which promote and facilitate:

- a range sustainable energy development proposals of an appropriate scale and type in the right location;
- energy efficiency measures in all new build including siting, microclimate, accessibility, on-site energy generation which can reduce both greenhouse gas emissions and demand for energy;
- heat exchange between producers and users of heat; and
- sustainable development which focuses on existing centres, reduces the need to travel and promotes all modes of transport.

All renewable energy production, including from wind, water, biomass, waste incineration and sources using emissions from wastewater treatment works and landfill sites will require some processing, generating or transmission infrastructure. Such developments can all contribute to generating renewable energy and reducing emissions and will be assessed in accordance with the following policy.

Policy PV9 Renewable and Low Carbon Energy Development

Proposals for renewable and low carbon energy development* will be supported in principle where they meet the following criteria:

- **the location, siting and appearance of apparatus, and any associated works and infrastructure have been chosen and/or designed to minimise impact on amenity, landscape and environment, while respecting operational efficiency;**
- **access for construction and maintenance traffic can be achieved without compromising road safety or causing unacceptable change to the environment and landscape;**
- **the site has been designed to make links to the national grid and/or other users of renewable energy and heat generated on site;**
- **there will be no unacceptable impact on existing or proposed aviation, defence, seismological or telecommunications facilities;**
- **there will be no unacceptable adverse impact individually or cumulatively with other exisitng or proposed development on:**
  - **landscape character, setting within the immediate and wider landscape (including cross boundary or regional features and landscapes), sensitive viewpoints and public access routes;**
  - **sites designated for natural heritage (including birds), scientific, historic, cultural or archaeological reasons;**
  - **any populations of protected species; and**
  - **the amenity of communities or individual dwellings including visual impact, noise, shadow flicker.**
- **during construction, operation and decommissioning of the energy plant there will be no unacceptable impacts on:**
  - **groundwater;**
  - **surface water resources; or**
  - **carbon rich soils, deep peat and priority peatland habitat or geodiversity.**

Where appropriate mitigation measures must be supported by commitment to a bond commensurate with site restoration requirements.

Consideration may be given to additional factors such as contribution to targets for energy generation and emissions, and/or local socio-economic economic impact.

Supplementary guidance will be prepared to set out a spatial framework to guide the location of onshore wind farm developments, consistent with the approach set out in Table 1 of Scottish Planning Policy. It will also provide further detail on the factors which should be taken into account in considering and advising on proposals for all types of renewable energy development.

Prior to the adoption of that supplementary guidance, the Council will apply the principles and considerations set out in Scottish Planning Policy in assessing the acceptability of any planning applications for onshore wind farms.

**infrastructure, activity and materials required for generation, storage or transmission of energy where it is within the remit of the council as local planning authority (or other duty). Includes new sites, extensions and/or repowering of established sites for onshore wind.*

Policy PV9 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
++	0	+	+	++	+	?/+	++	?/+	+

Wind Energy
Onshore wind power is likely to remain both an opportunity and challenge for developing renewable energy production in Angus. Wind energy developments, because of their scale and location, raise a number of issues which require specific consideration. Technical factors will establish the commercial viability of any site but not its environmental implications.

The latest version of Scottish Planning Policy which was published in June 2014 sets out a new approach for planning authorities to follow in guiding the development of new onshore wind farms in Scotland. Each planning authority is required to prepare, as part of the development plan, a spatial framework for onshore wind farms. Angus Council will prepare its spatial framework as supplementary guidance which, when adopted, will form part of the statutory development plan for Angus. Until it is adopted, the council will apply the principles and considerations set out in Scottish Planning Policy to any individual proposal for the development of a new wind farm.

Local Community Benefit
Renewable energy proposals that accord with policies in the ALDP may generate contributions from developers for community initiatives in accordance with the Council's Community Benefit policy. Such community contributions are separate from Developer Contributions set out in Policy DS5 and will not be considered as part of the determination of any planning application.

Heat Mapping and Decarbonised Heat
The generation of electricity and other forms of energy from renewable sources and low carbon technologies is one part of combatting over-dependence on fossil fuels and reducing the output of harmful emissions. However, 55% of the energy consumed in Scotland is used in heating and cooling. Improving building standards and reusing heat from buildings and processes will reduce demand for fossil fuels and therefore emissions of greenhouse gases with the added benefit of potentially lower fuel costs for businesses and homes.

Heat maps identify and illustrate where heat exists in excess and where it could be used to meet demand. This will become one of the factors in the consideration and allocation of development sites in due course.

Policy PV10 Heat Mapping and Decarbonised Heat

Angus Council will support the preparation and application of a heat map identifying existing and future opportunities for new heat networks, heat storage and energy centres. Development proposals will be encouraged to investigate the feasibility of district heating or combined heat and power installations.

Opportunities for Angus Council, developers and existing businesses to install facilities or identify routes for pipework within development for future integration into heat networks should be identified in appropriate development proposals.

Policy PV10 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
0	0	+	0	0	+	++	0	++	0

Energy Efficiency - Low and Zero Carbon Buildings

To address the causes and effects of Climate Change and move towards carbon neutral development the Scottish Government has placed a duty on local authorities to act in a way that contributes towards emission reduction targets set by the Scottish Government. Decarbonising energy generation and use contribute to this, as does the reducing energy and heat use as addressed in Policy PV10 – Heat Mapping and Decarbonised Heat, above. The Climate Change (Scotland) Act 2009 requires the inclusion on a policy specifying that all developments are designed to ensure that new buildings avoid a specified and rising proportion of projected greenhouse gas emissions through various means.

Energy efficiency and emissions reductions can be further enhanced through wider design principles including the siting, orientation and landscaping of development to enhance solar energy gain. The use and reuse of locally sourced materials can contribute to conservation of resources and limit the carbon footprint of development by reducing the need to manufacture and transport building materials. This approach also reduces waste in line with the waste hierarchy and Policy PV18.

Policy PV11 Energy Efficiency - Low and Zero Carbon Buildings

All qualifying new buildings must demonstrate that the installation and operation of low and zero-carbon generating technologies will avoid at least 10% of the projected greenhouse gas emissions from their use by 2016, and at least 15% by 2018.

This requirement does not apply to extensions, changes or use or conversion of buildings; stand-alone ancillary buildings under 50 sqm; buildings with a planned life of less than two years or which will not be heated or cooled for purposes other than frost protection.

Development proposals should be accompanied by a statement of the level of sustainability achieved to demonstrate compliance with the above standards.

Development proposals should also consider energy efficiency measures where possible including:

- **siting, form, orientation and layout of buildings to maximise solar gain, natural ventilation and light;**
- **the use of landscaping and boundary treatment to modify temperature extremes such as shelter belts; and**
- **the re-use and/or local sourcing of building materials.**

Policy PV11 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
0	0	0	0	0	0	+	0	++	0

WATER ENVIRONMENT

Water plays a vital part in development and the environment. The maintenance of the water environment itself and its impact on development including flooding; drainage; water supply; economic activities and green infrastructure are integral to the planning process. Site allocations consider water and drainage availability, flood risk, water quality and management which should result in development that is cost effective and sustainable in the long term. Development can have adverse impact on the water environment, exacerbate flood risk or simply be in the wrong place. Angus Council aims to ensure new development and regeneration proposals maintain and enhance the water environment whilst providing safe, well serviced places in which to live work and travel.

Flood Risk

The avoidance and mitigation of flood risk in new and existing development will be an important factor in determining development proposals. Within the context of the National Flood Risk Framework the council will prepare and monitor a Strategic Flood Risk Assessment and Flood Management Plan to help guide and protect development and site allocations from flooding.

In assessing proposals, reference will be made to the Flood Risk Framework, Flood Risk Maps and land use vulnerability guidance published by SEPA.

Policy PV12 Managing Flood Risk

To reduce potential risk from flooding there will be a general presumption against built development proposals:

- **on the functional floodplain;**
- **which involve land raising resulting in the loss of the functional flood plain; or**
- **which would materially increase the probability of flooding to existing or planned development.**

Development in areas known or suspected to be at the upper end of low to medium risk or of medium to high flood risk (as defined in Scottish Planning Policy (2014), see Table 4) may be required to undertake a flood risk assessment. This should demonstrate:

- **that flood risk can be adequately managed both within and outwith the site;**
- **that a freeboard allowance of at least 500-600mm in all circumstances can be provided;**
- **access and egress to the site can be provided that is free of flood risk; and**
- **where appropriate that water-resistant materials and construction will be utilised.**

Where appropriate development proposals will be:

- **assessed within the context of the Shoreline Management Plan, Strategic Flood Risk Assessments and Flood Management Plans; and**
- **considered within the context of SEPA flood maps to assess and mitigate surface water flood potential.**

Built development should avoid areas of ground instability (landslip) coastal erosion and storm surges. In areas prone to landslip a geomorphological assessment may be requested in support of a planning application to assess degree of risk and any remediation measures if required to make the site suitable for use.

Policy PV12 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
0	++	0	0	0	0	++	0	0	0

Table 3: Flood Risk Framework

Little or No Risk	Annual probability of coastal or watercourse flooding is less than 0.1% (1:1000 years)
No constraints due to coastal or watercourse flooding	
Low to Medium Risk Area	Annual probability of coastal or watercourse flooding is between 0.1% and 0.5% (1:1000 to 1:200 years)
Suitable for most development. • A flood risk assessment may be required at the upper end of the probability range (i.e. close to 0.5%), and for essential infrastructure and the most vulnerable uses. Water resistant materials and construction may be required.	

Medium to High Risk	Annual probability of coastal or watercourse flooding is greater than 0.5% (1:200 years)

May be suitable for:

- residential, institutional, commercial and industrial development within built up areas provided flood protection measures to the appropriate standard already exist and are maintained, are under construction, or are a planned measure in a current flood risk management plan;
- essential infrastructure within built-up areas, designed and constructed to remain operational during floods and not impede water flow;
- some recreational, sport, amenity and nature conservation uses, provided appropriate evacuation procedures are in place; and
- job-related accommodation, e.g. for caretakers or operational staff.

Generally not suitable for:

- civil infrastructure and the most vulnerable uses;
- additional development in undeveloped and sparsely developed areas, unless a location is essential for operational reasons, e.g. for navigation and water-based recreation, agriculture, transport or utilities infrastructure (which should be designed and constructed to be operational during floods and not impede water flow), and an alternative, lower risk location is not available;
- new caravan and camping sites; and
- where built development is permitted, measures to protect against or manage flood risk will be required and any loss of flood storage capacity mitigated to achieve a neutral or better outcome.

Water-resistant materials and construction should be used where appropriate. Elevated buildings on structures such as stilts are unlikely to be acceptable.

Additionally, in areas of **Surface Water Flooding**

- Infrastructure and buildings should generally be designed to be free from surface water flooding in rainfall events where the annual probability of occurrence is greater than 0.5% (1:200 years).
- Surface water drainage measures should have a neutral or better effect on the risk of flooding both on and off the site, taking account of rain falling on the site and run-off from adjacent areas.

Policy PV13 Resilience and Adaptation

Development should not require an increase in the provision and / or maintenance of flood defences.

To increase resilience to the effects of climate change such as flood and drought, extreme weather events and rising sea levels Angus Council may require development proposals to incorporate adaptation measures including:

- **use of flood resistant materials and construction techniques;**
- **removal of culverts and other engineering works where opportunity arises and avoidance of development over or requiring new culverts or other unnecessary engineering works unless there is no practical alternative;**
- **minimising the area of impermeable surfaces by using permeable surfaces where possible for car parking and hard landscaping and where appropriate, green roofs and green infrastructure; and**
- **natural flood management measures which reduce water flow and enhance biodiversity and the quality of the water environment. Such schemes can contribute to local green networks, biodiversity and provision of amenity open space and should form an integral part of the design process.**

Policy PV13 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
0	0	0	0	0	0	++	0	0	0

Protection and Management of the Water Environment

Angus Council has a duty to ensure that the quality of all water bodies – in ponds, watercourses, and groundwater and on our coast is maintained and enhanced. Any development has the potential to affect the water environment. In most cases this can be managed to prevent adverse impact and provide an opportunity to enhance water quality through provision of natural flood management, sustainable drainage systems (SUDs) and amenity open space. Development activity should not have adverse effects where it is properly managed and the potential effects fully understood. SNH and SEPA both provide a range of guidance for developers and local authorities on best practice in avoiding damage to and managing the water environment.

Policy PV14 Water Quality

To protect and enhance the quality of the water environment, development proposals will be assessed within the context of:

- **the National Marine Plan;**
- **the Scotland River Basin Management Plan and associated Area Management Plans;**
- **relevant guidance on controlling the impact of development and associated works;**
- **relevant guidance on engineering works affecting water courses; and**
- **potential mitigation measures.**

Development proposals which do not maintain or enhance the water environment will not be supported. Mitigation measures must be agreed with SEPA and Angus Council.

Development proposals must not pollute surface or underground water including water supply catchment areas due to discharge, leachates or disturbance of contaminated land.

Policy PV14 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
0/?	0	0	0	++	0	0	0	0	0

Policy PV15 Drainage Infrastructure

Development proposals within Development Boundaries will be required to connect to the public sewer where available.

Where there is limited capacity at the treatment works Scottish Water will provide additional wastewater capacity to accommodate development if the Developer can meet the 5 Criteria*. Scottish Water will instigate a growth project upon receipt of the 5 Criteria and will work with the developer, SEPA and Angus Council to identify solutions for the development to proceed.

Outwith areas served by public sewers or where there is no viable connection for economic or technical reasons private provision of waste water treatment must meet the requirements of SEPA and/or The Building Standards (Scotland) Regulations. A private drainage system will only be considered as a means towards achieving connection to the public sewer system, and when it forms part of a specific development proposal which meets the necessary criteria to trigger a Scottish Water growth project.

All new development (except single dwelling and developments that discharge directly to coastal waters) will be required to provide Sustainable Drainage Systems (SUDs) to accommodate surface water drainage and long term maintenance must be agreed with the local authority. SUDs schemes can contribute to local green networks, biodiversity and provision of amenity open space and should form an integral part of the design process.

Drainage Impact Assessment (DIA) will be required for new development where appropriate to identify potential network issues and minimise any reduction in existing levels of service.

**Enabling Development and our 5 Criteria (http://scotland.gov.uk/Resource/0040/00409361.pdf)*

Policy PV15 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
0	+	0	0	++	0	++	0	0	++

The Coast

The Angus Coast is an important part of the character of the area as well as accommodating the main transport links (rail, shipping and to a lesser extent road) and the main centres of population. Leisure, recreation, tourism and fishing are important to the local economy with the coast contributing significantly to them all. The cliffs, beaches and coastal waters are a major natural heritage asset – particularly for migratory birds and marine life. The variety of coastal features makes classification difficult – the water's edge defines the sea, but inland is less clear. Cliffs, raised beaches, wave cut platforms and sand create a mosaic of interlocking zones. The Shoreline Management Plan, Tayside Landscape Character Assessment and TAYplan SDP all have different interpretations of the coast.

Rising sea levels and extreme weather events can result in increasing incidence of erosion and inundation and the ALDP takes a precautionary approach to coastal flooding and ground instability.

Policy PV16 Coastal Planning

The Coast is subject to natural and human pressures ranging from climate change to caravan parks. The environmental, economic and defensive role of the coast will be protected by Angus Council and development proposals will be assessed within the context of the Shoreline Management Plan (SMP) and relevant landscape capacity studies.

Development requiring new sea defences will not be supported and proposals should be directed to the developed coast or be associated with existing development.

Within the undeveloped coast proposals will only be supported where there is:

- **a justifiable locational requirement for the development;**
- **no conflict with designated or proposed marine heritage sites; and**
- **no conflict with existing coastal protection works.**

Areas liable to ground instability and at risk from current or future inundation as identified in the second SMP for Angus will be considered for managed realignment.

Angus Council will work with adjacent terrestrial and marine authorities as appropriate to promote co-ordinated coastal planning on and offshore and will consider development proposals within this context.

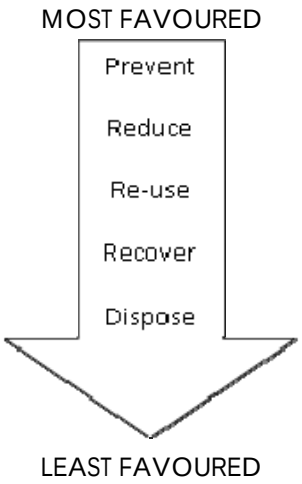
Development proposals should not result in adverse impacts, either alone or in combination with other proposals or projects, on the integrity of any European designated site, in accordance with Policy PV4 Sites Designated for Natural Heritage and Biodiversity Value.

Policy PV16 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+/?	0	0	+	?/0	0	++	+	+	0

RESOURCES

Waste

Scotland's Zero Waste Plan (ZWP) requires planning authorities to support the delivery of its targets to recycle 70% of all waste and no more than 5% being sent to landfill by 2025. The waste hierarchy is fundamental to achieving zero waste as more waste is prevented, more resources are reused, recycled and recovered and less waste is sent to landfill.



Angus Council already promotes and supports the principles of waste reduction, recycling and re-use and over the years has introduced kerbside collection of segregated waste within the towns and villages. There are already a number of waste management facilities and sites in Angus including the Restenneth landfill site, civic amenity sites, recycling centres and recycling points whilst residual waste from Angus is supplied to the Dundee Waste to Energy Plant. Existing sites in Angus have additional capacity and there is no need for significant new waste management sites in Angus to meet the Zero Waste Plan requirements.

The ALDP has a role in supporting waste reduction by making provision for sustainable waste management facilities on appropriate sites in Angus and ensuring new development provides for the collection and sustainable recovery and treatment of waste. The policy framework set out below safeguards existing facilities, identifies appropriate locations for new waste management proposals and seeks to ensure that any impacts on local communities or the environment are properly addressed. It also seeks to encourage developers to establish strategies to minimise waste from new development and that the design of new development facilitates recycling.

Policy PV17 Waste Management Facilities

Existing waste management facilities will be safeguarded from alternative development except where it is demonstrated that they are surplus or no longer suitable to meet future requirements or where alternative provision of equal or improved standard is provided on another site.

Development proposals adjacent to existing or proposed waste management facilities should not directly or indirectly compromise the present or future operation of the facility.

Proposals for new waste management facilities will be supported where they deliver the objectives outlined in the Zero Waste Plan (to prevent, reduce, recycle, recover and pre-treat waste).

The preferred location for new waste management facilities will be within or adjacent to existing waste management sites or on land identified for employment or industrial use. Former mineral sites and derelict or degraded land may also be acceptable. Such facilities should have regard to the local townscape and pattern of development.

Outwith these locations, proposals for new waste management facilities may be acceptable where they meet an identified community need and are in a location that minimises travel distances for that community.

Proposals will be supported where:

- **impacts on the natural and built environment, amenity, landscape character, visual amenity, air quality, water quality, groundwater resources, site access, traffic movements, road capacity and road safety are acceptable or could be satisfactorily mitigated through planning conditions or planning agreement; and**
- **appropriate details of restoration, aftercare and after use are submitted for approval by Angus Council, recognising that ecological solutions are the preferred from of restoration. Opportunities to enhance, extend and / or link to existing green networks should be investigated. Prior to commencement of development Angus Council may require a bond to cover the cost of the agreed scheme of restoration, aftercare and after use.**

Energy from waste recovery facilities will also be assessed against Policy PV9 Renewable and Low Carbon Energy Development and the Scottish Environment Protection Agency's Thermal Treatment of Waste Guidelines 2014.

Policy PV17 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+	+	+	+	+	+	+	+	+	+

Policy PV18 Waste Management in New Development

Proposals for new retail, residential, commercial, business and industrial development should seek to minimise the production of demolition and construction waste and incorporate recycled waste into the development.

Where appropriate, Angus Council will require the submission of a Site Waste Management Plan to demonstrate how the generation of waste will be minimised during the construction and operational phases of the development.

Development proposals that are likely to generate waste when operational will be expected to include appropriate facilities for the segregation, storage and collection of waste. This will include provision for the separate collection and storage of recyclates within the curtilage of individual houses.

Policy PV18 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
0	+	0	0	0	0	+	0	+	0

Minerals

Mineral deposits make an important contribution to the Angus economy, providing construction materials and supporting employment. The extraction of minerals and associated activities can have an impact on the natural and built environment, including landscape as well as the residential amenity of properties and settlements.

Scottish Planning Policy (SPP) (2014) states that LDPs should safeguard all workable mineral resources which are of economic or conservation value and ensure that these are not sterilised by other development. In addition, LDPs should support the maintenance of a landbank of permitted reserves for construction aggregates of at least 10 years at all times.

In order to maintain a 10 year landbank, Angus Council has granted planning permission for a joint-working proposal to extend the extraction of hard rock at Ethiebeaton and Ardownie Quarries, and has granted planning permission for a new sand and gravel extraction site at Struan, by Edzell.

Policy PV19 Minerals

Angus Council will protect existing mineral resources within Angus which are of economic and/or conservation value from other forms of development.

Proposals for new or extended mineral workings must demonstrate that the development is required to maintain, at least a 10 year land bank for aggregates or the development is required for the local, regional and/or national market that cannot be satisfied by recycled or secondary aggregates at existing workings.

Proposals will only be supported where:

- **impacts on the natural and built environment, amenity, landscape, visual amenity, air quality, water quality, groundwater resources, prime quality agricultural land, geodiversity, site access, traffic movements, road capacity and road safety are acceptable or could be satisfactorily mitigated through planning conditions , a Section 75 agreement or other legal agreement; and**
- **appropriate details of restoration, aftercare and after use are submitted for approval by Angus Council, recognising that ecological solutions are the preferred from of restoration. Opportunities to enhance, extend and / or link to existing green networks should be investigated. Prior to commencement of development Angus Council may require a bond to cover the cost of the agreed scheme of restoration, aftercare and after use.**

Policy PV19 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+	0	0	+/?	+	+	+	+	?/+	+

Soils and Geodiversity

Geodiversity is the variety of rocks, minerals, fossils, landforms, sediments and soils, together with the natural processes which form and alter them. It is increasingly recognised as the basis for plant, animal and human life and defines our physical surroundings from landscape to the quality of farmland and location of mineral deposits. The ALDP aims to protect and enhance geodiversity through a range of policies. Soils form an important part of this biodiversity and their specific protection and preservation should be addressed through the planning system.

Soils are recognised as a valuable resource in many ways – food production, carbon absorption, biodiversity, flood management. It takes millennia for soils to form but their destruction is much quicker and restoration difficult. The Scottish Government's Soil Framework; Land Use Strategy and NPF3 emphasise the importance of prime agricultural land and deep peat and carbon rich soils and this should be balanced against the need for new development and infrastructure.

The protection, storage and reinstatement of soils should be undertaken with care and in accordance with the appropriate available guidance for various types of development provided by SEPA, SNH and Scottish Government.

THE POLICY FRAMEWORK – PART 2
PROTECTED AND VALUED

Policy PV20 Soils and Geodiversity

Development proposals on prime agricultural land will only be supported where they:

- **support delivery of the development strategy and policies in this local plan;**
- **are small scale and directly related to a rural business or mineral extraction; or**
- **constitute renewable energy development and are supported by a commitment to a bond commensurate with site restoration requirements.**

Design and layout should minimise land required for development proposals on agricultural land and should not render any farm unit unviable.

Development proposals affecting deep peat or carbon rich soils will not be allowed unless there is an overwhelming social or economic need that cannot be met elsewhere. Where peat and carbon rich soils are present, applicants should assess the likely effects of development proposals on carbon dioxide emissions.

All development proposals will incorporate measures to manage, protect and reinstate valuable soils, groundwater and soil biodiversity during construction.

Policy PV20 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
0	0	0	++	++	0	0	0	+	0

Pipeline Consultation Zones

There are a number of pipelines which pass through the plan area. There are potential hazards which may arise from developing in proximity to them. Within specified distances from these pipelines there is a statutory framework for ensuring that the Health and Safety Executive is consulted on the implications which arise from development proposals which are the subject of planning applications. These pipeline consultation zones are identified on the proposals map, and the following policy will be applied to submitted development proposals within them. The Health and Safety Executive has produced a 'Planning Advice Web App' to assist developers in preparing planning applications for development proposals.

Policy PV21 Pipeline Consultation Zones

Decisions on whether to grant planning permission for development proposals within the pipeline consultation zones shown on the proposals map will be taken in light of the views and advice of the Health and Safety Executive.

Policy PV21 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
0	+	0	0	0	0	0	0	0	0

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SETTLEMENT STATEMENTS, VILLAGE DIRECTORY & DEVELOPMENT BOUNDARY MAPS

Figure 2: Towns and Villages

- TOWN INSET MAPS (WITH SETTLEMENT STATEMENT)
- RURAL SERVICE CENTRE MAPS (WITH SETTLEMENT STATEMENT)
- VILLAGE BOUNDARY MAPS

- East Angus HMA
- North Angus HMA
- West Angus HMA
- South Angus HMA

SETTLEMENT STATEMENTS, VILLAGE DIRECTORY & DEVELOPMENT BOUNDARY MAPS

The Housing Market Areas

Angus contains four Housing Market Areas (HMAs), as shown on Figure 2. Whilst the North, East and West Angus HMAs are self-contained, South Angus HMA forms part of the Greater Dundee HMA, which also covers Dundee City and parts of North Fife and Perth and Kinross. The general approach to allocating land in accordance with TAYplan SDP and the ALDP Development Strategy in each HMA is set out below.

The North Angus Housing Market Area comprises the two principal settlements of Brechin and Montrose, together with the Rural Service Centre of Edzell and a number of smaller villages. In accordance with TAYplan SDP and the ALDP Development Strategy, development is focused in the principal settlements with the majority allocated in the tier 2 settlement of Montrose (which includes Ferryden and Hillside). Housing has also been allocated in Edzell to support and maintain population, services and facilities.

The East Angus Housing Market Area comprises the principal settlement of Arbroath, which is the focus of development in this area. The Rural Service Centre of Friockheim is also expected to accommodate some growth to support and maintain population, services and facilities. There are also a number of smaller villages in the HMA such as Inverkeilor.

The South Angus Housing Market Area forms part of the Greater Dundee Housing Market Area. The area comprises the settlements of Monifieth and Birkhill / Muirhead (both of which are within the Dundee Core Area) and Carnoustie as well as the rural environs of Dundee City. As set out in the Development Strategy, in order to avoid conflicts with TAYplan SDP and the Dundee Local Development Plan, the ALDP does not seek to allocate greenfield land outwith the development boundaries for Birkhill / Muirhead. Development in the South Angus Housing Market Area is therefore focused on the principal settlements of Monifieth (tier 1) and Carnoustie (tier 3), with some housing allocated in Newtyle to support and maintain population, services and facilities.

The West Angus Housing Market Area contains the principal settlements of Forfar and Kirriemuir as well as the Rural Service Centre of Letham and many small villages such as Glamis and Aberlemno. In accordance with TAYplan SDP and the ALDP Development Strategy, development is focused in the tier 2 principal settlement of Forfar, with limited housing allocated in Letham to support and maintain population, services and facilities.

A statement and Proposals Map is provided for the Angus Towns and Rural Service Centres listed below.

Angus Towns

Arbroath	**Forfar**	**Montrose inc. Ferryden and Hillside**
Brechin	**Kirriemuir**	
Carnoustie and Barry	**Monifieth**	

Rural Service Centres

Edzell	**Letham**
Friockheim	**Newtyle**

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Arbroath

Arbroath, the largest town in Angus, originally developed as a market town around the Abbey (founded 1178) and it was here that the Scottish Declaration of Independence was signed in 1320. The town subsequently developed as a fishing port with associated activities – including production of Arbroath 'smokies'. Engineering developed in support of fishing and farming, as did processing of local resources – textiles and food processing/packaging. Later the town developed as a popular holiday resort based on the beach, harbour, historic Abbey and other attractions.

Arbroath's traditional manufacturing sector declined from the 1980's but still accounts for 12% of employment, and fishing is now inshore or recreational as the larger boats have moved north. Diversification and renewal however have provided new opportunities - the harbour is now a successful marina with a small but viable shellfish industry; the Abbey precinct is a major tourist draw and focus for local events and the town remains the largest shopping centre in Angus.

The existing supply of greenfield employment land at Kirkton and Elliot industrial estates can meet short term needs, with an additional greenfield site allocated in this plan to ensure that a marketable supply is maintained throughout the plan period.

The town's population has increased over the past decade as new housing sites at Cliffburn Road (128 house) and Montrose Road (344 house) to the east of the town have been developed. In accordance with the Angus Local Plan Review (2009), this has diversified the range and types of housing available in the town. The site at Montrose Road will continue to do so for much of the plan period, augmented by redevelopment of brownfield sites. Land allocated to the west of the town will add to the range and choice of housing throughout the plan period and beyond. This will reinforce existing and proposed investment in services and facilities in the area including employment land, transport, education and retailing.

The challenge for the Local Development Plan will be how to continue the regeneration of Arbroath and enhance new opportunities for jobs, investment and tourism by allocating and promoting appropriate sites for development.

DEVELOPMENT STRATEGY

The development strategy for Angus is set out in the introduction to the ALDP, for Arbroath this means:

- supporting the redevelopment of vacant, underused and brownfield sites within the defined Development Boundary, including land at Dens Road/Wardmill Road;
- identifying sites that are effective or capable of becoming effective within the plan period to accommodate a mix of new housing development to meet local needs and releasing green field land at East Muirlands Road and Arbirlot Road West phased for release throughout the plan period and beyond;
- ensuring the continued provision of marketable land for employment uses by continuing to allocate land east of Elliot Industrial Estate to support Class 4, 5, 6 and other compatible uses;

- protecting and enhancing Arbroath's wide range of visitor assets and further developing tourism and recreation facilities and accommodation particularly along the sea front, redeveloping a number of sites and properties to support the Harbour and West Links;

- encouraging new development and investment where this will strengthen the role of the town centre and enhance its vibrancy, vitality and viability whilst improving the quality of the physical environment;

- safeguarding and enhancing the natural and built features which are a key part of the character and identity of the town including the Abbey, seafront, harbour and Fit 'o the Toon;

- managing the risk of flooding along both the Brothock Water and coast ensuring new development is not at risk of flooding and does not increase flood risk elsewhere; and

- protecting and enhancing open space and play provision whilst improving the connectivity and functionality of green networks, integrating new provision as part of land allocations and new development especially around the Hercules Den burn and Elliot Water and associated path network.

HOUSING

EXISTING SITES

Sites with planning permission or under construction as identified in the Angus Housing Land Audit 2014 and subsequent consents included for completeness, are shown in Table A1.

Table A1: Existing Sites

Name / reference	Capacity
A(a) Montrose Road	280
A(b) Springfield Terrace, Abbeybank House	9
A(c) Cliffburn	1
A(d) Ernest Street/Palmer Street	75
A(e) Cairnie Loan, The Cairnie	20
A(f) Viewfield Hotel	21
A(g) Alexandra Place, Arbroath Lads Club	6
A(h) Roy's Auto, 32-38 Dishlandtown St	13
A(i) Noran Avenue 15-29	7
A(j) Bank Street, Inverpark Hotel	12
A(k) Wardmill Road/Andrew Welsh Way	51
A(l) Baltic Mill, Dens Road[1]	39
Total	**534**

[1] Planning permission for this site was granted following the publication of the 2014 Housing Land Audit, but has been included for completeness.

NEW ALLOCATIONS

Table A2 summarises new allocations of housing land that will contribute towards meeting TAYplan SDP requirements beyond 2016.

Table A2: New Allocations

Name / reference	Capacity	ALDP Phase1 (2016 – 2021)	ALDP Phase 2 (2021 – 2026)
A1 Crudie Acres, East Muirlands Road	230	100	130
A2 Crudie Farm, Arbirlot Road West (Phase 1)	120	0	120
Total	**350**	**100**	**250**

Land is allocated for residential development north of East Muirlands Road and west of Arbirlot Road West to provide for a range and choice of housing sites, complement recently completed greenfield sites and to maintain a generous supply of housing land in the plan period. These sites capitalise on the renewal of Muirfield Primary School, and have good linkages to employment, school and retail facilities.

A1 Housing – Crudie Acres, East Muirlands Road

9.4ha of land at Crudie Acres, is allocated for residential development of around 230 dwellings. A first phase of around 100 dwellings will be permitted in the period to 2021 with the remaining phase of around 130 dwellings permitted in the period to 2026.

Development proposals should be in accordance with the development brief which will be prepared for the site and should include:

- **enhancement of the Hercules Den Burn to contribute to natural flood management, create new green infrastructure and form a landscaped edge to the town;**
- **opportunities for active transport through linkages with the existing path network;**
- **linking planting / landscaping around the electricity substation and through the site to enhance the green network; and**
- **supporting information including a Drainage Impact Assessment, Sustainable Drainage and Surface Water Management Plan, Flood Risk Assessment and Transport Assessment.**

A1 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+?	+	0/+	-/+	0/+	+	-/+	0	-/+	+

Land at Arbirlot Road West is allocated for around 120 houses as a first phase of a larger site. Given the landscape context provided by this site, additional land beyond the initial allocation identified by the ALDP is safeguarded beyond 2026. This additional land will need to be confirmed by a future Local Development Plan.

A2 Housing – Crudie Farm, Arbirlot Road West

5ha of land at Crudie Farm is allocated for residential development of around 120 dwellings in the period 2021 – 2026.

Development proposals should be in accordance with the development brief which will be prepared for the site and should include:

- **a landscaped edge to the town incorporating structure planting and amenity open space;**
- **opportunities for active transport through linkages with the existing path network;**
- **planting throughout the area to enhance biodiversity, the green networks and views through the site and out into the open countryside; and**
- **supporting information including a Drainage Impact Assessment; Sustainable Drainage and Surface Water Management Plan, Flood Risk Assessment and Transport Assessment.**

Additional land is safeguarded for further residential development in the period beyond 2026. The scale of further land release in the period beyond 2026 will be determined by a future Local Development Plan.

A2 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+?	++	0/+	-/+	?/+	+	-/+	0	-/+	+

OPPORTUNITY SITES

There are a number of sites in Arbroath that provide opportunities for development and / or redevelopment. Where proposals involve new housing development they will be required to meet the provisions of Policy TC3 - Affordable Housing.

A3 Opportunity Site – Wardmill/Dens Road

The Dens Road/Wardmill Road area of Arbroath provides an opportunity for Class 4 (business), Class 5 (general industrial) and Class 11 (leisure). Residential use may also be acceptable.

Development proposals should take account of existing activities and should include:

- **provision of access and circulation within the area and onto Guthrie Port;**
- **opportunities for active transport through linkages with the existing path network;**
- **an assessment of the effect of development on the A listed Baltic Mill;**
- **an assessment of the quality of the amenity of any proposed housing and compatibility with established uses; and**
- **supporting information including a Flood Risk Assessment which considers the potential for channel restoration, Drainage Impact Assessment, Transport Assessment and a Contaminated Land Investigation Report.**

Adaptation measures and resilience to flooding through construction techniques and mitigation should be incorporated into design appropriate to proposed development type.

A3 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
?/+	++	0/+	+	0	+	+/-	+	+	+

A4 Opportunity Site - The Elms, Cairnie Road

0.58 ha of land at The Elms, Cairnie Road provides an opportunity for subdivision or conversion for residential, Class 7 (hotel), education, Class 11 (assembly and leisure) or Class 4 (business) uses. To protect the setting of the Category A listed house, new build and reconstruction will be restricted to the rear of the main building.

Development proposals should be designed to respect the character and setting of the house, recognise the presence of a Tree Preservation Order within the grounds and maintain the garden's contribution to the green network in this area.

Proposals should provide supporting information including a Drainage Impact Assessment.

A4 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+/?	++	0/+	0/+	0	+	+	+	+	-/+

A5 Opportunity Site - Little Cairnie

0.3 ha of land to the rear of Little Cairnie Hospital provides an opportunity for residential development of around 6 dwellings or other uses compatible with the surrounding area. Improvements to the existing access from Forfar Road will be required.

Proposals should provide supporting information including a Drainage Impact Assessment.

A5 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
?/0	++	0/+	0/+	0	+	+	0	+	-/+

A6 Opportunity Site – Former Bleachworks, Elliot

1.24 ha of land at the Former Bleachworks, Elliot provides an opportunity for a range of uses including leisure, tourism or Class 4 (business). Proposals should recognise that the site is located at an important gateway to the town and that there is an opportunity to reinforce this as part of design proposals. Given the level of fluvial and tidal flood risk a Flood Risk Assessment will be required, including investigation of any culverts flowing through the site, to establish the scope for development, including residential development.

Planting and landscaping within the site should enhance the trees and water environment along the Elliot Water, contributing to the green network. Linkages with the existing path and cycle network should be included in any development.

A6 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+/?	++	0/+	0/+	0	+	+	0	+	-/+

A7 Opportunity Site – Former Seaforth Hotel

0.6 ha of land at the Former Seaforth Hotel provides an opportunity for a hotel and possible complementary leisure, tourism or recreation use. Development proposals should be in accordance with the approved Supplementary Guidance for this site updated as a Development Brief to reflect policies in this Local Development Plan. Surface water management measures may be required.

Proposals should provide supporting information including a Drainage Impact Assessment.

A7 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
?/0	0	0/+	+	0	+	+	0	+	-/+

A8 Opportunity Site – Former Ladyloan Primary School

The 0.2 ha site at the Former Ladyloan Primary School provides an opportunity for Class 4 (business), restaurant / café or leisure uses.

Proposals should provide supporting information including a Drainage Impact Assessment.

A8 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
?/0	0	0/+	0/+	?/+	+	+	0	+	-/+

A9 Opportunity Site – Helen Street Goods Yard

2.3 ha of land at Helen Street Goods Yard provides an opportunity for car parking, Class 4 (business and light industry). Development proposals should retain the sidings in accordance with Policy TC12 Freight Facilities, and be compatible with surrounding uses.

Proposals should provide supporting information including a Drainage Impact Assessment.

A9 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
?/0	0	0/+	0/+	?/+	+	+	0	+	-/+

WORKING

EXISTING SITES

Kirkton and Elliot Industrial Estates continue to provide a range of sites and premises for a variety of employment uses at accessible, serviced locations at the southern and northern entrances to Arbroath. Brownfield sites within Arbroath that are well related to the town centre and transport links provide the potential for more specialised needs such as office or business use and there are opportunity sites identified with the capacity to accommodate a range of employment uses.

SITES PREVIOUSLY IDENTIFIED BY THE ANGUS LOCAL PLAN REVIEW

The Angus Local Plan Review allocated land West of Elliot Industrial Estate for employment purposes. Planning permission has been granted to Angus Council to develop part of the site and acquisition and development will proceed as resources allow.

A10 Working – Elliot Industrial Estate Extension

21 ha of land at West of Elliot Industrial Estate, 14.2ha of which has the benefit of planning consent, is allocated for employment use in accordance with Policy TC14 Employment Allocations and Existing Employment Areas.

Development proposals should include:

- **consideration of the potential for heat storage and exchange;**
- **foot and cycle linkages; ~~and~~**
- **opportunities to strengthen the green network; and**
- **supporting information including a Flood Risk Assessment.**

Development proposals which would prejudice the expansion of employment land to the west of the existing Elliot Industrial Estate will not accord with this Local Plan.

Traditional fish smoking businesses within the Fit o' the Toon around the harbour continues to be an important part of the culture, economy and history of Arbroath and will be facilitated as appropriate.

A11 Working - Domestic Scale Fish Processing

Smoking and processing of fish on a small domestic scale will continue to be supported within the Fit o' the Toon area.

TOURISM

Tourism remains an important activity and source of employment for Arbroath, and Angus Council will continue to promote and support projects and investment that improve the town's facilities and role in this sector. Recent projects have included the West Links upgrade and the expansion of the highly successful marina in the inner harbour. Marketing initiatives such as the annual 'Seafest' complement the physical works projects and assist in attracting more visitors into the town. Improved links between attractions will make them more accessible to visitors, encouraging them to stay longer and explore the town.

A12 Tourism - Improvement of Tourist Linkages and Facilities

Angus Council will continue to pursue the strengthening of linkages between the Abbey, High Street and Harbour area, Signal Tower and West Links as a means of consolidating and promoting tourism in Arbroath and Angus. In support of this a town centre strategy for Arbroath integrating and enhancing the historic core and links with the visitor assets of the town will be promoted in partnership with private and public interests.

TOWN CENTRES AND RETAILING

Arbroath has a number centres indicating the importance of the town as a retail, service and visitor centre. The town centre should be the focus for appropriate development and the upper floors provide opportunity for residential, storage and office accommodation. Angus Council will support the preparation of a Town Centre Strategy for Arbroath and future Local Development Plans will incorporate relevant outcomes from the strategy in policies and proposals to deliver physical improvements to review the core retail area and town centre designations.

COMMUNITY FACILITIES AND SERVICES

Over the plan period Angus Council propose the improvement of the Arbroath Primary School Estate. Whilst individual proposals are not identified in this plan, there is a presumption in favour of supporting the Council's approved strategy and programme for replacement and upgraded schools.

The Western Cemetery is nearing capacity and a cemetery will be required over the plan period. Work has been undertaken to provide a new cemetery for Arbroath to the rear of Little Cairnie hospital to meet future needs.

A13 Community Facilities - Western Cemetery Extension

2.7 ha of land adjacent to Little Cairnie Hospital is reserved for future cemetery provision. Before any development occurs at the site, a flood risk assessment should be carried out and ground investigation works should be undertaken in line with SEPA's guidance on assessing the impacts of cemeteries on groundwater.

A13 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
?/0	0	0/+	0/+	?~~/0~~	+	+	0	+	-/+

BUILT AND NATURAL ENVIRONMENT

HOSPITALFIELD

Hospitalfield House (a Category A listed building), set in around 22 ha of managed woodland and open agricultural land, is a prominent feature in the local landscape and a unique private open space within Arbroath. The ALDP seeks to maintain this unique character and all development proposals will require to be accompanied by a conservation and/or design statement demonstrating how they contribute to the character and setting of the area. This policy is not intended to prevent all development, but to ensure any future development proposals are in keeping with this historic property and its landscape setting.

A14 Built and Natural Environment- Hospitalfield House

Hospitalfield House and grounds will be protected from development that would be detrimental to the historic character and landscape setting of the property.

A14 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
?/+	0	+	0	0	0	0	0	0	+

FLOODING

A Flood Strategy for Arbroath is being developed by Angus Council in consultation with stakeholders and community groups to identify and deliver measures to manage river and coastal flood risk including the proposed Arbroath (Brothock Water) Flood Protection Scheme.

A15 Built and Natural Environment - Arbroath (Brothock Water) Flood Protection Scheme

Angus Council will develop and implement proposals in accordance with the Arbroath (Brothock Water) Flood Protection Scheme over the plan period as resources allow. Until such a scheme is in place each site will be assessed in accordance with the Flood Risk Framework and with reference to current SEPA flood maps.

A15 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
0	+	0	+	?/+	0	+	+	+	?

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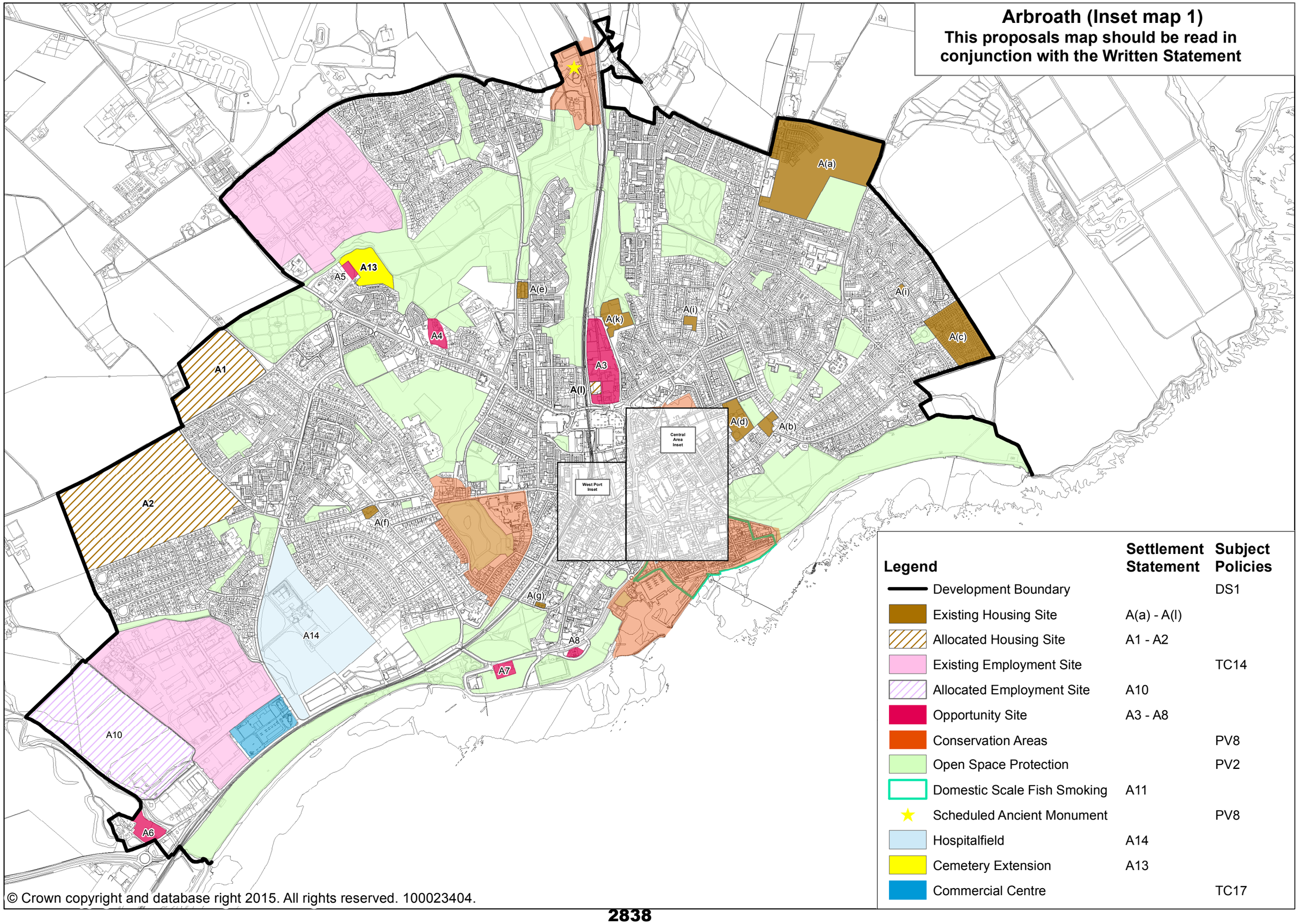
Arbroath (Inset map 1)

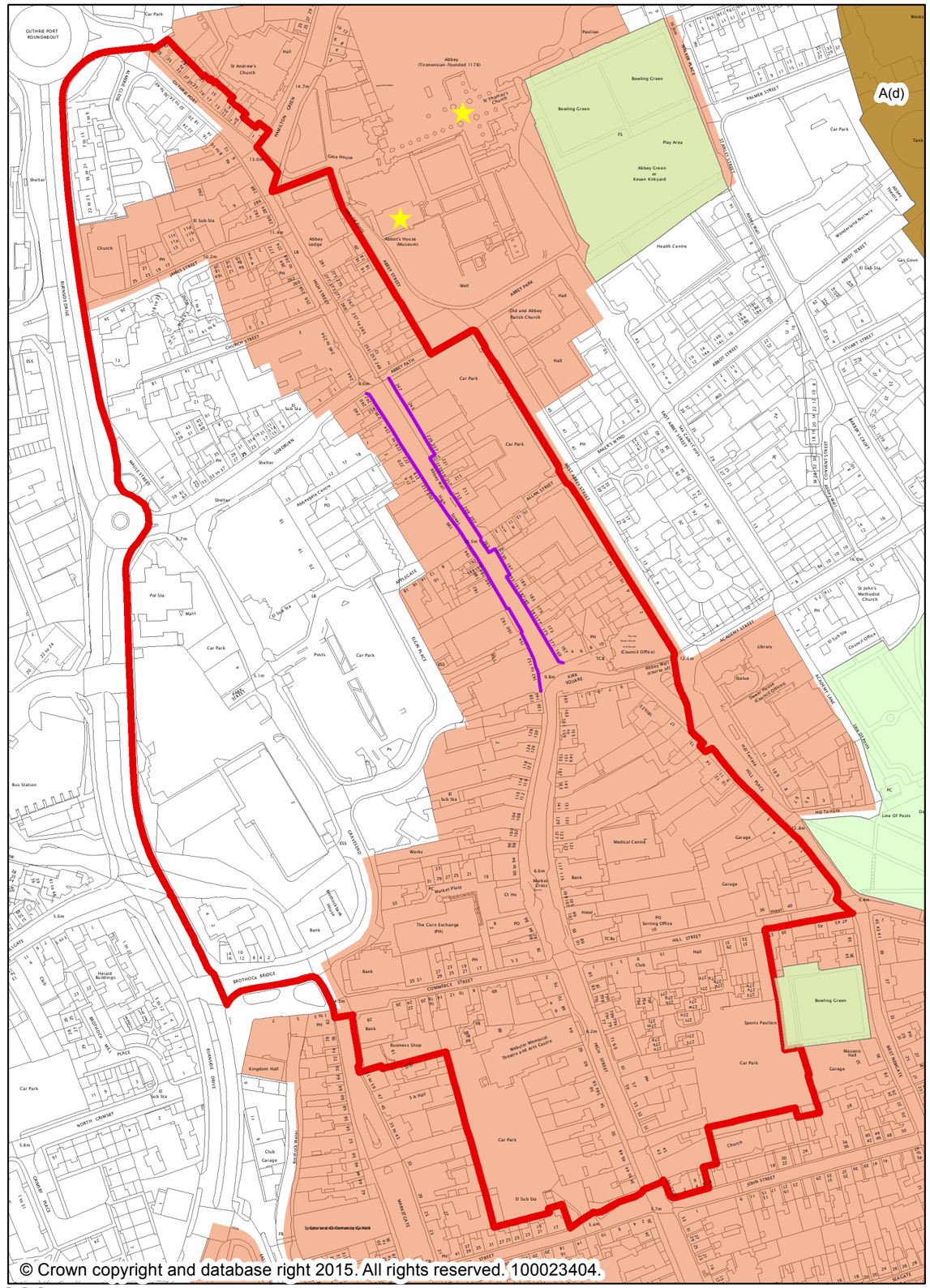
This proposals map should be read in conjunction with the Written Statement



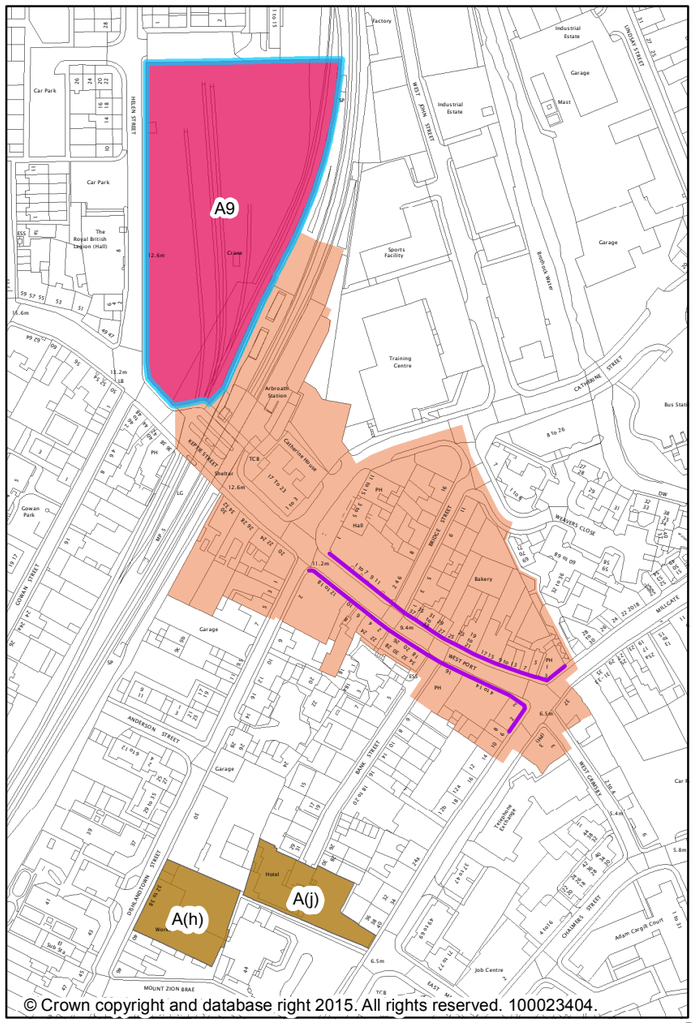
Legend	Settlement Statement	Subject Policies
Development Boundary		DS1
Existing Housing Site	A(a) - A(l)	
Allocated Housing Site	A1 - A2	
Existing Employment Site		TC14
Allocated Employment Site	A10	
Opportunity Site	A3 - A8	
Conservation Areas		PV8
Open Space Protection		PV2
Domestic Scale Fish Smoking	A11	
Scheduled Ancient Monument		PV8
Hospitalfield	A14	
Cemetery Extension	A13	
Commercial Centre		TC17

Central Area Inset Map

Legend	Settlement Statement	Subject Policies
Scheduled Ancient Monument		PV8
Opportunity Site	A9	
Core Retail Area		TC18
Town Centre		TC17 - TC19
Open Space Protection		PV2
Conservation Areas		PV8
Existing Housing Site	A(h), A(j)	
Freight Facility	A9	



West Port Inset Map



Brechin

Brechin is a historic settlement, located in the northeast of Angus adjacent to the A90 trunk road. The town is situated on the north bank of the River South Esk and has expanded from its historic core in a northerly and easterly direction towards the trunk road and the former railway line at Drumachlie Loan. The town contains many listed buildings, two Conservation Areas and a number of areas with their own distinctive character. The woodland policies of Brechin Castle Estate and the River South Esk are also important landscape and environmental features.

The Queens Park housing estate together with brownfield sites at Albert Place and Southesk Street have been successfully regenerated for housing and retail uses. A range of properties within the town centre Conservation Area have also been improved through the Townscape Heritage Initiative and the Scottish Government's Town Centre Regeneration Fund. However, longstanding brownfield sites within the town including the former Andover Primary School and the Gas Works Site at Witchden Road remain vacant.

Key elements of the long term development strategy to direct housing and economic development to the west of the town have been implemented or are being progressed including Brechin Castle Centre, Brechin Business Park and the Bearehill/Rosehill housing development. Land remains available within this area for future development including housing opportunities at Dubton Farm.

A new Community Campus is being developed at Brechin High School to provide new secondary school accommodation, community education and, recreation facilities for community use.

The Brechin Flood Prevention Scheme at River Street has commenced which will address flooding issues and improve development opportunities in the south of the town.

DEVELOPMENT STRATEGY

The development strategy for Angus is set out in the introduction to the ALDP, for Brechin this means:

- supporting the redevelopment of vacant, underused and brownfield sites within the defined Development Boundary, including former Andover School, Scott Street Goods Yard and Witchden Road Gas Works site;
- identifying sites that are effective or capable of becoming effective within the plan period to accommodate a mix of new housing development to meet local needs and the phased release of green field land at Dubton Farm;
- ensuring the continued provision of marketable land for employment uses by allocating further land at Brechin West;
- protecting and enhancing Brechins's visitor assets and further developing tourism and recreation facilities and accommodation especially at Brechin West;
- encouraging new development and investment where this will strengthen the role of the town centre and enhance its vibrancy, vitality and viability whilst improving the quality of the physical environment;
- safeguarding and enhancing the natural and built features which are a key part of the character and identity of the town including the town centre and St Ninians

Square Conservation areas, the woodland setting of Brechin Castle and the River South Esk Special Area of Conservation;

- managing the risk of flooding particularly along the River South Esk, ensuring development is not at risk of flooding and does not increase flood risk elsewhere; and
- protecting and enhancing open spaces and the connectivity and functionality of green networks, integrating new provision as part of land allocations and new development especially at Dubton Farm and Brechin West.

HOUSING

EXISTING SITES

Sites with planning permission or under construction as identified in the Angus Housing Land Audit 2014 are shown in Table B1.

Table B1: Existing Sites

Name / reference	Capacity
B(a) Bearehill/Rosehill	22
B(b) St Andrew Street, Townhead Nursery	3
B(c) 59 Clerk Street	9
B(d) Park Road	8
Total	**42**

SITES PREVIOUSLY IDENTIFIED BY THE ANGUS LOCAL PLAN REVIEW

The sites summarised in Table B2 were previously identified in the Angus Local Plan Review. This Plan continues to identify these sites for housing development, and where appropriate the wording of the proposal and / or the indicative yield from the site may have changed.

Table B2: Sites from Angus Local Plan Review

Name / reference	Capacity	ALDP 1st Phase (2016 - 2021)	ALDP 2nd Phase (2021 - 2026)
B1 Dubton Farm	400	125	125
Total	**400**	**125**	**125**

B1 Housing – Dubton Farm

29 Ha of land at Dubton Farm is allocated for residential development of around 400 dwellings. Around 250 dwellings will be released within the plan period including a first phase of around 125 dwellings in the period to 2021 and the remaining 125 dwellings permitted in the period to 2026. The scale of further land release in the period beyond 2026 will be determined by a future Local Plan.

Development proposals should be in accordance with the approved development brief for this site updated as appropriate to reflect policies in this Local Development Plan.

Development proposals should not result in adverse impacts, either alone or in combination with other proposals or projects, on the integrity of the River South Esk SAC, in accordance with Policy PV4 Sites Designated for the Natural Heritage and Biodiversity Value.

Development proposals should be supported with the submission of a Flood Risk Assessment.

OPPORTUNITY SITES

There are a number of sites in Brechin that provide opportunities for development and / or redevelopment. Where proposals involve new housing development they will be required to meet the provisions of Policy TC3 Affordable Housing.

B2 Opportunity Site – Andover School, Nursery Lane

The former Andover School provides an opportunity for residential, Class 4 (business) and community uses. Development proposals should seek to retain the Category B listed school building and surrounding stone boundary wall and be designed to respect its character and setting.

Proposals should be supported by a Conservation Statement and a Drainage Impact Assessment.

B2 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
0	+	+	+	0	+	+	+	+	+

B3 Opportunity Site – Scott Street Goods Yard

2.4 ha of land at Scott Street provides an opportunity for employment uses which are compatible with surrounding activities and can be accommodated without adverse impact on traffic safety and amenity of the area.

Development proposals should be supported with the submission of a Flood Risk Assessment, a Drainage Impact Assessment, a Contaminated Land Investigation Report and a Transport Assessment. Potential footpath connection to Strachans Park should also be explored.

B3 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
0	0	+	+	0	+	+	0	+	+

B4 Opportunity Site – Former Gas Works, Witchden Road

0.6 ha of land at the former gas works site provides an opportunity for residential or employment uses compatible with surrounding activities. Development proposals should be supported with the submission of a Flood Risk Assessment, Drainage Impact Assessment and a Contaminated Land Investigation Report.

Development proposals should be designed to take account of the Den Burn culvert which traverses the site.

B4 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
?/0	0	+	+	0	+	+	0	+	+

B5 Opportunity Site – Maisondieu Church, Witchden Road

The Maisondieu Church provides an opportunity for residential, Class 4 (business) or community uses. Development proposals should seek to retain the Category B listed building, surrounding stone boundary wall, important landscape features and be designed to respect its character and setting.

Proposals should be supported by a Conservation Statement and a Drainage Impact Assessment.

Finished floor levels for the site should be considered in the context of available information to minimise any residual flood risk.

B5 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+	+	+	+	0	+	+	+	+	+

WORKING

EXISTING SITES

The two main employment areas in Brechin are located in the south east of the town at Montrose Road and to the west at Brechin Business Park adjacent to the A90(T). There has been increasing demand for employment sites in Brechin and there is a need to allocate additional land to meet future requirements and provide for economic growth.

Land within the development boundary at Brechin west continues to provide development opportunities for a range of employment uses including tourist related development or roadside facilities in accordance with Policy TC10 – Roadside Facilities where they would complement the visitor facility at Brechin Castle Centre. In seeking to support economic development and provide continuity in supply, additional employment land is allocated adjacent to Brechin Business Park.

NEW ALLOCATIONS

B6 Working – Brechin West

27 ha of land at Brechin West is allocated for employment development including tourist or roadside service related uses complementary to the existing gateway facility at Brechin Castle Centre and an extension to Brechin Business Park for Class 4 (business), Class 5 (general industry), and Class 6 (storage and distribution) uses.

Development proposals should be in accordance with the development brief which will be prepared for the site and should include:

- **justification for the scale and location of the Business Park extension;**
- **retention of existing landscape features and provision of structural landscaping to help integrate development into the existing landscape, define development zones and extend green network provision;**
- **provision of an internal link road between the Business Park extension and Brechin Business Park. Vehicular access to any tourist related development from the existing Business Park/Business Park extension will not be permitted;**
- **high quality design and boundary treatment adjacent to the A935; and**
- **supporting information including a Flood Risk Assessment, Drainage Impact Assessment, Sustainable Drainage and Surface Water Management Plan and a Transport Assessment to establish access and associated transport infrastructure requirements.**

Development proposals should not result in adverse impacts, either alone or in combination with other proposals or projects, on the integrity of the River South Esk SAC, in accordance with Policy PV4 Sites Designated for Natural Heritage and Biodiversity Value.

B6 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+	+	0/+	0	0	+	+	0	+	+

TOWN CENTRES AND RETAILING

Brechin town centre provides a range of retail, business and public service facilities for the local area as well as residential uses. The majority of the town centre including its core retail area lies within the Town Centre Conservation Area reflecting its architectural and historic importance. Environmental improvement and regeneration of parts of the town centre have been delivered through the Brechin Townscape Heritage Initiative and Town Centre Regeneration Fund.

The town centre network contained within Policy TC17 Network of Centres identifies Brechin as a smaller town centre. This recognises the level of facilities and services currently available within the centre. Policy TC17 seeks to direct uses which attract a significant number of people to town centres such as Brechin to support its vibrancy, vitality and viability.

Angus Council will support the preparation of a Town Centre Strategy for Brechin developed in partnership with the local community through the Community Planning Process. The Town Centre Strategy will look to identify and address the challenges faced by Brechin town centre and will provide a framework for co-ordinated action, including: developing a long term vision, identifying the potential for change, promoting opportunities for new

development, diversification of uses, management tools and delivery mechanisms (including funding availability), accessibility, marketing and promotion.

Future Local Development Plans will reflect relevant outcomes from the strategy in policies and proposals specific to Brechin town centre.

COMMUNITY FACILITIES AND SERVICES

B7 Brechin Cemetery Extension

0.6 ha of land adjacent to Brechin Cemetery is reserved for future cemetery provision. Before any development occurs at the site, ground investigation works should be undertaken in line with SEPA's guidance on assessing the impacts of cemeteries on groundwater.

B7 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+	+	+	0	?	+	+	0	0	+

SPORT AND RECREATION

B8 Open Space/ Green Network Enhancement - Cookston

12 ha of land adjacent to the A90(T) at Cookston is identified and protected by Policies PV1 – Green Infrastructure and Green Networks and PV2 – Open Space Protection and Provision. Proposals which enhance the amenity, biodiversity and recreational value of the site will be supported.

B8 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+	+	+	0	0	+	+	0	0	+

Brechin (Inset Map 2)

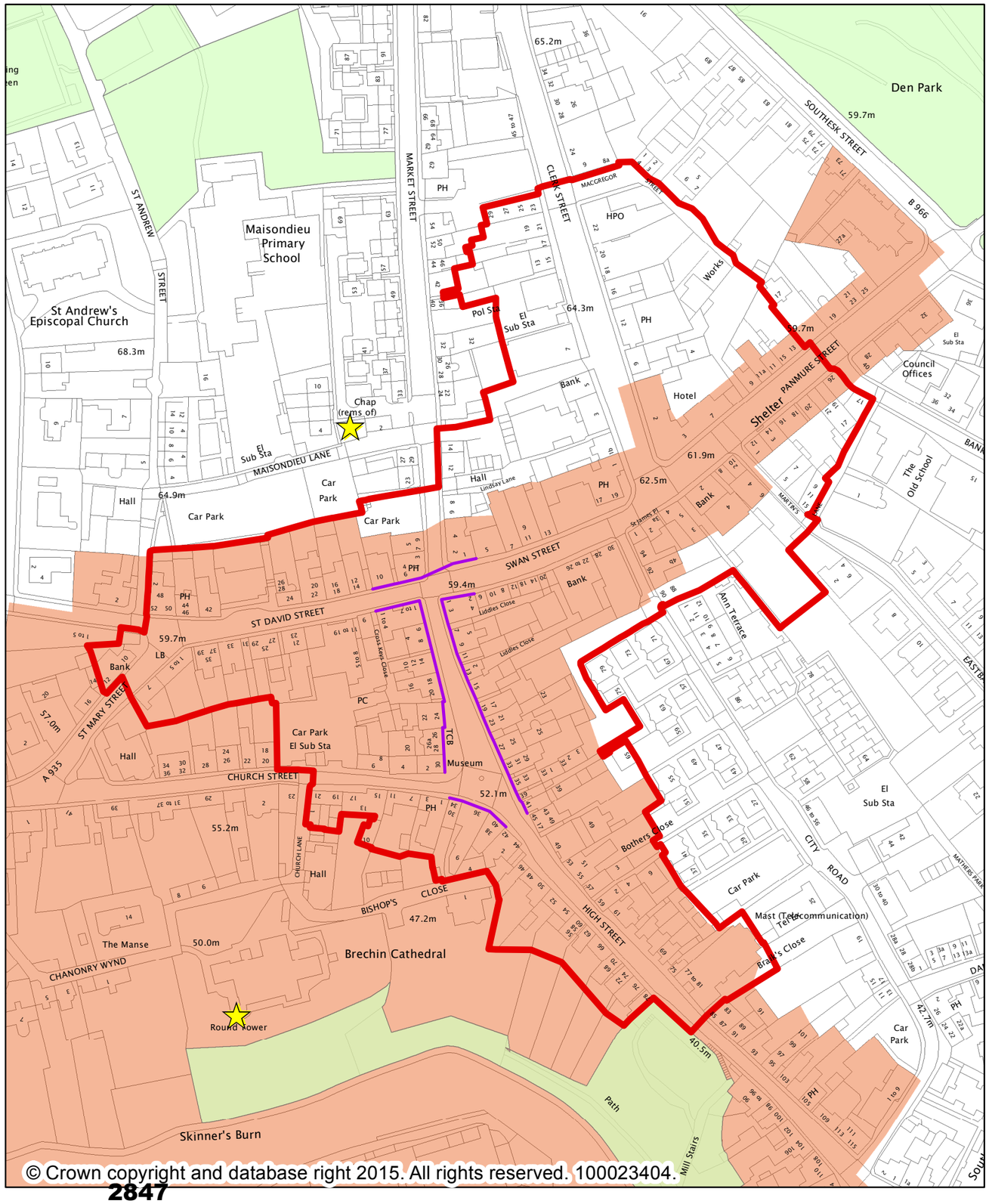
This proposals map should be read in conjunction with the Written Statement

Legend	Settlement Statement	Subject Policies
Development Boundary		DS1
Existing Housing Site	B(a) - B(d)	
Allocated Housing Site	B1	
Existing Employment Site		TC14, TC15
Allocated Employment Site	B6	
Opportunity Site	B2 - B5	
Open Space Protection		PV2
Green Network Enhancement	B8	
Cemetery Extension	B7	
Conservation Area		PV8
Pipeline Consultation Zone		PV21

B8
B7
B(c)
B(b)
B1
Central Area Inset
B(a)
B(d)
B6
B3
B4
B5
B2

Central Area Inset Map

Legend	Subject Policies
Town Centre	TC17 - TC19
Core Retail Area	TC18
Scheduled Ancient Monument (Property in Care)	PV8
Open Space Protection	PV2
Conservation Area	PV8



Carnoustie and Barry

Located on the coast, mid-way between Arbroath and Dundee, Carnoustie has evolved from a fishing village to an attractive seaside town. The town has developed in a linear manner primarily on land between the shoreline and raised beach, extending from Westhaven in the east along to Barry in the west.

The coastal setting provides the town with much of its character and includes several important natural heritage sites. The important beachfront area also provides opportunities for recreation and is an excellent base for the holiday and tourism market with its renowned reputation for links golf. The Carnoustie Championship Golf Course enjoys an international reputation with the British Open due to return in 2018.

During much of the 1990's, opportunities for development were constrained by drainage issues and poor accessibility to/from the town. Such constraints have been eased by the construction of the wastewater treatment plant at Hatton and the upgrading of the A92 (Arbroath – Dundee road). Furthermore, the construction of the Barry bypass and the Upper Victoria link road has improved accessibility to/from Carnoustie, to the western end of the town in particular. Whilst a road line and land was reserved at the east for improvements at Carlogie Road, this has yet to be implemented. The town is also served by the east coast railway line.

Since the publication of the Angus Local Plan Review (2009), housing land allocations at Newton Road have been built out and several inner town renewal projects have been undertaken. Although this has provided a range of new homes in the area, an expansion of Carnoustie beyond the current development boundary is required in order to meet identified need and demands in the South Angus Housing Market Area.

Availability of land and property for employment related development has been limited in Carnoustie, in part because of housing regeneration at the former Maltings site at Victoria Street. The continued allocation of marketable land at Carlogie and the provision of additional land at Pitskelly will provide support to employment uses.

DEVELOPMENT STRATEGY

The development strategy for Angus is set out in the introduction to the ALDP, for Carnoustie and Barry this means:

- supporting the redevelopment of vacant, underused and brownfield sites within the defined Development Boundary, including Woodside/Pitskelly, Barry Road, Greenlaw Hill and the former Maltings;
- phased release of green field land at Pitskelly for residential development;
- the continued allocation of land for employment use at Carlogie to support business, industrial and storage and distribution uses, with additional employment land allocated at Pitskelly;
- delivery of the planned upgrade to the Carlogie Road;
- encouraging new development and investment where this will strengthen the role of the town centre and enhance its vibrancy, vitality and viability whilst improving the quality of the physical environment; and

- protecting and enhancing Carnoustie's internationally recognised golfing facilities, where appropriate, and further developing tourism, recreation facilities and accommodation.

HOUSING

EXISTING SITES

Sites with planning permission or under construction as identified in the Angus Housing Land Audit 2014 are shown in Table C1.

Table C1: Existing Sites

Name/reference	Capacity
C(a) Victoria Street, Former Maltings	62
C(b) Burnside Street 2	7
C(c) High Street 108	7
C(d) Balmachie Road	5
C(e) West Path, Camus House	16
C(f) North Brown Street 2 Unit 1	8
C(g) Former Manse, Barry	4
Total	**109**

NEW ALLOCATIONS

Table C2 below summarises new allocations of housing land that will contribute towards meeting TAYplan SDP requirements beyond 2016.

Table C2: New Allocations

Name/reference	Capacity	ALDP First Phase (2016-2021)	ALDP Second Phase (2021-2026)
C1 Land at Pitskelly	250	150	100
Total	**250**	**150**	**100**

Land for residential development is allocated at Pitskelly to provide for a range and choice of housing sites; in order to meet current need and demand for housing; and to maintain a generous supply of housing land into the later plan period.

C1 Housing – Land at Pitskelly

10 ha of land at Pitskelly is allocated for residential development of around 250 dwellings. A first phase of around 150 dwellings will be permitted in the period to 2021, with the remaining phase of around 100 dwellings permitted in the period to 2026.

Proposals should include:

- **a high quality of design and site layout which integrates with the rural landscape character and the layout and character of neighbouring buildings with frontages onto the Upper Victoria link road.**
- **a phasing programme to ensure that the development of the employment land at site C7 is delivered in conjunction with the housing development on this site.**
- **provision of structure planting, landscaping and networks of green corridors within and around the site to create an appropriate urban edge.**
- **provision of vehicular, cycle and pedestrian access arrangements to the satisfaction of the Council as Roads Authority.**
- **supporting information including a Drainage Impact Assessment, Sustainable Drainage and Surface Water Management Plan, Flood Risk Assessment, Landscape Assessment, Transport Assessment and Archaeological evaluation and implementation as necessary.**

C1 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+	+	+	-	0/+	+	+	0	0/+/-	0/+

OPPORTUNITY SITES

There are a number of sites in Carnoustie that provide opportunities for development and / or redevelopment. Where proposals involve new housing development they will be required to meet the provisions of Policy TC3 Affordable Housing.

C2 Opportunity Site – Woodside/Pitskelly

2.5 ha of land at Woodside/Pitskelly provides an opportunity for residential, Class 4 (business) and Class 11 (assembly and leisure) uses where they are compatible with surrounding activities.

Vehicular access arrangements will be from the Upper Victoria Link Road. Ground condition surveys establishing the suitability of the ground for residential or other built uses will be required.

A landscaping scheme providing open space and play provision will be required as an integral part of proposals for this site and should include new tree planting to complement the valuable tree belt on the raised beach adjacent to this site.

Information submitted in conjunction with any planning application to develop the land should include a Drainage Impact Assessment.

C2 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+/?	+	+	?/+	0/+	0/+	?/+	0	?/+	+

C3 Opportunity Site – Barry Road

1 ha of land at Barry Road provides an opportunity for residential, Class 4 (business), and Class 11 (assembly and leisure) uses where they are compatible with surrounding activities. The site comprises a disused social club building and part of the former junior football ground.

Vehicular access arrangements should be taken from Barry Road. Ground condition surveys establishing the suitability of the ground for housing or other built uses will be required.

A landscaping scheme providing open space and play provision will be required as an integral part of proposals for this site and should include new tree planting to complement the valuable tree belt to the north and west of this site.

Development proposals should be supported by a Flood Risk Assessment and a Drainage Impact Assessment.

C3 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+/?	+	+	?/+	+	0/+	?/+	0	?/+	+

C4 Opportunity Site – Greenlaw Hill

3.2 ha of land at Greenlaw Hill provides an opportunity for residential development which should reflect the rural setting and open nature of this site, and its prominence at the entrance to Carnoustie on the Upper Victoria Link Road.

Vehicular access arrangements will be from the Upper Victoria Link Road.

A landscaping scheme providing an appropriate town edge will be required including consideration of the enhancement and linkages to the green network.

C4 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+/?	+	+	-/?/+	0/+	0/+	?/+	0	?/+/-	+

C5 Opportunity Site – Panmure Industrial Estate

3.7 ha of land at Panmure Industrial Estate is covered by Policy TC14 Employment Allocations and Existing Employment Areas. The land provides an opportunity for residential uses if a comprehensive redevelopment scheme is brought forward which provides a satisfactory residential environment and is compatible with surrounding activities.

Supporting information required with any proposal will include a Contaminated Land Investigation Report, Drainage Impact Assessment and a Flood Risk Assessment which assesses the flood risk from the Barry Burn.

C5 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
?/0	+	+	+	0/+	0/+	?/+	0	0/+	+

WORKING

SITES PREVIOUSLY IDENTIFIED BY THE ANGUS LOCAL PLAN REVIEW (2009)

The Angus Local Plan Review (2009) allocated land at Carlogie for employment purposes. A number of factors including the economic downturn have meant that the site has not progressed. Planning permission has recently been granted for the formation of an employment area comprising Class 4 (Business), Class 5 (General Industry) and Class 6 (Storage and Distribution) uses and realignment of the A930 Carlogie road.

C6 Working – Land at Carlogie

15 ha of land at Carlogie is allocated for employment use in accordance with Policy TC14 Employment Allocations and Existing Employment Areas.

Proposals should include:

- **design and site layout which accommodates a range of employment uses whilst ensuring integration with the rural landscape character, in particular the topography of this site;**
- **structural planting, landscaping or networks of green corridors within and around the site to create an appropriate urban edge;**
- **provision of vehicular, cycle and pedestrian access arrangements to the satisfaction of the Council. Vehicular access arrangements will include the construction of a realigned Carlogie Road which will improve accessibility to/from the eastern end of the town with the upgraded A92; and**
- **supporting information including a Drainage Impact Assessment, Sustainable Drainage and Surface Water Management Plan, Flood Risk Assessment, Landscape Assessment and a Noise Impact Assessment as necessary.**

(Planning permission in principle approved for employment development and associated realignment of the A930 in August 2014.)

There has been increasing demand for employment sites in Carnoustie and there is a need to allocate additional land to meet future requirements and provide for economic growth. In

order to meet current need and demand for employment land and to maintain a generous supply of employment land into the later plan period, land is allocated at Pitskelly.

C7 Working – Land at Pitskelly

10 ha of land at Pitskelly is allocated for employment use in accordance with Policy TC14 Employment Allocations and Existing Employment Areas.

Proposals should include:

- **a high quality of design and site layout which accommodates a range of employment uses whilst ensuring integration with the rural landscape character.**
- **provision of structure planting, landscaping or networks of green corridors within and around the site to create an appropriate urban edge.**
- **provision of vehicular, cycle and pedestrian access arrangements to the satisfaction of the Council as Roads Authority.**
- **supporting information including a Drainage Impact Assessment, Sustainable Drainage and Surface Water Management Plan, Flood Risk Assessment, Landscape Assessment, Transport Assessment, Air Quality Assessment, Noise Impact Assessment and Archaeological evaluation and implementation as necessary.**

C7 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+	0/+	+	-	0/+	0/+	+	0	0/+/-	0/+

TOWN CENTRES AND RETAILING

Carnoustie town centre provides a range of uses including office, business, retail and other service activities. The mix of uses and layout which contribute to the town's unique character, also limit the opportunity for major redevelopment.

The town centre network contained within Policy TC17 – Network of Centres identifies Carnoustie as a smaller town centre. This recognises the level of facilities and services currently available within the centre. Policy TC17 seeks to direct uses which attract a significant number of people to town centres such as Carnoustie to support its vibrancy, vitality and viability.

Angus Council will support the preparation of a Town Centre Strategy for Carnoustie developed in partnership with the local community through the Community Planning Process. The Town Centre Strategy will look to identify and address the challenges faced by Carnoustie town centre and will provide a framework for coordinated action, including: developing a long term vision, identifying the potential for change, promoting opportunities for new development, diversification of uses, management tools and delivery mechanisms (including funding availability), accessibility, marketing and promotion. Future Local Development Plans will then reflect relevant outcomes from the strategy in policies and proposals specific to Carnoustie town centre.

TRANSPORT

The Angus Local Plan Review (2009) safeguarded land which would be required to enable the implementation of an upgraded A930 Carlogie Road. The ALDP reaffirms the

safeguarding of land to upgrade the A930 Carlogie Road which would improve road safety and linkages between the eastern end of Carnoustie and the A92 which in turn, would support economic and tourism opportunities within the town. The approved alignment as identified on the Proposals Map is safeguarded from development proposals which may adversely affect the implementation of the project.

C8 Transport – Upgrade A930 Carlogie Road

Angus Council will safeguard land required to enable the implementation of an upgraded A930 Carlogie Road to improve linkages between the eastern end of Carnoustie and the A92.

COMMUNITY FACILITIES AND SERVICES

An extension to Shanwell Cemetery was allocated in the Angus Local Plan (2000) and the Angus Local Plan Review (2009). The ALDP reaffirms the allocation of land for a cemetery extension.

C9 Shanwell Cemetery Extension

1.65 ha of land adjoining the existing Shanwell Cemetery is reserved as an extension. Upgrading of the access road from the Upper Victoria Link Road along the line of the existing track will be required.

Prior to applying for any development, an intrusive ground investigation should be undertaken in line with the Scottish Environment Protection Agency's guidance on assessing the impacts of cemeteries on groundwater.

C9 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
?/+	0	0/+	-	?	0/+	0/+	0	-/+	0/+

SPORT AND RECREATION

This Local Development Plan continues the land allocation from the Angus Local Plan and Angus Local Plan Review (2009) for a new sports ground and associated facilities at Shanwell Road, adjacent to Carnoustie High School.

C10 Sports Ground, Shanwell Road

1.7 ha of land north of Shanwell Road and west of Balmachie Road is allocated for the development of a recreational sports ground and associated facilities, including new access road and car parking.

C10 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
?/+	0	0/+	-	0/+	0/+	0/+	0	-/+	0/+

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Carnoustie & Barry (Inset Map 3)

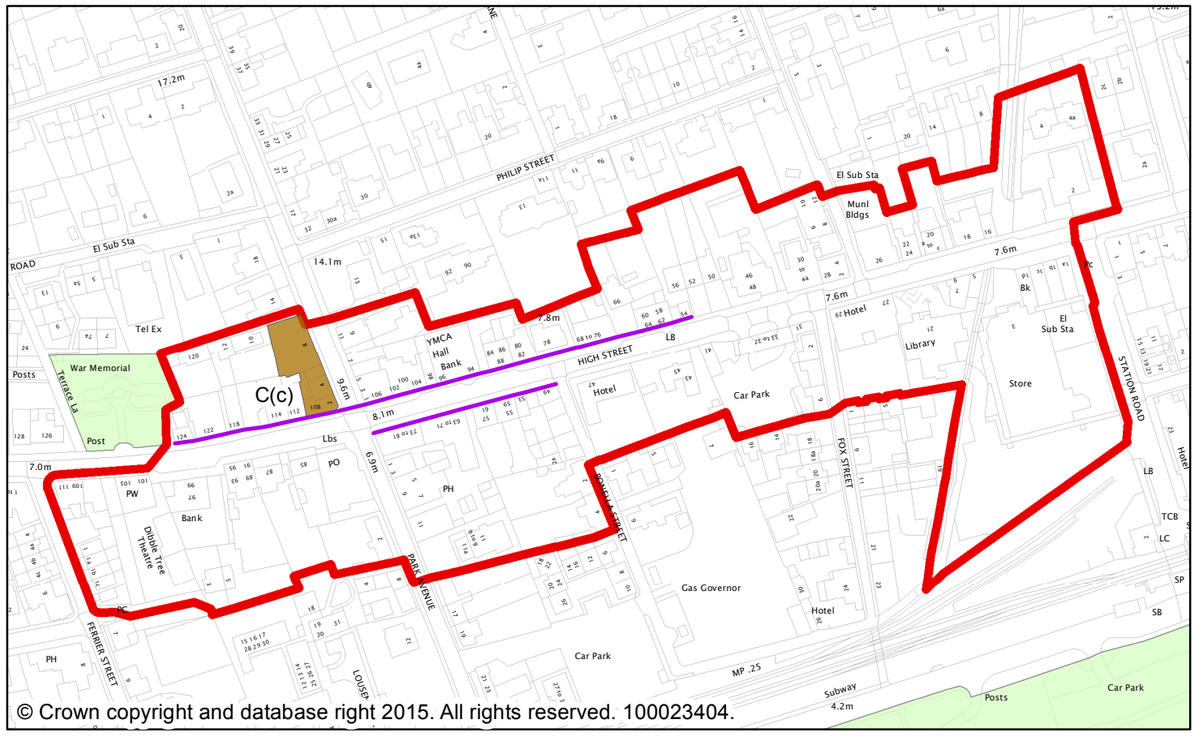
This Proposals Map should be read in conjunction with the Written Statement

C6
C8
C7
C1
C9
C10
C(d)
C4
C2
C3
C(f)
C(e)
C(b)
C(g)
C(a)
C5
Central Area Inset

Legend	Settlement Statement	Subject Policies
Development Boundary		DS1
Existing Housing Site	C(a) - C(g)	
Allocated Housing Site	C1	
Allocated Employment Site	C6, C7	TC14
Opportunity Site	C2-C5	
Cemetery Extension	C9	
A930 Upgrade	C8	
Sports Ground	C10	
Open Space Protection		PV2

Legend	Settlement Statement	Subject Policies
Core Retail Area		TC18
Existing Housing Site	C(c)	
Town Centre		TC17 - TC19
Open Space Protection		PV2

Central Area Inset Map



Forfar

Forfar is a traditional market town providing a wide range of services and facilities to a large rural hinterland. It is one of the towns in Angus, located centrally in Strathmore within the heart of Angus. The town is well connected to the strategic road network. The Glamis Road and Kirriemuir Road junctions on the A90(T) are grade separated junctions, which provides good accessibility to the town.

The town has continued to expand in recent years with successful housing development progressing at Wester Restenneth and continued economic development at Orchardbank Business Park, where land remains available. Regeneration projects have provided new housing and retail uses, including an Asda at the former St James Works. A number of longstanding brownfield sites within the town including South Street Mill and the former Chapelpark Primary School remain vacant.

The town also contains a number of listed buildings, a Conservation Area and residential areas with their own distinctive character. Policies also protect Balmashanner Hill and Forfar Loch Country Park for their landscape and environmental qualities.

A number of sites previously identified in the Angus Local Plan Review (2009) have still to come forward. Further areas of land are available to accommodate residential development in order to meet the housing land requirements at Turfbeg and Westfield.

DEVELOPMENT STRATEGY

The development strategy for Angus is set out in the introduction to the ALDP, for Forfar this means:

- supporting the redevelopment of vacant, underused and brownfield sites within the defined Development Boundary, including opportunity sites at South Street, former Chapelpark School, former Music Centre and Forfar Swimming Pool;
- releasing green field land at Turfbeg and Westfield for residential development throughout the plan period;
- ensuring the continued provision of marketable land for employment uses by continuing to allocate land at the Strategic Development Area at Orchardbank and Carseview Road to support further economic development;
- the continued promotion through active marketing of the agricultural service based industries in the town with the potential for further investigation of an agri-park;
- protecting and enhancing Forfar's visitor assets and further developing tourism and recreation facilities as well as accommodation;
- encouraging new development and investment where this will strengthen the role of the town centre and enhance its vibrancy, vitality and viability whilst improving the quality of the physical environment;
- safeguarding and enhancing the natural and built features which are a key part of the character and identity of the town including Forfar Conservation Area, Balmashanner and Forfar Loch;
- managing surface water disposal in order to protect the important ground water resource used by the Strathmore Mineral Water Company;

- protecting and enhancing open spaces and play provision whilst improving the connectivity and functionality of green networks, integrating new provision as part of land allocations and new development especially at Turfbeg and Westfield; and
- supporting the enhancement and extension of the network of paths and cycleways around Turfbeg and Westfield.

GROUND WATER PROTECTION ZONES

Surface water disposal in Forfar requires special consideration in order to protect the ground water resource used by the Strathmore Mineral Water Company. Disposal of sewage effluent will be to the public drainage system and is therefore not covered here. Proposals that dispose of surface water via soakaways to the ground, including the use of Sustainable Drainage Systems (SuDS) schemes, could potentially have an impact on the ground water resource. These may include developments with large car parks or other impenetrable areas, garage forecourts, major roads, industrial areas, or development on land which is known to have been previously landfilled. Developers are encouraged to make early contact with Angus Council and/or SEPA in order to establish the need for further assessment of potential risk.

F1 Protection of Ground Water Resources

Angus Council will require development proposals that involve the use of surface water soakaways to consider the potential impact on the ground water resource. An assessment of the potential impact may be required.

F1 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
?	+	+	0	++	0/+	?/+	0	+/?	?/+

HOUSING

EXISTING SITES

Sites with planning permission or under construction as identified in the Angus Housing Land Audit 2014 are shown in Table F1.

Table F1: Existing Sites

Name / reference	Capacity
F(a) Turfbeg Farm	3
F(b) New Road	16
F(c) Wester Restenneth	136
F(d) Dundee Road	120
F(e) Slatefield Rise (Phase 2)	7
F(f) Queen Street Pavilion	14
F(g) Roberts Street	22
Total	**318**

SITES PREVIOUSLY IDENTIFIED BY THE ANGUS LOCAL PLAN REVIEW

The site summarised in Table F2 was previously identified in the Angus Local Plan Review. This Plan continues the allocation of this site for housing development, and where appropriate the wording of the proposal and / or the indicative yield from the site may have changed.

Table F2: Sites Previously Identified by the Angus Local Plan Review

Name / reference	Capacity	ALDP First Phase (2016 – 2021)	ALDP Second Phase 2021 – 2026)
F2 Gowanbank	60	60	-
Total	**60**	**60**	**-**

F2 Housing – Gowanbank

6 Ha of land at Gowanbank is allocated for residential development of around 60 units.

An appropriate vehicular access will require to be provided from Arbroath Road, or from both Montrose Road and Arbroath Road. No through route for vehicles will be permitted between Montrose Road and Arbroath Road, although emergency access should be provided.

The public footpath which crosses the site from north east to south west and connects into the Forfar Path network at those points will require to be taken into account and incorporated into the layout of the site.

Development will require to take account of the amenity of existing properties around the perimeter of the site any loss of amenity or nuisance to future occupiers in terms of noise or odour associated with the operational landfill site to the east and respect the cordon sanitaire.

Foul drainage arrangements for the site should be agreed in writing with Scottish Water. A Flood Risk Assessment and Drainage Impact Assessment are also required.

Developer contributions may be required from development proposals, including a contribution towards education infrastructure.

(Planning permission in principle approved subject to a Section 75 Agreement for 63 residential units in August 2014.)

NEW ALLOCATIONS

Table F3 summarises new allocations of housing land that will contribute towards meeting TAYplan SDP requirements.

Table F3: New Allocations

Name / reference	Capacity	ALDP First Phase (2016-2021)	ALDP Second Phase (2021-2026)
F3 Turfbeg	300	175	125
F4 Westfield	300	0	300
Total	**600**	**175**	**425**

The sites at Turfbeg and Westfield capitalise upon a landscape framework which can successfully accommodate new development. They both benefit from good accessibility to the local and strategic transport network, primary and secondary schools, local services and facilities within the town centre, the existing employment site at Orchardbank and allocated employment site at Carseview Road.

Land at Turfbeg was previously safeguarded for residential development in the Angus Local Plan Review (2009). The ALDP now allocates the site for around 300 units with a phased release throughout the plan period.

F3 Housing – Turfbeg

17.6 Ha of land north of Turfbeg is allocated for residential development of around 300 dwellings. A first phase of around 175 dwellings will be permitted in the period to 2021, with the remaining phase of around 125 dwellings permitted in the period to 2026.

Development proposals should include:

- **design and site layout which integrates with the existing landscape character, pattern of development and character of neighbouring uses and buildings;**
- **structural planting and landscaping within and around the site to enhance biodiversity and to create an appropriate town edge, particularly along the western and northern boundaries of the site;**
- **the provision of open space and SuDS as necessary;**
- **appropriate developer contributions towards education, future primary school provision to be identified within the burgh as required;**
- **opportunity for active travel through improved linkages with the existing path network; and**
- **supporting information including a Flood Risk Assessment, Drainage Impact Assessment, Sustainable Drainage and Surface Water Management Plan and Transport Assessment.**

F3 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
0/+	0/+	+	-/+	+	+	0/+	0	-/+	+

A Greenfield site at Westfield is also allocated for residential development. Development of this site will complement existing sites, provide a range and choice of housing and maintain a generous supply of housing land.

The allocated site has an overall capacity of around 300 units. These units are phased for release between 2021 and 2026 to help ensure choice and flexibility in the housing land supply in the second phase of the plan.

Development of this site will have to consider the long-term impact on the A90 junctions, in-particular the impact of development at the Lochlands junctions and any potential mitigation that may result from further assessments. Given the landscape context provided by this site, additional land beyond the initial allocation identified by this Local Development Plan is safeguarded beyond 2026. This additional land will need to be confirmed by a future Local Development Plan and may also need to provide additional employment land.

F4 Housing – Westfield

38.8 Ha of land west of Westfield Loan is allocated for residential development of around 300 dwellings in the second phase of the plan (2021 – 2026).

The development should commence at the north of the site with access from Glamis Road. No development will be allowed until a full assessment of the potential impact on the A90 junctions (including Lochlands) is completed and any resulting mitigation is agreed with Angus Council and Transport Scotland.

Development proposals should be in accordance with a masterplan prepared for the site and should include:

- **design and site layout which takes account of the existing landscape character, pattern of development and character of neighbouring uses and buildings;**
- **the protection of scheduled ancient monuments within the site and how these will be managed;**
- **a landscape framework, preserving existing woodland and hedges and setting out structural planting and landscaping within and around the site to enhance biodiversity and to create an appropriate town edge;**
- **appropriate developer contributions, towards education infrastructure;**
- **the potential for a new distributor road linking Dundee Road and Westfield Loan with Glamis Road, taking account of any potential impact on the A90 junctions (including Lochlands) in conjunction with Angus Council, TACTRAN and Transport Scotland;**
- **the provision of open space and SuDS as necessary;**
- **opportunities for active travel through improved linkages with the existing path/Green Network; and**
- **supporting information including a Flood Risk Assessment, Drainage Impact Assessment, Sustainable Drainage and Surface Water Management Plan, Contaminated Land Investigation Report and a Transport Assessment which should include assessment of the West Port junction and analysis of the traffic flows and junctions along East and West High Streets.**

Additional land is safeguarded for further residential development in the period beyond 2026. The scale of further land release in the period beyond 2026 will be determined by a future Local Development Plan and may also include:

- **provision of a new Primary School.**
- **an area of land south of Glamis Road for further business / employment development.**

Development proposals should not result in adverse impacts, either alone or in combination with other proposals or projects, on the integrity of the River Tay SAC, in accordance with Policy PV4 Sites Designated for Natural Heritage and Biodiversity Value.

F4 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
0/+	0/+	0/+	-/+	+	+	0/+	+	-/+	+

OPPORTUNITY SITES

There are a number of sites in Forfar that provide opportunities for development and / or redevelopment. Where proposals involve new housing development they will be required to meet the provisions of Policy TC3 Affordable Housing.

F5 Opportunity Site – South Street

0.8 ha of land at South Street provides an opportunity for residential or Class 4 (business) uses.

Proposals should provide for improved sightlines at the Strang Street/South Street corner through realignment of the building line and/or reduction in the height of the walls.

Development proposals should be supported by a Conservation Statement and a Drainage Impact Assessment.

F5 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
?/+	+	++	?/+	+	+	?/+	0	?/+	+

F6 Opportunity Site – Former Chapelpark School

0.5 ha of land at the former Chapelpark School provides an opportunity for residential or Class 4 (business).

Proposals should respect the character and appearance of the Category B listed building, retain the boundary walls and consider the re-establishment of the main access for vehicular traffic from Academy Street.

Development proposals should be supported by a Conservation Statement and a Drainage Impact Assessment.

F6 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
?/+	+	++	?/+	+	+	?/+	0	?/+	+

F7 Opportunity Site – Former Music Centre, Prior Road

0.2 ha of land at the former Music Centre provides an opportunity for residential, Class 4 (business) or community uses.

Development proposals should be supported by a Drainage Impact Assessment.

F7 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
?/+	+	++	?/+	+	+	?/+	0	?/+	+

F8 Opportunity Site – Forfar Swimming Pool

0.1 ha of land at Forfar Swimming Pool provides an opportunity for residential, Class 4 (business), Class 1 (retail) or community uses.

Proposals should seek to retain the Category C listed building and respect the character and appearance of the building and the Forfar Conservation Area. Proposals should have regard to the sites location adjacent to the town centre.

Development proposals should be supported by a Conservation Statement and a Drainage Impact Assessment.

F8 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
?/+	+	++	?/+	+	+	?/+	0	?/+	+

WORKING

EXISTING SITES

The Angus Local Plan (2000) and Angus Local Plan Review (2009) identified land at Orchardbank as an employment land allocation. This site continues to be a long-standing identified employment site; therefore any proposals for development will be assessed against Policy TC14 – Employment Allocations and Existing Employment Areas.

SITES PREVIOUSLY IDENTIFIED BY THE ANGUS LOCAL PLAN REVIEW

The Angus Local Plan Review allocated additional land at Orchardbank Business Park and Carseview Road. Orchardbank is identified by the TAYplan SDP as a Strategic Development Area and continues to be the main location for new business development. Given the size of this site and the continuing availability of large plots for new business premises, as well as the employment land site at Carseview Road there is enough employment land to meet the TAYplan SDP requirements for the ALDP period (2016-2026).

F9 Working - Orchardbank

29.6 ha of land to the west of Orchardbank adjacent the A90(T) is reserved for a 'Gateway' development comprising Class 4 (business), Class 5 (general industry), Class 6 (storage and distribution) and Roadside facilities in accordance with Policy TC10 – Roadside Facilities.

Development should be in accordance with the approved Development Brief for the site updated as appropriate to reflect policies in this Local Development Plan.

Development proposals should not result in adverse impacts, either alone or in combination with other proposals or projects, on the integrity of the River Tay SAC, in accordance with Policy PV4 sites Designated for Natural Heritage and Biodiversity Value.

F10 Working – Carseview Road

4 ha of land at Carseview Road is allocated for Class 5 (general industrial) development. There may also be scope for limited areas of Class 4 (business) development in the western part of the site. Access will be from Carseview Road and a landscaped buffer will be required along the northern and western boundaries to provide an appropriate town edge and contribute to biodiversity and green networks.

Development proposals should be supported by a Sustainable Drainage and Surface Water Management Plan and a Drainage Impact Assessment.

F10 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+/?	0/+	0/+	-/?	0/-	0/+	+/-	0	-/+	+

TOWN CENTRES AND RETAILING

Forfar is a market town serving a large rural area. The town centre has a core retail area, is within a Conservation Area and provides for a range of uses including retail, business, office, other service activities and housing and should continue to be the focus for appropriate development, including mixed use redevelopment to strengthen and enhance the town's retail and service function and opportunities to provide residential, storage and office accommodation within upper floors. Whilst in recent years there have been a number of business closures within the town centre, the majority of shops have been re-occupied with new business interests. An Asda retail store has also opened adjacent to the town centre and has provided improved linkages to the town centre from the south. In addition, a number of environmental improvements have taken place within the town centre including improved public realm around The Cross and the opening of a Botanists Garden.

The town centre network contained within Policy TC17 Network of Centres identifies Forfar as a larger town centre. This recognises the level of facilities and services currently available within the centre. Policy TC17 seeks to direct uses which attract a significant number of people to town centres such as Forfar to support its vibrancy, vitality and viability.

Angus Council will support the preparation of a Town Centre Strategy for Forfar developed in partnership with the local community through the Community Planning Process. The Town Centre Strategy will look to identify and address the challenges faced by Forfar town centre and will provide a framework for co-ordinated action, including: developing a long term vision, identifying the potential for change, promoting opportunities for new development, diversification of uses, management tools and delivery mechanisms (including funding availability), accessibility, marketing and promotion.

Future Local Development Plans will reflect relevant outcomes from the strategy in policies and proposals specific to Forfar town centre.

AGRICULTURAL BUSINESSES

A number of agricultural businesses are located within Forfar, including Forfar Mart, agricultural engineering companies, food processors, agricultural merchants, crop spraying and a wide range of specialist and complementary agricultural services such as farm advisory services and vets. Whilst no specific site is identified for the potential co-location of these businesses, Angus Council will continue to support the agricultural service based industries within the town. These should be directed towards existing employment areas or assessed against relevant policies in the LDP.

COMMUNITY FACILITIES AND SERVICES

A redevelopment of Forfar Academy into a community campus with new community facilities and recreational facilities has planning permission. The new facilities including secondary school accommodation, community education and, recreation facilities will be of community benefit and will be accessible with pedestrian/cycle access from Taylor Street and a new vehicle entrance, including bus stop, from the A926. Development is due to commence at the end of 2014. Phase 1of the project, to be completed by December 2016, will include the construction of the new build facilities and sports pitches. Phase 2 of the project, to be completed by October 2017, will include the demolition of the existing buildings and any outstanding external works.

F11 Newmonthill Cemetery Extension

1.7ha of land to the south of Newmonthill Cemetery is reserved for long term cemetery provision. Access will be through the existing cemetery and no direct vehicular access will be permitted from Lour Road. A Sustainable Drainage and Surface Water Management Plan will be required. Before any development occurs at the site, a Flood Risk Assessment should be carried out and ground investigation works should be undertaken in line with SEPA's guidance on assessing the impacts of cemeteries on groundwater.

F11 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
?/+	0	0/+	?/-	?	+	?/-	0	+/?	0/+

ENVIRONMENT AND RESOURCES

Two locally important landscape features make a valuable contribution to the setting of Forfar. The town sits in a sheltered valley at the foot of Balmashanner Hill to the south, and Forfar Loch Country Park lies on the western side of the town. These features are protected from development which would erode their character and local recreational value.

F12 Balmashanner

In order to protect the open character and landscape value of Balmashanner Hill development within the area defined on the Proposals Map will not be permitted.

F12 SEA Implications

Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
?/+	0/+	+	0	0	0/+	?/+	+	+/?	++/?

F13 Forfar Loch

Development which would adversely affect the landscape or nature conservation value of Forfar Loch, the Country Park or its setting will not be permitted. In particular no further built development will be permitted on land along the northern shore of the Loch.

F13 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+/?	0/+	+	0	+	0/+	?/+	0	0/+	++/?

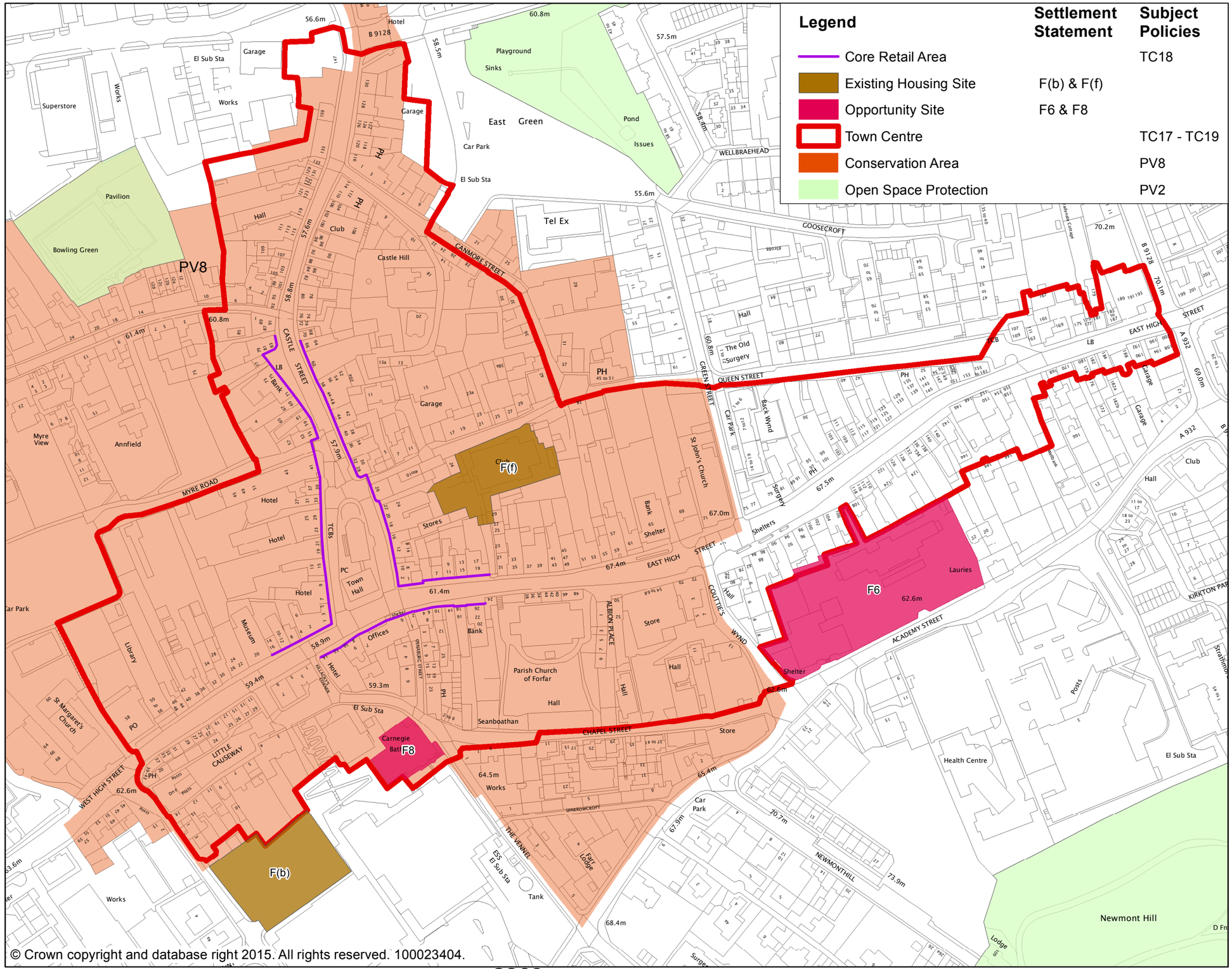
Forfar (Inset Map 4)

This proposals map should be read in conjunction with the Written Statement

Legend	Settlement Statement	Subject Policies
Development Boundary		DS1
Existing Housing Site	F(a) - F(g)	
Allocated Housing Site	F2 - F4	
Existing Employment Site	F9	
Allocated Employment Land	F10	
Opportunity Site	F5 - F8	
Safeguarded Site	F4	
Cemetery Extension	F11	
Forfar Loch	F13	
Balmashanner	F12	
Conservation Area		PV8
Town Centre		TC17 - TC19
Open Space Protection		PV2

F10
F3
F(a)
F(c)
F(g)
F2
CENTRAL AREA INSET
F7
F5
F13
F11
F9
F4
F(d)
F12
F4
F(e)

Central Area Inset Map



Kirriemuir

Kirriemuir lies at the gateway to the Angus glens, providing a range of services and facilities for the town and for other communities in the rural area. The town is located on a south-facing slope and was formed by consolidating the central area with the communities of Northmuir and Southmuir. This process of consolidation has been strengthened by the recent development of infill sites, particularly in the Northmuir part of the town with the successful housing development at Hillhead.

The East Muirhead of Logie Business Park has now opened and provides opportunity for further economic development within the town. Currently there is an outline planning permission for a retail store at Pathhead.

The town contains a number of listed buildings and a Conservation Area. A number of properties are currently being improved through the Kirriemuir Conservation Area Regeneration Scheme (CARS).

DEVELOPMENT STRATEGY

The development strategy for Angus is set out in the introduction to the ALDP, for Kirriemuir this means:

- supporting the redevelopment of vacant, underused and brownfield sites within the defined Development Boundary, including opportunity sites at Gairie Works and Cortachy Road;
- identifying sites that are effective or capable of becoming effective within the plan period to accommodate a mix of new housing development to meet local needs;
- releasing greenfield land South of Beechwood Place for residential development;
- ensuring the continued provision of marketable land for employment uses by identifying existing employment sites at East Muirhead of Logie and North Mains of Logie to support further economic development;
- protecting and enhancing Kirriemuir's visitor assets and further developing tourism and recreation facilities as well as accommodation;
- encouraging new development and investment where this will strengthen the role of the town centre and enhance its vibrancy, vitality and viability whilst improving the quality of the physical environment especially around Gairie Works;
- safeguarding and enhancing the natural and built features which are a key part of the character and identity of the town including supporting the Kirriemuir Conservation Area Regeneration Scheme;
- protecting and enhancing open spaces and play provision whilst improving the connectivity and functionality of green networks, integrating new provision as part of new development; and
- supporting the enhancement and extension of the network of paths and cycleways around the town.

HOUSING

EXISTING SITES

Sites with planning permission or under construction as identified in the Angus Housing Land Audit 2014 and subsequent consents included for completeness, are shown in Table K1.

Table K1: Existing Sites

Name / reference	Capacity
K(a) Westfield/Lindsay Street/Sunnyside	38
K(b) Sunnyside	35
K(c) Hillhead	1
K(d) Platten, Brechin Road	1
K(e) 19 Glengate Hall, Glengate	9
K(f) Pathhead Nursery, Forfar Road	1
K(g) Former Workshop & Yard, Cortachy Road*	33
Total	**118**

**Planning permission for this site was granted following the publication of the 2014 Housing Land Audit, but has been included for completeness.*

NEW ALLOCATIONS

Table K2 summarises new allocations of housing land that will contribute towards meeting TAYplan SDP requirements.

Table K2: New Allocations

Name / reference	Capacity	ALDP First Phase (2016 – 2021)	ALDP Second Phase (2021 – 2026)
K1 South of Beechwood Place	100	50	50
Total	**100**	**50**	**50**

A greenfield site South of Beechwood Place is allocated for residential development. Development of this site will complement existing sites, provide a range and choice of housing and maintain a generous supply of housing land in Kirriemuir and the West Angus Housing Market Area.

K1 Housing – South of Beechwood Place

6 Ha of land South of Beechwood Place is allocated for residential development of around 100 dwellings. A first phase of around 50 dwellings will be permitted in the period to 2021, with the remaining phase of around 50 dwellings permitted in the period to 2026.

Development proposals should include:

- **design and site layout which integrates with the existing landscape character, pattern of development and character of neighbouring uses and buildings;**
- **structural planting and landscaping within and around the site to enhance biodiversity and to create an appropriate town edge, particularly along the southern boundaries of the site, and provide a suitable buffer along the boundary with adjacent employment land and existing residential development at Beechwood Place;**
- **vehicular access to be taken from Logie Road, including junction upgrade with Forfar Road as required. No direct access from Beechwood Place will be permitted.**
- **opportunities for active travel through improved linkages with the existing path/Green Network;**
- **supporting information including a Transport Assessment, Flood Risk Assessment, Drainage Impact Assessment and a Sustainable Drainage and Surface Water Management Plan.**

K1 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
?/0/+	+	+	-	+	+	?/0/+	0	0/+/-	+

OPPORTUNITY SITES

The following site in Kirriemuir provides opportunity for development and / or redevelopment. Where proposals involve new housing development they will be required to meet the provisions of Policy TC3 Affordable Housing.

K2 Opportunity Site – Gairie Works

2.75 ha of land at Gairie Works provides an opportunity for residential, Class 4 (business), Class 1 (retail) or community uses.

Proposals should be developed in accordance with the approved Development Brief for the site, inparticular taking account of the listed buildings and issues such as vehicular access and flooding.

Development proposals should be supported by the submission of a Flood Risk Assessment, Conservation Statement, Drainage Impact Assessment, Transport Assessment and Contaminated Land Investigation Report. Retail proposals should demonstrate compliance with TC19 – Retail and Town Centre Uses.

K2 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
?/+	+	++	?/+	+	+	?/+	0	?/+	0/+

K3 Opportunity Site – Land at Cortachy Road

2.1 ha of land at Cortachy Road provides an opportunity for residential or Class 4 (business) uses.

Proposals should provide suitable access directly from Cortachy Road and should have regard to adjacent land uses.

Development proposals should also be supported with the submission of a Drainage Impact Assessment and a Contaminated Land Investigation Report.

K3 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
?/+	0/+	0/+	?/+	+	+	?/+	0	?/+	0/+

WORKING

EXISTING SITES

The Angus Local Plan (2000) and Angus Local Plan Review (2009) identified land at Muirhead Industrial Estate as an established employment land allocation. This site continues to be a long-standing identified employment sites and any proposals for development will be assessed against Policy TC14 – Employment Allocations and Existing Employment Areas.

SITES PREVIOUSLY IDENTIFIED BY THE ANGUS LOCAL PLAN REVIEW

The Angus Local Plan Review allocated land at East Muirhead of Logie for new business development. Planning permission has recently been implemented. The size of the site means that there is sufficient employment land to meet the TAYplan SDP requirements for the ALDP period (2016-2026).

TOWN CENTRES AND RETAILING

Kirriemuir is a small town serving a relatively large rural area, including the Angus Glens. The town centre sits within a conservation area and provides for a range of uses including retail, business, office, other service activities and housing and should continue to be the focus for appropriate development, including mixed use redevelopment to strengthen and enhance the town's retail and service function and opportunities to provide residential, storage and office accommodation within upper floors. Angus Council will continue to support the Kirriemuir Conservation Area Regeneration Scheme which is a partnership between Historic Scotland and Angus Council to provide a jointly funded grant programme to enhance the appearance of Kirriemuir Conservation Area.

The town centre network contained within Policy TC17 – Network of Centres identifies Kirriemuir as a smaller town centre. This recognises the level of facilities and services currently

available within the centre. Policy TC17 seeks to direct uses which attract a significant number of people to town centres such as Forfar to support its vibrancy, vitality and viability.

Angus Council will support the preparation of a Town Centre Strategy for Kirriemuir developed in partnership with the local community through the Community Planning Process. The Town Centre Strategy will look to identify and address the challenges faced by Kirriemuir town centre and will provide a framework for co-ordinated action, including: developing a long term vision, identifying the potential for change, promoting opportunities for new development, diversification of uses, management tools and delivery mechanisms (including funding availability), accessibility, marketing and promotion.

Future Local Development Plans will reflect relevant outcomes from the strategy in policies and proposals specific to Kirriemuir town centre.

K4 Retail – Land at Pathhead

3.2 hectares of land at Pathhead is allocated for a supermarket, associated parking, landscaping and improved road layout in accordance within the planning permission (planning application reference 11/00150/PPPM). Proposals will be supported that are in accordance with this permission.

COMMUNITY FACILITIES AND SERVICES

K5 Kirriemuir Cemetery Extension

0.8 ha of land to the southeast of the existing cemetery is reserved for future cemetery purposes. Before any development occurs at the site, ground investigation works should be undertaken in line with SEPA's guidance on assessing the impacts of cemeteries on groundwater.

K5 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
?/+	0	0/+	?/-	?	+	?/-	0	+/?	0/+

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Legend	Settlement Statement	Subject Policies
Development Boundary		DS1
Open Space Protection		PV2
Existing Housing Site	K(a)-K(g)	
Allocated Housing Site	K1	
Existing Employment Site		TC14
Retail Site	K4	
Cemetery Extension	K5	
Opportunity Site	K2-K3	
Conservation Area		PV8

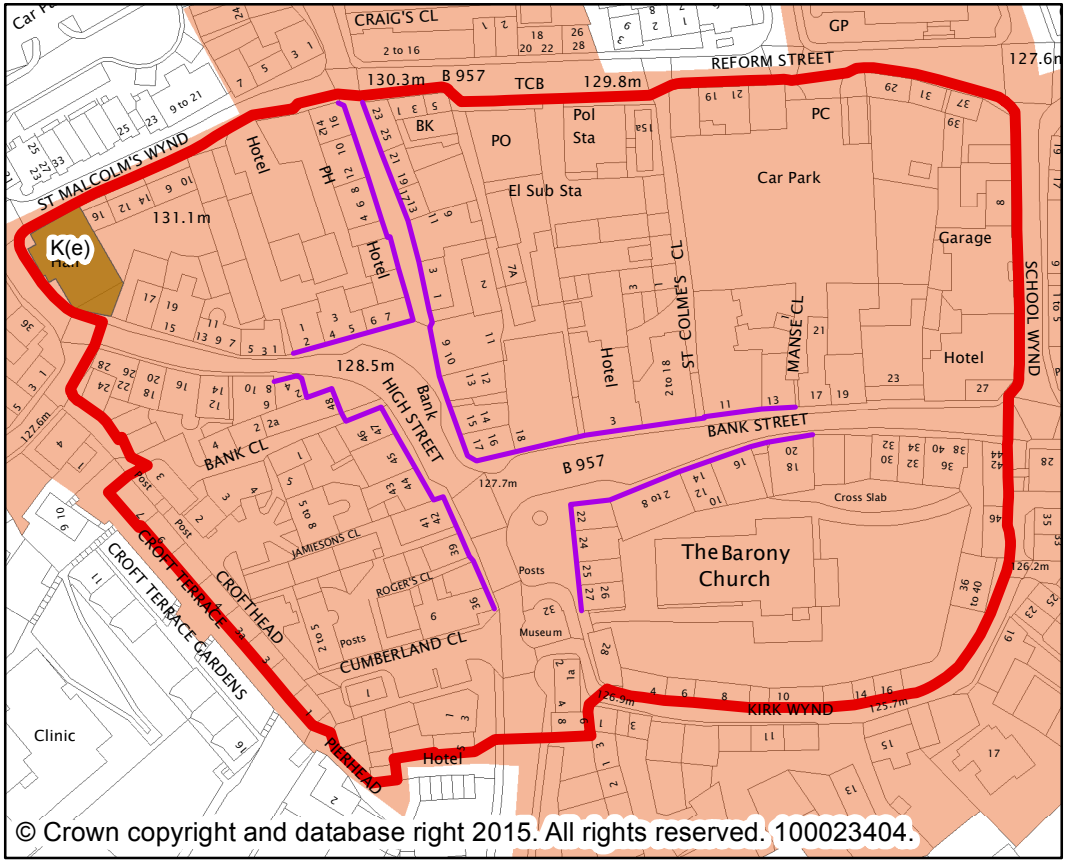
K3
K(g)
K(c)
K5
K(d)
Central Area Inset
K2
K(f)
K(a)
K(b)
K4
K1

Kirriemuir (Inset Map 5)

This proposals map should be read in conjunction with the Written Statement

Central Area Inset Map

Legend	Settlement Statement	Subject Policies
Core Retail Area		TC18
Town Centre		TC17 - TC19
Existing Housing Site	K(e)	
Conservation Area		PV8



Monifieth

Originally a small fishing village, Monifieth has become a predominantly residential centre and is situated within the South Angus Housing Market Area.

Monifieth is spread across two landscape character zones, with very fertile undulating farmland to the north and north east, and a low level sandy coastal zone to the south and south east. There are several important natural heritage sites identified within the low level sandy coastal zone and it is this coastal setting which provides the town with much of its character. Furthermore, this important coastal area also provides opportunities for recreation which along with its renowned reputation for links golf, has added to the town's attraction for residents and visitors.

The town has a range of small scale retail shops, commercial and community facilities as well as easy access to mixed use retail, leisure, visitor and commercial facilities at Ethiebeaton Park which is located to the north adjacent to the A92.

The upgrading of the A92 (Arbroath – Dundee road) and the associated junction improvements has improved accessibility to and from the town. The potential for future provision of developing a park and ride facility with good access from the A92 and community recycling facilities may come forward through the allocation of housing sites over the plan period.

Since the publication of the Angus Local Plan Review (2009), only a small amount of new housing has been developed in Monifieth. In order to bring forward new homes to meet identified need and demands, an expansion of Monifieth beyond the current development boundary is required. There are also likely to be opportunities for new housing development in the town during the ALDP period on brownfield sites such as Ashludie Hospital. There are also opportunities for small scale employment related development associated with the retail or service sectors within or close to the town centre.

DEVELOPMENT STRATEGY

The development strategy for Angus is set out in the introduction to the ALDP, for Monifieth this means:

- supporting the redevelopment of vacant, underused and brownfield sites within the defined development boundary, including the former petrol filling station located on the High Street and Ashludie Hospital;
- phased release of green field land west of Victoria Street; and
- encouraging new development and investment where this will strengthen the role of the town centre and enhance its vibrancy, vitality and viability whilst improving the quality of the physical environment.

HOUSING

EXISTING SITES

Sites with planning permission or under construction as identified in the Angus Housing Land Audit 2014 are shown in Table Mf1.

Table Mf1: Existing Sites

Name/Reference	Capacity
Mf(a) Milton Mill	50
Mf(b) Former Nursery, Victoria Street	5
Total	**55**

NEW ALLOCATIONS

Table Mf2 summarises new allocations of housing land that will contribute towards meeting TAYplan SDP requirements beyond 2016.

Table Mf2: New Allocations

Name/Reference	Capacity	ALDP First Phase (2016 – 2021)	ALDP Second Phase (2021 – 2026)
Mf1 Ashludie Hospital	130	130	-
Mf2 Land west of Victoria Street	350	200	150
Total	**480**	**330**	**150**

The Angus Local Plan Review (2009) allocated part of the grounds of Ashludie Hospital in the north east corner of the hospital estate. This site was not released for development and therefore remains undeveloped.

The ALDP extends the current allocation to incorporate the remainder of the hospital estate. This allocation site will facilitate the regeneration of the Ashludie Hospital site, including the category B listed Ashludie House. This site capitalises upon an established landscape framework which can successfully accommodate new development. The site benefits from good accessibility by a range of transport modes and is located within close proximity to the primary school and/or services and facilities.

Mf1 Housing – Ashludie Hospital

8.5 ha of land at Ashludie Hospital is allocated for residential development of around 130 dwellings.

Proposals should include:

- **a high quality of design and site layout which integrates with the existing landscape character and where the layout and orientation of development respects the setting of the Category B listed Ashludie Hospital building;**
- **the preservation of landscape and built features, such as the existing mature trees and where adequate stone boundary walls, to create an appropriate urban edge and interface with surroundings and to provide a setting for the Category B listed Ashludie Hospital building and any future housing development;**
- **provision of vehicular, cycle and pedestrian access arrangements to the satisfaction of the Council as Roads Authority; and**
- **supporting information including a Conservation Statement and a Drainage Impact Assessment, Sustainable Drainage and Surface Water Management Plan, Landscape Assessment, Transport Assessment, Contaminated Land Investigation Report and a Tree Survey as necessary.**

Mf1 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+/?	+	+	+	0/+	+	+	0/+	+	0/+

Land for residential development is allocated at Victoria Street West to provide a range and choice of housing sites and maintain a generous supply of housing land in the plan period. The site capitalises on an existing landscape framework which can successfully accommodate new development. The site also benefits from good accessibility by a range of transport modes and is located within close proximity to the primary school and services and facilities.

Mf2 Housing – Victoria Street West

16.3 ha of land west of Victoria Street is allocated for residential development of around 350 dwellings. A first phase of around 200 dwellings will be permitted in the period to 2021, with the remaining phase of around 150 dwellings permitted in the period to 2026.

Proposals should include:

- **design and site layout which integrates with and responds to the existing landscape character and development context. The layout should be orientated in a way to preserve open viewing corridors which create a visual connection with the hills to the north west and the lower lying open landscape to the north east;**
- **structural planting, landscaping or networks of green corridors within and around the site, taking account of and retaining wherever possible existing mature trees and vegetation to create an appropriate urban edge and a functioning interface with the existing surroundings;**
- **provision of vehicular, cycle and pedestrian access arrangements to the satisfaction of the Council; and**
- **supporting information including a Drainage Impact Assessment, Sustainable Drainage and Surface Water Management Plan, Flood Risk Assessment, Noise Impact Assessment, Air Quality Assessment, Ecological Assessment, Landscape Assessment, Transport Assessment, Tree Survey and Archaeological evaluation as necessary.**

Mf2 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+/?	+	+	-	0/+	0/+	0	0	-/+	+

OPPORTUNITY SITES

There are sites in Monifieth that provide opportunities for development and / or redevelopment. Where proposals involve new housing development they will be required to meet the provisions of Policy TC3 Affordable Housing.

Mf3 Opportunity Site – Former Monifieth Health Centre, Victoria Street

0.14 ha of land at the former Monifieth Health Centre, Victoria Street provides an opportunity for residential, Class 4 (business) or community uses where they are compatible with surrounding activities.

Vehicular access will be from Victoria Street and existing stone wall boundaries along with existing mature trees should be retained and enhanced in order to create an appropriate edge to the site.

Mf3 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+/?	+	+	?/+	0/+	0/+	?/+	0	?/+	+

Mf4 Opportunity Site – Former Petrol Filling Station, High Street

0.1 ha of land at the former Petrol Filling Station, High Street provides an opportunity for Class 1 (retail), business (Class 4), commercial and leisure uses where they are compatible with surrounding activities.

Contaminated Land Investigation Reports will require to be undertaken with any proposal.

TOWN CENTRES AND RETAILING

Monifieth town centre provides for local commercial and retail requirements. The High Street is the focus of shopping provision in the town and includes a large foodstore, shopping parade and local shops.

The town centre network contained within Policy TC17 – Network of Centres identifies Monifieth as a smaller town centre. This recognises the level of services and facilities currently available within the centre. Policy TC17 seeks to direct uses which attract a significant number of people to town centres such as Monifieth to support its vibrancy, vitality and viability.

Angus Council will support the preparation of a Town Centre Strategy for Monifieth developed in partnership with the local community through the Community Planning Process. The Town Centre Strategy will look to identify and address the challenges faced by Monifieth town centre and will provide a framework for coordinated action, including: developing a long term vision, identifying the potential for change, promoting opportunities for new development, diversification of uses, management tools and delivery mechanisms (including funding availability), accessibility, marketing and promotion. Future Local Development Plans will then reflect relevant outcomes from the strategy in policies and proposals specific to Monifieth town centre.

The town centre network contained within Policy TC17 also identifies Ethiebeaton Park, which is located to the north of Monifieth adjacent to the A92, as a commercial centre. This centre is situated within an out of town location and constitutes a mixed use retail, leisure, visitor and commercial development.

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Monifieth (Inset Map 6)

This Proposals Map should be read in conjunction with the Written Statement

Legend	Settlement Statement	Subject Policies
Development Boundary		DS1
Existing Housing Site	Mf(a), Mf(b)	
Allocated Housing Site	Mf1, Mf2	
Opportunity Site	Mf3	
Commercial Centre		TC17, TC19
Open Space Protection		PV2

Mf2

Mf1

Mf3

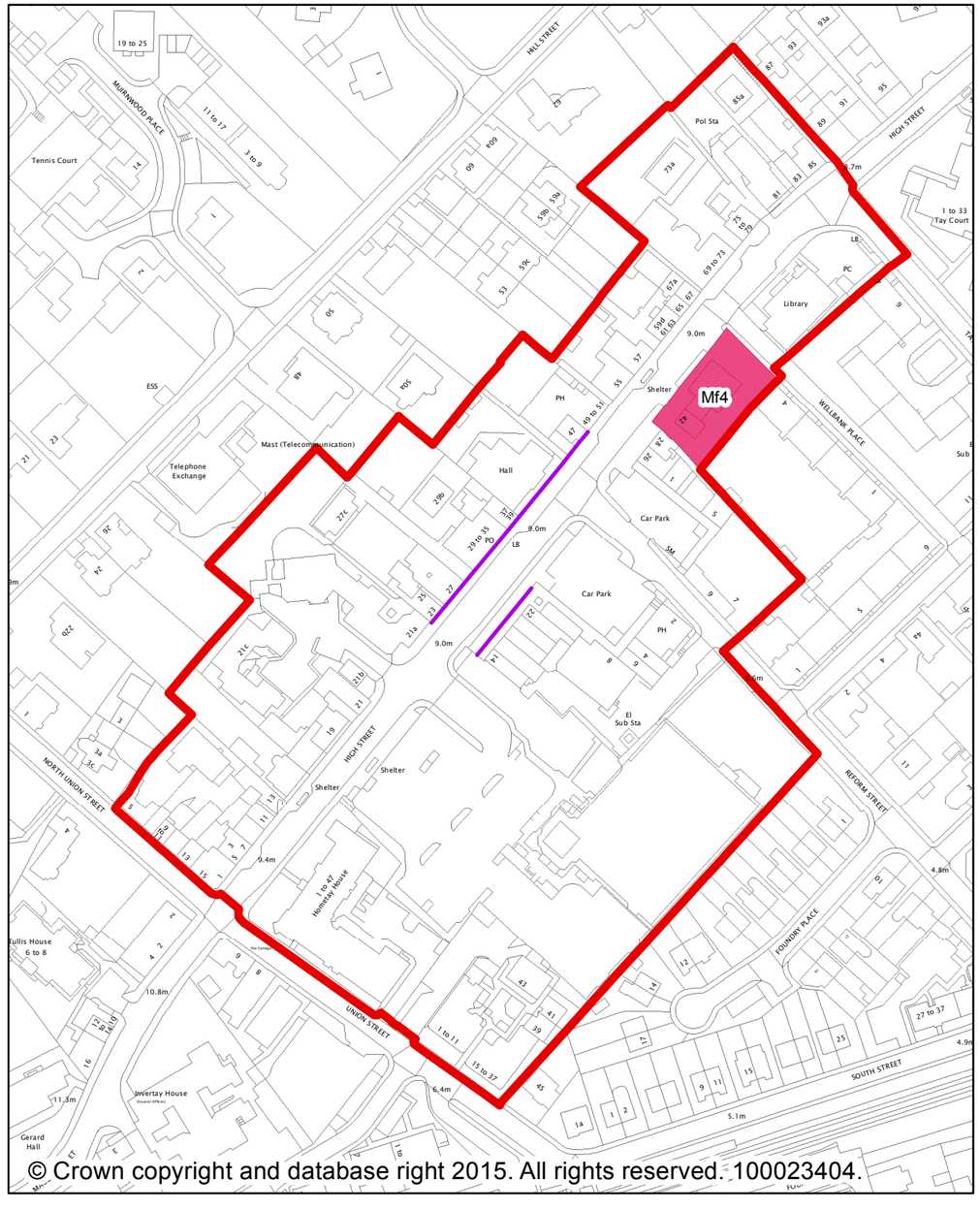
Mf(b)

Mf(a)

Central Area Inset

Legend		Settlement Statement	Subject Policies
	Core Retail Area		TC18
	Opportunity Site	Mf4	
	Town Centre		TC17-TC19

Central Area Inset Map



Montrose including Ferryden and Hillside

Located on the northeast coast of Angus, Montrose is an important service and employment centre for north Angus and the southern parts of Aberdeenshire. The town is served by the A92 coastal route (with linkages to the A90 trunk road network) and by the east coast railway line, which provides strategic links to major Scottish cities and beyond.

Montrose has historically developed on a narrow peninsula, with the sea to the east and a unique tidal basin to the west. This has resulted in the linear north-south pattern of development that is clearly apparent today. The town has an attractive townscape and a number of distinctive character areas including its wide town centre, the Mid Links, Harbour area and extensive seafront and open links.

The nearby settlements of Ferryden and Hillside have an individual character and identity and have a strong functional relationship with Montrose. Although they are supported by some local services, the settlements rely on Montrose for shopping, education, employment and wider range of community facilities.

Ferryden is located south of Montrose and retains the character of a traditional fishing village, with more modern housing development in western areas. Hillside, a few kilometres north of Montrose, is one of the larger villages in Angus. It is predominantly a residential area but also contains the large hospital campus of Sunnyside Hospital which is currently vacant. In seeking to accommodate long term development needs, maintaining a physical separation between Montrose and Hillside will be a key consideration.

Over the years, the majority of new housing and employment development in Montrose has continued to take place at the northern end of the town. Early phases of the long-standing housing land allocation at Brechin Road have been developed and this site continues to provide a viable location for future housing. In addition, a range of brownfield renewal projects for housing, commercial and community development have come forward.

The regeneration of the Sunnyside Hospital Estate remains a priority of Angus Council. The site includes a number of listed buildings set in an attractive landscaped setting and provides an opportunity for mixed use development. This could include a significant number of residential units along with opportunities for employment, community, health, social and recreational facilities.

The NESTRANS 'Access to Laurencekirk' Report (2015) has identified a need for a grade-separated junction as the preferred option to address capacity issues at the A90/A937 south junction. A funding package was announced in January 2016 to support delivery of a new grade separated junction, however the total costs, potential additional funding sources and timescale for delivery of the scheme have not been confirmed.

Development proposals in Montrose that are likely to generate significant new traffic will require to submit a transport assessment to establish impact on the local and strategic road network including the A90/A937 junction at Laurencekirk. Where impacts are identified, conditions controlling development or requirement for appropriate mitigation including Developer Contributions in accordance with Policy DS5 may be applicable.

In terms of employment land, existing sites at Forties Road and Broomfield provide opportunity for new business investment however there is insufficient land available within the town to meet demand. Whilst the site allocated in the Angus Local Plan Review (2009) on

part of the former Montrose Airfield has not come forward, there is current interest in developing a Business Park in this location to support offshore renewable energy development.

Key industries including Montrose Port and GSK located in the south of the town play an important strategic role in the Angus economy. Montrose Port is identified by TAYplan SDP as a Strategic Development Area for port related uses. Whilst the Port is well placed to accommodate activities associated with offshore renewables sector, land constraints in and around the Port restrict its ability to accommodate large scale development requirements. The South Montrose Strategic Review (2012) and Draft Masterplan identifies opportunities for physical regeneration, new development and improved access. The delivery of a new spine road and associated environmental improvement measures within the plan period will improve accessibility and help stimulate private investment and development in the area.

DEVELOPMENT STRATEGY

The development strategy for Angus is set out in the introduction to the ALDP, for Montrose this means:

- supporting the redevelopment of vacant, underused and brownfield sites within the defined Development Boundary, including Sunnyside Hospital Estate, Chapel Works Mill and the Former Swimming Pool;
- identifying sites that are effective or capable of becoming effective within the plan period to accommodate a mix of new housing development to meet local needs at Rosemount Road, Hillside and the remainder of green field land at Brechin Road for phased release throughout the plan period;
- ensuring the continued provision of marketable land for employment uses by allocating land at Forties Road North and Montrose Airfield to support the renewable energy sector;
- supporting the continued development of the Strategic Development Area at Montrose Port;
- protecting and enhancing Montrose's visitor assets and further developing tourism and recreation facilities and accommodation;
- encouraging new development and investment where this will strengthen the role of the town centre and enhance its vibrancy, vitality and viability whilst improving the quality of the physical environment;
- safeguarding and enhancing the natural and built features which are a key part of the character and identity of Montrose including its historic town centre, Mid Links, east links and seafront and the Basin;
- managing the risk of flooding particularly along the coast and around the Basin, ensuring development is not at risk of flooding and does not increase flood risk elsewhere;
- mitigating the effects of coastal erosion and dune instability in the context of the Shoreline Management Plan; and
- protecting and enhancing open spaces and the connectivity and functionality of green networks, integrating new provision as part of land allocations and new

development especially at Brechin Road, Forties Road North, Montrose Airfield, Sunnyside Estate and Rosemount Road

HOUSING

EXISTING SITES

Sites with planning permission or under construction as identified in the Angus Housing Land Audit 2014 are shown in Table M1.

Table M1: Existing Sites

Name / reference	Capacity
M(a) Brechin Road (Phase 1)	15
M(b) Hill Place	10
M(c) Croft Road	2
M(d) Wishart Gardens	6
M(e) Lower Hall Street	7
M(f) Bridge Street	5
M(g) Waldron Road, Former Drexel Workshop	29
M(h) Broomfield Road	5
Total	**79**

SITES PREVIOUSLY IDENTIFIED BY THE ANGUS LOCAL PLAN REVIEW

The sites summarised in Table M2 were previously identified in the Angus Local Plan Review. This Plan continues to allocate these sites for housing development, and where appropriate the wording of the proposal and / or the indicative yield from the site may have changed.

The remainder of the site at Brechin Road is identified in the 2014 Housing Land Audit as having a potential capacity of 293 units. However, only 150 units are required to come forward in the period to 2021 to meet the requirements of TAYplan SDP. This position is reflected in Table M2

Table M2: Sites from Angus Local Plan Review

Name / reference	Capacity	ALDP Phase 1 (2016 - 2021)	ALDP Phase 2 (2021 - 2026
M1 Brechin Road	293	150	150
Total	**293**	**150**	**150**

M1 Housing – Brechin Road

19 Ha of land at Brechin Road is allocated for residential development of around 300 dwellings. A first phase of around 150 dwellings will be permitted in the period to 2021, with the remaining phase of around 150 dwellings permitted in the period to 2026.

Proposals should be in accordance with the approved development brief for this site updated as appropriate to reflect policies in this Local Development Plan.

Development proposals should not result in adverse impacts, either alone or in combination with other proposals or projects, on the integrity of any European designated site, in accordance with Policy PV4 Sites Designated for Natural Heritage and Biodiversity Value.

Proposals should be supported by a Transport Assessment and the submission of a Flood Risk Assessment which assesses the risk from all sources. The assessment of options for morphological improvement including consideration of any culverted watercourses related to the site will also be required.

(Planning permission was granted in April 2014 to extend the time limit for implementation of the original outline permission until 1 March 2016)

NEW ALLOCATIONS

Table M3 summarises new allocations of housing land that will contribute towards meeting TAYplan SDP requirements.

Table M3: New Housing Allocations

Name / reference	Capacity
M2 Rosemount Road, Hillside	65
Total	**65**

M2 Housing – Rosemount Road, Hillside

3.0 Ha of land at Rosemount Road is allocated for residential development of around 65 dwellings and possible extension to Rosemount Primary School. Development proposals will require to be accessed from Hospital Road, provide footpath linkage through the site between Rosemount Road and Hospital Road and, retain and enhance existing perimeter landscaping.

Proposals should be supported by a Drainage Impact Assessment and Transport Assessment.

M2 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+/?	+	+	0	0	+	+	0	0/+	+

MIXED USE DEVELOPMENT

Table M4 summarises new mixed use allocations that include housing land which will contribute towards meeting TAYplan SDP requirements.

Table M4: New Mixed Use Allocations

Name / reference	Capacity	ALDP First Phase (2016 – 2021)	ALDP Second Phase (2021 – 2026)
M3 Sunnyside Hospital, Hillside	265	140	125
Total	**265**	**140**	**125**

M3 Mixed Use – Sunnyside Hospital, Hillside

Sunnyside Hospital Estate is allocated for mixed use development including residential, Class 4 (business), Class 7 (hotels and hostels), Class 8 (residential institutions), Class 11 (assembly and leisure) and community uses.

Around 265 dwellings will be released within the plan period including a first phase of around 140 dwellings in the period to 2021, and the remaining 125 dwellings permitted in the period to 2026. The scale of any further land release in the period beyond 2026 will be determined by a future Local Plan.

Proposals should be in accordance with the approved development brief for this site updated as appropriate to reflect policies in this Local Development Plan.

Proposals should be supported by a Transport Assessment.

M3 SEA Implications

Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
0/+	+	+	+	0	+	+	+	+	+

OPPORTUNITY SITES

There are a number of sites in Montrose that provide opportunities for development and / or redevelopment. Where proposals involve new housing development they will be required to meet the provisions of Policy TC3 Affordable Housing.

M4 Opportunity Site – Chapel Works Mill, Marine Avenue

The former Chapel Works provides an opportunity for uses including residential, Class 4 (business) or hotel uses. Proposals should seek to retain the Category B listed building and be designed to respect its character and setting. Development proposals should be supported by a Drainage Impact Assessment and a Conservation Statement.

M4 SEA Implications

Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+	+	+	+	0	+	+	+	+	+

M5 Opportunity Site – Former Swimming Pool, the Mall

The former swimming pool at the Mall provides an opportunity for residential, Class 4 (business) or community uses. Development proposals should be supported by a Drainage Impact Assessment.

(Planning permission for alterations and extension to form cinema/art centre approved May 2014)

M5 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
0	+	+	+	0	+	+	+	+	+

WORKING

EXISTING SITES

The main employment areas are located in the north of the town at Forties Road and Broomfield. These long established sites offer good accessibility to the A92 and provide for a range of business and industrial needs. Land allocated in the Angus Local Plan Review (2009) at Montrose Airfield has not come forward as anticipated and little land remains available at the existing employment sites to meet the demand for land and property in Montrose. The 10 hectare site at Montrose Airfield is unlikely to meet future requirements and there is a need to ensure sufficient land is made available to provide for economic growth.

Montrose Port provides modern handling and storage facilities for commercial and oil related cargoes. The Port is identified in the National Renewables Infrastructure Plan (Stage 2 Report 2010) as a potential location for the future servicing and maintenance of renewable energy infrastructure. Continued investment by Montrose Port Authority in quayside facilities further enhances the role of the Port as a sea freight facility and its potential to support the energy sector. As land within the Port area itself is limited, the Plan seeks to make provision for renewable energy developments not requiring direct quayside access by allocating additional land at Montrose Airfield to complement the role of the Port.

M6 Working – Montrose Port

Montrose Port is safeguarded for port related uses. Development proposals which enhance the commercial and economic role of the Port will be supported where these are compatible with adjacent land uses. Development proposals should be supported by a Flood Risk Assessment and a Drainage Impact Assessment.

Development proposals at Montrose Port should not result in adverse impacts, either alone or in combination with other proposals or projects, on the integrity of any European designated site, in accordance with Policy PV4 Sites Designated for Natural Heritage and Biodiversity Value.

M6 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
0	+	+	+	0	+	+	+	+	+

NEW ALLOCATIONS

The 10 hectare site allocated in the Angus Local Plan Review (2009) at Montrose Airfield will be extended to ensure Montrose is well placed to accommodate new economic development and complement Montrose Port in supporting the renewable energy sector.

Additional land will also be allocated north of Forties Road to provide continuity in supply and meet short to medium terms needs. Whilst the uptake of land will continue to be monitored, the feasibility of providing additional land to meet longer term needs will be investigated in the north of Montrose.

M7 Working – Montrose Airfield

50 ha of land at Montrose Airfield is allocated for employment uses comprising Class 4 (business), Class 5 (general industry) and Class 6 (storage and distribution). Development proposals will be required to submit an Environmental Statement to assess impacts on the environment and identify appropriate mitigation on matters including:

- **Landscape and Visual capacity;**
- **Ecology;**
- **Drainage and Coastal Flooding;**
- **Archaeology and Cultural Heritage;**
- **Noise and Odour; and**
- **Traffic and Transport.**

Proposals should be in accordance with the development brief which will be prepared for the site and should include:

- **structural landscaping to integrate the site with the landscape;**
- **new access from the A92 and associated junction improvements;**
- **high quality building design and boundary treatment adjacent to the A92; and**
- **provision of pedestrian and cyclist linkages through the site to provide access to the links and dunes and retain linkage to National Cycle Route 1.**

Proposals should be supported by a Transport Assessment.

M7 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+/?	+	+	+	0	+	+	0	+	+

M8 Working - North of Forties Road

11 ha of land north of Forties Road is allocated for employment including Class 4 (business), Class 5 (general industry) and Class 6 (storage and distribution) uses. The feasibility of providing additional employment land for longer term needs will also be investigated.

Development proposals should be in accordance with the development brief which will be prepared for the site and should include:

- **structural landscaping and native woodland planting along the northern and eastern boundaries of the site to safeguard the setting of Charleton Farm, integrate development into the existing landscape and extend green network provision;**
- **new path connections between the A937, Charelton Road and the existing path network;**
- **access from the existing internal road at Brent Avenue. Vehicular access from Charleton Road will not be permitted;**
- **design and layout which allows for future expansion to meet longer term needs and not prejudice connection to adjacent areas of land; and**
- **supporting information including a Drainage Impact Assessment, Flood Risk Assessment and Transport Assessment.**

M8 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+	+	+	0/-	0	0/+	+	0	-/+	+

TOWN CENTRES AND RETAILING

Montrose supports a good range of retail provision including a number of multiple retailers within the town centre as well as edge of centre food stores. In addition to shopping, the town centre provides a range of business and public service facilities for the local area as well as residential uses. The town centre is a designated Conservation area reflecting its architectural and historic importance and has recently benefited from investment in streetscape improvements.

The town centre network contained within Policy TC17 – Network of Centres identifies Montrose as a larger town centre. This recognises the level of facilities and services currently available within the centre. Policy TC17 seeks to direct uses which attract a significant number of people to town centres such as Montrose to support its vibrancy, vitality and viability.

Angus Council will support the preparation of a Town Centre Strategy for Montrose developed in partnership with the local community through the Community Planning Process. The Town Centre Strategy will look to identify and address the challenges faced by Montrose town centre and will provide a framework for co-ordinated action, including: developing a long term vision, identifying the potential for change, promoting opportunities for new development, diversification of uses, management tools and delivery mechanisms (including funding availability), accessibility, marketing and promotion.

Future Local Development Plans will reflect relevant outcomes from the strategy in policies and proposals specific to Montrose town centre.

EXISTING SITES

Land at the former Lochside Distillery has planning permission for a retail food store (Planning Application 09/01353/FULL refers). Angus Council will support proposals that are in accordance with this permission. Where proposals seek to renew this permission they will be required to submit updated impact studies, including retail, town centre impact and transport assessments in accordance with requirements established in Policy TC19 – Retail and Town Centre Uses.

M9 Opportunity Site – Lochside Distillery, Brechin Road

Land at the former Lochside Distillery provides an opportunity for retail development in accordance with the planning permission Ref: 09/01353/FULL or Class 4 (business) uses which are compatible with surrounding activities.

Development proposals should be supported by a Drainage Impact Assessment.

M9 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+	+	+	+	0	+	+	0	+	+

COMMUNITY FACILITIES AND SERVICES

M10 Sleepyhillock Cemetery Extension

0.8 ha of land adjacent to Montrose Basin is reserved for future cemetery provision.

Development proposals should not result in adverse impacts, either alone or in combination with other proposals or projects, on the integrity of Montrose Basin SPA, in accordance with Policy PV4 Sites Designated for Natural Heritage and Biodiversity Value. Before any development occurs at the site, ground investigation works should be undertaken in line with SEPA's guidance on assessing the impacts of cemeteries on groundwater.

M10 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+	+	+	0	?	+	+	0	0	+

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Montrose including Ferryden & Hillside (Inset map 7)

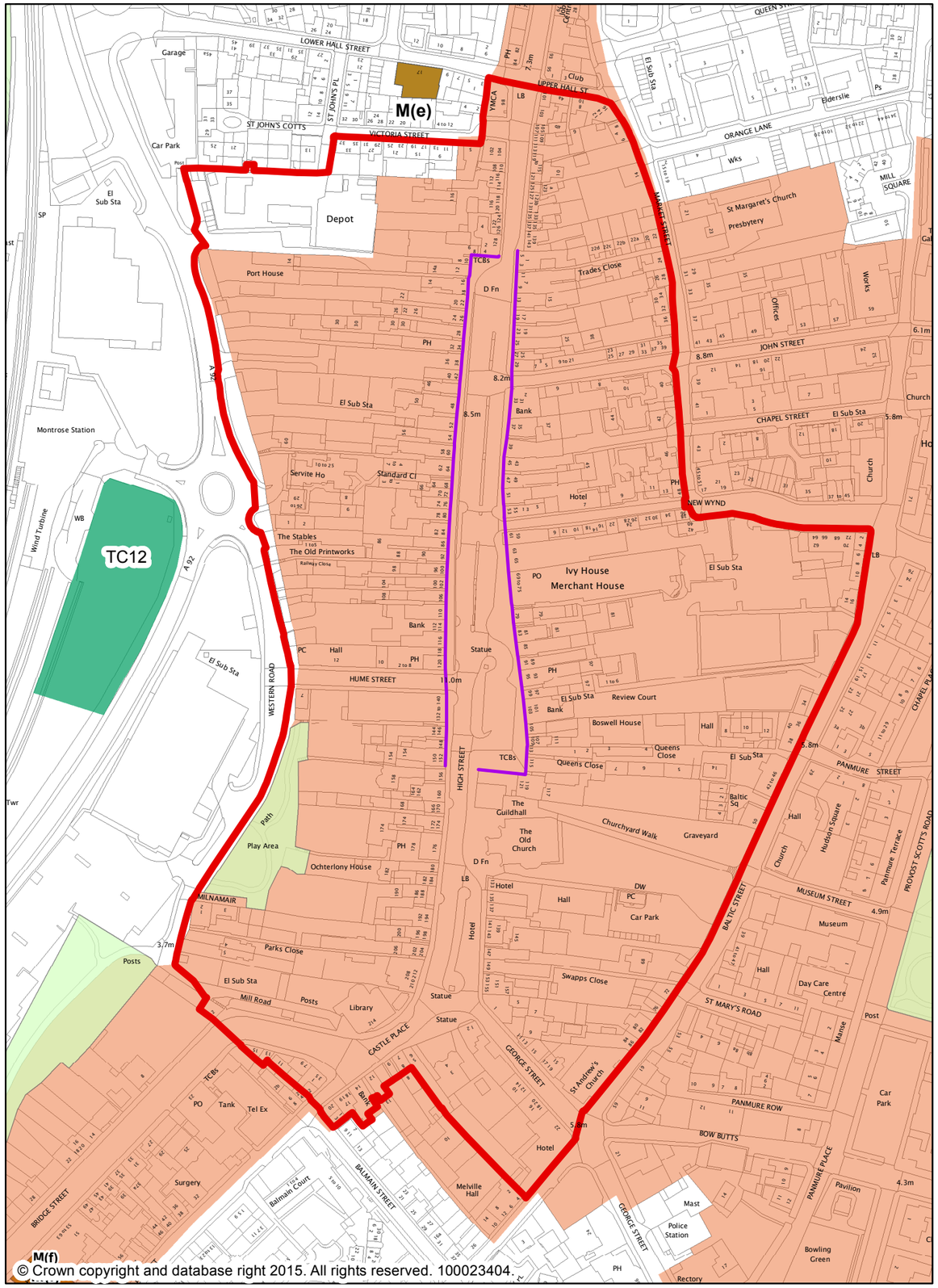
This proposals map should be read in conjunction with the Written Statement

Legend	Settlement Statement	Subject Policies
Development Boundary		DS1
Existing Housing Site	M(a)-M(d), M(f)-M(h)	
Allocated Housing Site	M1, M2	
Existing Employment Site		TC14, TC15
Allocated Employment Site	M7, M8	
Opportunity Sites	M4, M5, M9	
Mixed Use Site	M3	
Montrose Port	M6	TC12
Open Space Protection		PV2
Conservation Area		PV8
Cemetery Extension	M10	

M3
M8
M7
M1
M(a)
M(g)
M10
M9
M(h)
M(d)
M5
Central Area Inset
M4
M(f)
M(b)
M6
M(c)
M6

Central Area Inset Map

Legend	Settlement Statement	Subject Policies
Town Centre		TC17 - TC19
Core Retail Area		TC18
Open Space Protection		PV2
Conservation Area		PV8
Existing Housing Site	M(e)	
Freight Facility		TC12



Edzell

As the largest village in north Angus, Edzell is an important rural service centre providing a range of local services and some employment. The village is located at the foot of Glen Lethnot and Glen Esk, approximately 6 miles northeast of Brechin and is close to the Aberdeenshire boundary. Edzell is an attractive village and its proximity to the Angus glens and rural Aberdeenshire draws many visitors, however it is predominantly a dormitory settlement with residents living in the village and commuting to other places for work.

The character of Edzell derives from its wide High Street, the grid iron street pattern and the continuity of design in many of the older buildings. The settlement is surrounded by large areas of green space, including the Muir and woodland to the north, the woodland banks of the River North Esk to the east and Edzell woods and golf course to the south. These features have influenced the urban form of the village and continue to contribute to its character.

Recent housing development has taken place in the northwest and east of the village, but this has not altered the historic form of development, particularly the grid iron street pattern and absence of residential development north of Lethnot Road. A number of small infill sites including the former primary school and annexe have also been redeveloped for housing. Proposals for new courtyard style housing development at East Mains Farm and a visitor centre at the former mart site have not yet progressed.

.With the exception of the brownfield site at East Mains Farm, there is very little land available within the existing settlement boundary to accommodate future development. In terms of rural employment, whilst no site allocations are made in the current local plan, planning policy provides support for economic development of an appropriate scale and type. The location and nature of the sites at East Mains Farm and the former mart may provide opportunities for small-scale rural employment uses.

DEVELOPMENT STRATEGY

The development strategy for Rural Angus is set out in the introduction to the ALDP, for Edzell this means:

- supporting the redevelopment of vacant, underused and brownfield sites within the defined development boundary including East Mains Farm and the former mart;
- allocating greenfield land for 50 houses to accommodate a mix of new housing development to meet local needs east of Duriehill Road; and
- protecting open spaces and the connectivity and functionality of green networks, integrating new provision as part of the land allocation east of Duriehill Road and new development at the former mart.

HOUSING

EXISTING SITES

Sites with planning permission or under construction as identified in the Angus Housing Land Audit 2014 are shown in Table E1.

Table E1: Existing Sites

Name / reference	Capacity
E(a) East Mains Farm	13
Total	**13**

NEW ALLOCATIONS

Land east of Duriehill Road has good access connections with the existing built up area, existing open space and path networks and is reasonably close to the core of the village. Development in this area would respect the landscape character of Edzell and provide an opportunity for a grid iron layout which is a distinctive feature of the village. The River North Esk to the north is an important recreational and landscape feature and forms part of the green network. Whilst a wastewater treatment plant is located further east, the scale of land available east of the village provides opportunity for a significant landscape buffer between the wastewater treatment plant and any new development. An Odour Impact Assessment will be required to inform the location of new development and appropriate mitigation measures.

E1 Housing – East of Duriehill Road

6.2 Ha of land east of Duriehill Road/Lindsay Place is allocated for residential development of around 50 dwellings. Proposals should be in accordance with the development brief which will be prepared for this site and should include:

- **provision of structural landscaping and open space to protect the setting of the River North Esk, provide a buffer to the waste water treatment facility, integrate development into the wider landscape and extend green network provision;**
- **provision of a minimum 100m buffer zone between the Waste Water Treatment Plan and any new development;**
- **access from Duriehill Road and Lindsay Place;**
- **upgrading of Lindsay Place to an adoptable standard including provision of new footway;**
- **provision and enhancement of path connections to the River North Esk and open space areas at Lindsay place and Duriehill Road;**
- **design and layout which does not prejudice future expansion and connection to adjacent areas of land; ~~and~~**
- **supporting information including a Drainage Impact Assessment and an Odour Impact Assessment to establish appropriate mitigation measures associated with the waste water treatment facility; and**
- **submission of a Transport Assessment which confirms how access is best to be achieved and any associated mitigation.**

E1 SEA Implications									
Biodiversity Flora and Fauna	**Population**	**Human Health**	**Soil**	**Water**	**Air**	**Climatic Factors**	**Cultural Heritage**	**Material Assets**	**Landscape**
+	+	0/+	-	0	+	0/+	0	-/+	+

OPPORTUNITY SITES

The former mart site located on the periphery of the village north of Lethnot Road consists of the remains of livestock pens and has a semi natural appearance. The woodland to the east is covered by a Tree Preservation Order which together with the adjacent Muir defines the entrance to the village from the west. Lethnot Road provides a marked division between the built up area of Edzell and its landscape setting which is one of the most distinctive and attractive features of the village. Whilst residential development north of Lethnot Road would not be appropriate, the site provides opportunities for employment related uses of a scale and nature appropriate to its peripheral location and rural setting.

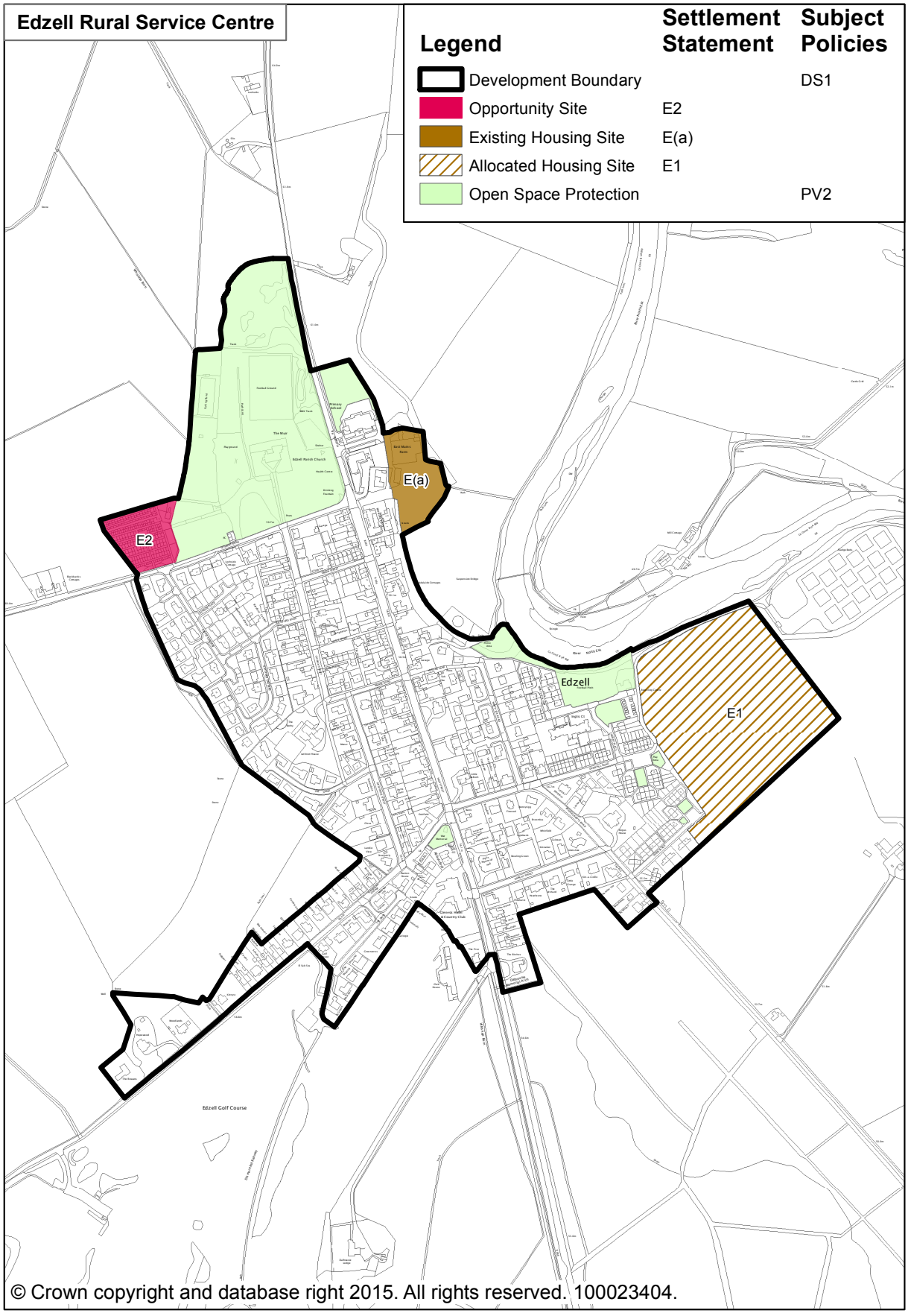
E2 Opportunity Site – Former Mart, Lethnot Road

0.7 ha of land at Lethnot Road provides an opportunity for small scale rural employment use, visitor/tourist related facilities or community uses. Residential, chalets or development of a similar nature will not be acceptable on this site.

Development proposals will require to be accessed from Lethnot Road and widen the existing carriageway to 6 metres. A new footpath should be provided through the woodland to the east to retain and improve pedestrian access from the site to the Muir. The location of the footpath should be informed by a Tree Survey. Proposals should also provide structural landscaping to integrate development into the wider landscape and extend green network provision.

Development proposals should be supported by a Flood Risk Assessment and Drainage Impact Assessment.

E2 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+	+	0	0	0	+	0	0	0/+	+


Edzell Rural Service Centre
Legend
Settlement Statement
Subject Policies
Development Boundary
DS1
Opportunity Site
E2
Existing Housing Site
E(a)
Allocated Housing Site
E1
Open Space Protection
PV2
E2
E(a)
E1
Edzell
Edzell Golf Course
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Friockheim

As one of the Rural Service Centres within Angus, Friockheim is an important local centre providing a range of facilities, services and employment. Being geographically central in Angus the village also has a commuter role with many residents living in the village and working in other larger employment centres. Small-scale infill and renewal projects continue to come forward within the village and although the rate of development slowed during the last plan period, there remains provision for significant greenfield housing and community development south of Gardyne Street.

DEVELOPMENT STRATEGY

The development strategy for Angus is set out in the introduction to the ALDP but for Friockheim this means:

- supporting the redevelopment of vacant, underused and brownfield sites within the defined Development Boundary;
- maintaining existing greenfield land release for housing and related development south of Gardyne Street with increased capacity; and
- accommodating development which supports local employment development including home/work properties; mixed use development; conversion and redevelopment; and community uses.

HOUSING

SITES PREVIOUSLY IDENTIFIED IN THE ANGUS LOCAL PLAN REVIEW

The site summarised in Table Fk1 was previously identified in the Angus Local Plan Review and is included in the 2014 Housing Land Audit as having potential capacity for 40 units. This Plan continues the allocation of this site for residential development, and where appropriate the wording of the proposal and / or the indicative yield from the site may have changed.

Table Fk1: Sites Previously Identified by the Angus Local Plan Review

Name / reference	Total Capacity	ALDP Phase 1 (2016-21)	ALDP Phase 2 (2021-26)
Fk1 South of Gardyne Street	80	50	30
Total	**80**	**50**	**30**

The Angus Local Plan Review allocation south of Gardyne Street extends to 7.4ha and the development brief for the site identifies land for open space, parking, health centre and green links to Friock Wood. Given the design requirement to create a village green with smaller terraced and semi-detached properties on the south side of the open amenity space, it is possible to accommodate more houses on this site than allocated in the previous Local Plan.

Within Friockheim, the site south of Gardyne Street has the capacity to accommodate additional housing, subject to detailed design proposals being approved. Scottish Water have advised that the current drainage constraint need not restrict future development in the village, removing the previous 40 unit limit at the waste water treatment works. Given the

developable area, the opportunity to develop a range of house sizes to meet all life demands and to achieve the best use of the agricultural land resource, it is appropriate to increase the allocation on this site to around 80 houses. This will be phased over the plan period and further land allocations will be reviewed in a future local development plan.

Fk1 Housing – South of Gardyne Street

7.4 ha of land south of Gardyne Street is allocated for residential development of around 80 dwellings. A first phase of around 50 dwellings will be permitted in the period to 2021, with the remaining phase of around 30 dwellings permitted in the period to 2026.

Proposals should be in accordance with the approved development brief for this site updated as appropriate to reflect policies in this local Development Plan and should include:

- **a site for a health centre, open space, servicing and car parking for the Co-op store;**
- **landscape, footpaths and buffer zones around the site;**
- **traffic management on Gardyne Street; and**
- **supporting information including a Drainage Impact Assessment and agreement with Scottish Water for the provision of foul drainage, including pumping, Sustainable Drainage and Surface Water Management Plan, and a Planting Scheme.**

OPPORTUNITY SITES

There are possible sites in Friockheim that provide opportunities for development and / or redevelopment. Where proposals involve new housing development they will be required to meet the provisions of Policy TC3 Affordable Housing.

Fk2 Opportunity Site – Former Primary School, Eastgate

0.4 ha of land at the former Primary School, Eastgate provides an opportunity for residential, leisure and recreation, Class 3 (restaurant), Class 4 (business) or community uses. Proposals should consider the need for a bat survey.

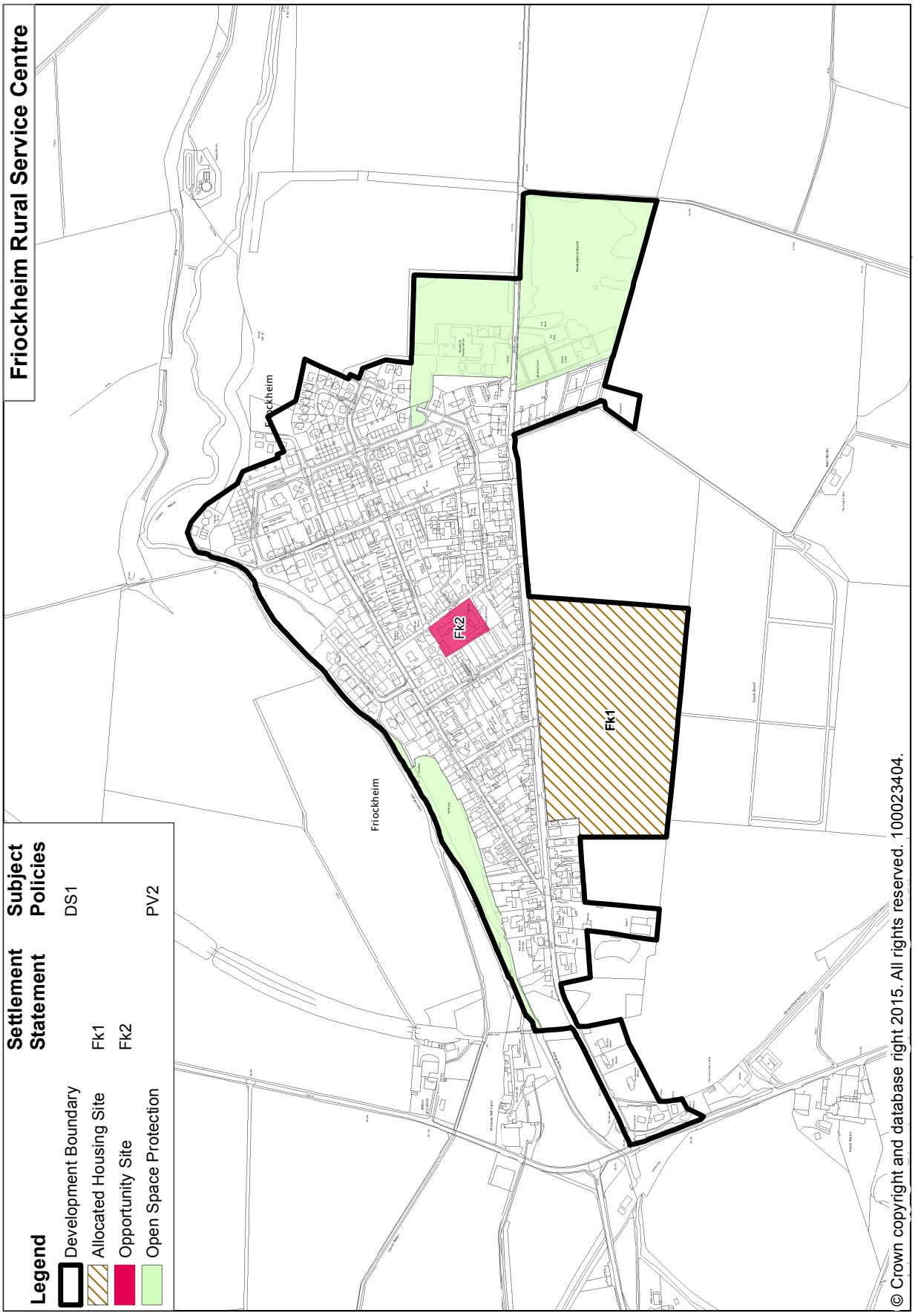
Fk2 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
0/+	0/+	0/+	0/+	?/0	+	+	0	0/+	-/+

COMMUNITY FACILITIES AND SERVICES

Friockheim has a number of public and private community facilities. Provision is made in Policy Fk1 above for the possible development of a new health centre and the development of community assets.

ENVIRONMENT AND RESOURCES

Development south of Gardyne Street will be required to make provision for green corridors linking Friock Wood through the village to the new amenity space and beyond to the Lunan Water to the north creating a network of non-vehicular links and integrating existing and planned green infrastructure.


Friockheim Rural Service Centre
Legend
Development Boundary
Allocated Housing Site
Opportunity Site
Open Space Protection
Settlement Statement
Fk1
Fk2
Subject Policies
DS1
PV2
Friockheim
Fk2
Fk1
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Letham

Letham is one of the largest villages in Angus and is the largest in the West Angus Housing Market Area. Surrounded by good quality agricultural land, the village is an important rural service centre providing a range of local services as well as employment opportunities. The village square provides the focal point for most of the shops and services.

The development boundary for Letham was established in the 1970s and has, with few exceptions, remained unchanged. The open character of the village combined with low density housing has allowed opportunity for numerous greenfield infill developments. This has continued in recent years and includes the successful development of housing at East Hemming Street.

Land for development is required to take account of the unadopted roads policy which applies in Letham due to the rural character of many roads within the village. The policy seeks to guide development to suitable areas which are able to be served by the road network.

DEVELOPMENT STRATEGY

The development strategy for Angus is set out in the introduction to the ALDP, for Letham this means:

- supporting the redevelopment of vacant, underused and brownfield sites within the defined Development Boundary;
- releasing green field land Between Blairs Road and Dundee Street and continuing with the allocation of land for residential use at Jubilee Park.
- ensuring the continued provision of small scale land for employment uses by supporting an existing site East Den Brae whilst identifying an area of land for extended employment related uses west of Dundee Street;
- continuing to have regard to the unadopted roads policy in considering new proposals for development;
- safeguarding and enhancing the natural and built features which are a key part of the character and identity of the village;
- protecting open spaces and the connectivity and functionality of green networks, integrating new provision as part of land allocations and new development especially at Dundee Street and Jubilee Park; and
- supporting the enhancement and extension of the network of paths and cycleways around allocations at Dundee Street and Jubilee Park.

GENERAL

L1 Unadopted Roads Policy

All proposals for new development in Letham will be considered against the Council's Unadopted Roads Policy set out in Appendix 5 which gives an assessment of the capacity of the local road network and seeks to direct development to areas where satisfactory road access can be achieved.

L1 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
0	+	+	0	0	0/+	0	0	+/?	?/+

HOUSING

EXISTING SITES

Sites with planning permission or under construction as identified in the Angus Housing Land Audit 2014 are shown in Table L1.

Table L1: Existing Sites

Name / reference	Capacity
L(a) 16 Guthrie Street	2
L(b) East Hemming Street	15
Total	**17**

SITES PREVIOUSLY IDENTIFIED BY THE ANGUS LOCAL PLAN REVIEW

The sites summarised in Table L2 were previously identified in the Angus Local Plan Review. This Plan continues the allocation of these sites for housing development, and where appropriate the wording of the proposal and / or the indicative yield from the site may have changed.

Table L2: Sites from Angus Local Plan Review

Name / reference	Capacity
L2 Jubilee Park	30
Total	**30**

L2 Housing – Jubilee Park

2.3 ha of land between Bractullo Gardens and Letham Primary School is allocated for residential development of around 30 dwellings. Proposals should be in accordance with the development brief for the site updated as appropriate to reflect policies in this Local Development Plan and should include:

- **provision of 0.7 ha of open space / playing fields adjacent to the primary school which could incorporate a small car parking area accessed from Braehead Road;**
- **a footpath / cycleway along the southern boundary of the site linking Woodside Road with the primary school including possible connections to Dundee Road via Bractullo Gardens, Jubilee Park and Old Letham;**
- **vehicular access to serve the new housing from the existing development at Bractullo Gardens and / or Jubilee Park. Vehicular access to the new housing will not be permitted from Old Letham, Woodside Road, or Braehead Road; and**
- **supporting information including a Flood Risk Assessment and an Odour Impact Assessment.**

Opportunity to provide vehicular access for residents at Woodside Road through this area should also be investigated as part of this development.

L2 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
0/+	+	+	0/+	0/+	+	0/+	0	0/+	0/+

NEW ALLOCATIONS

Table L3 summarises new allocations of housing land.

Table L3: New Housing Land Allocations

Name / reference	Capacity
L3 Land Between Blairs Road & Dundee Street	20
Total	**20**

L3 Housing – Land Between Blairs Road & Dundee Street

4.4 ha of land between Blairs Road & Dundee Street is allocated for the development of around 20 dwellings. Access to the site should be taken from Blairs Road.

Development proposals should be in accordance with the development brief which will be prepared for the site and should include:

- **provision of land for a range of house sizes, types and tenures;**
- **design and site layout which integrates with the existing landscape character, pattern of development and character of neighbouring uses and buildings;**
- **structural planting and landscaping within and around the site should be provided to enhance biodiversity and to create an appropriate village edge, particularly along the western and southern boundaries of the site;**
- **the provision of open space and SUDS as necessary;**
- **opportunities for active travel through improved linkages with the existing core path/green network; and**
- **supporting information including a Flood Risk Assessment, Drainage Impact Assessment and Odour Impact Assessment.**

L3 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
0/+	+	0/+	-/+	+	-/+	+	0	-/+	+

WORKING

NEW ALLOCATIONS

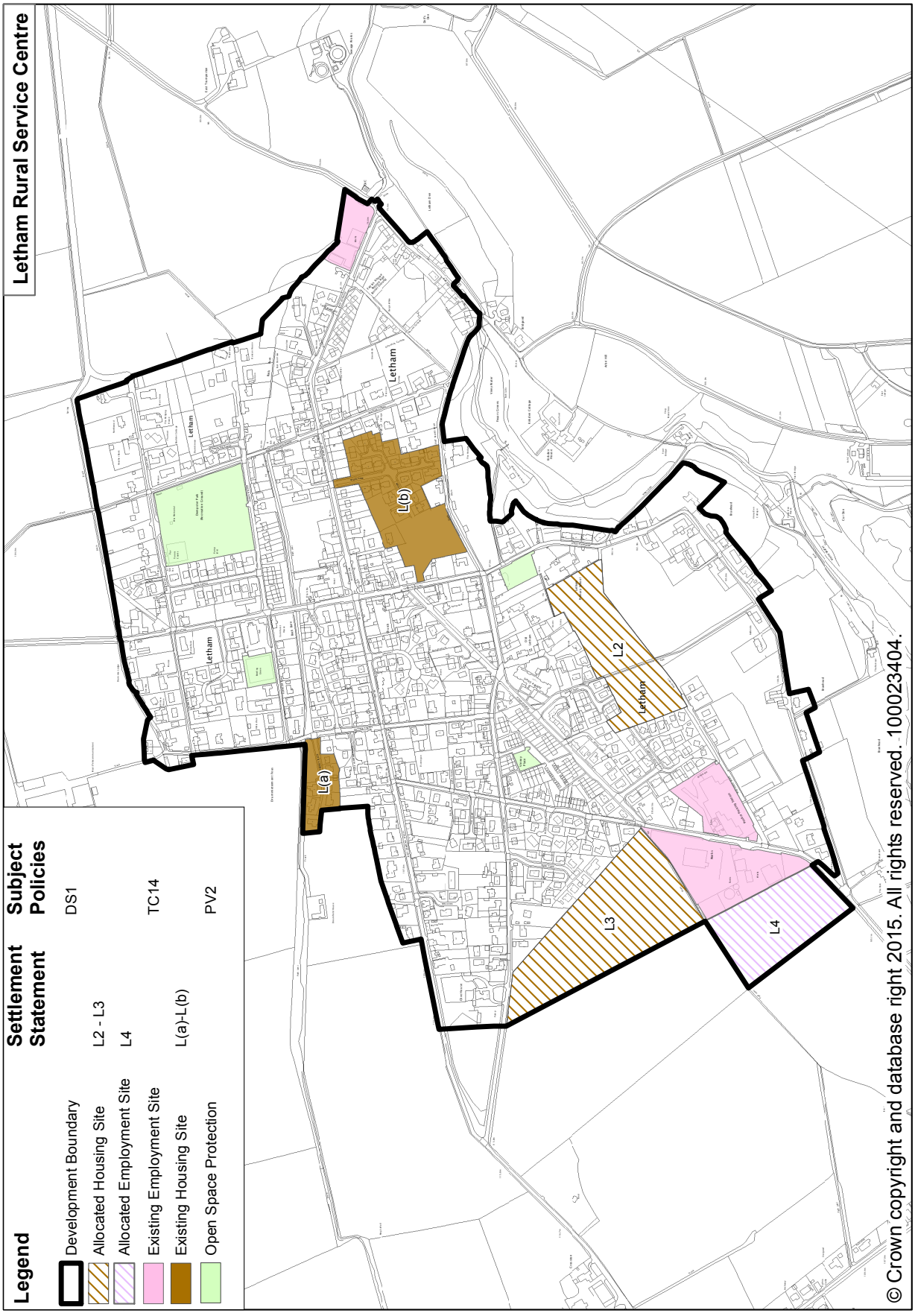
An existing employment area is provided at the southern end of Dundee Street. This employment area provides local employment opportunities which support the economic base of Letham. Additional land is allocated in the Local Development Plan for employment related uses which are of a scale and nature appropriate to its peripheral location on the edge of Letham and which take account of the rural setting and adjacent uses.

L4 Working – Land at Dundee Street

1.9 ha of land at Dundee Street is allocated for small scale business/employment uses. Development proposals should be accessed from Dundee Street and should be compatible with surrounding and proposed land uses. Proposals should also provide structural landscaping to the north of the site to integrate development into the wider landscape, enhance biodiversity and extend green network provision.

Development proposals should be supported by a Flood Risk Assessment and a Drainage Impact Assessment. In addition, an Odour Impact Assessment may also be required depending on the types of business/employment uses proposed.

L4 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
0/+	+	0/+	-/+	+	-/+	+	0	-/+	+/-


Letham Rural Service Centre
Legend
Settlement Statement
Subject Policies
Development Boundary
DS1
Allocated Housing Site
L2 - L3
Allocated Employment Site
L4
Existing Employment Site
TC14
Existing Housing Site
L(a)-L(b)
Open Space Protection
PV2
L(a)
L(b)
L2
L3
L4
Letham
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Newtyle

Newtyle is a large village situated within the South Angus Housing Market Area. The village is an important rural service centre which provides services and facilities for the village and the wider catchment area. The services and facilities provided include a primary school, doctor's surgery, small scale retail shops, a post office, some commercial services and sources of local employment. During more recent times the village has become largely a dormitory settlement with people commuting to places such as Dundee for employment purposes.

Newtyle is surrounded by prime quality agricultural land and is set between the Sidlaw Hills to the south and the open flat plain of the Strathmore valley to the north. Distinctive features of the local environment include the tree lined approach roads to the village and the disused railway line, much of which now forms part of the local path network. Together, these locally important landscape features form a rich and diverse rural landscape context.

The village is characterised by a largely compact form and is laid out in a grid pattern. These are both original features which remain largely unchanged. However, more recent developments comprising regeneration of the former railway goods yard and adjacent bulb fields have deviated from this original layout. During more recent times, the primary school site has also been redeveloped to provide modern primary school facilities.

DEVELOPMENT STRATEGY

The development strategy for Angus is set out in the introduction to the ALDP, for Newtyle this means:

- supporting the redevelopment of vacant, underused and brownfield sites within the defined development boundary;
- releasing green field land north of Coupar Angus Road and north of Eassie Road;
- safeguarding and enhancing the natural and built features which are a key part of the character and identity of the village;
- protecting open spaces and the connectivity and functionality of green networks, integrating new provision as part of land allocations and new development; and
- supporting the enhancement and extension of the network of paths and cycleways.

HOUSING

NEW ALLOCATIONS

Table N1 summarises new allocations of housing land.

Table N1: New Allocations

Name/reference	Capacity	ALDP Phase 1 (2016 – 2021)	ALDP Phase 2 (2021 – 2026)
N1 Land north of Coupar Angus Road	20	20	-
N2 Land north of Eassie Road	30	30	-
Total	**50**	**50**	**-**

Land for housing is allocated north of Coupar Angus Road. The site capitalises on a landscape framework which can successfully accommodate new development. The site benefits from good accessibility by a range of transport modes and is located within close proximity to the primary school and/or services and facilities.

N1 Housing – Land north of Coupar Angus Road

1 ha of land north of Coupar Angus Road is allocated for residential development of around 20 dwellings.

Proposals should be in accordance with the development brief which will be prepared for this site and should include:

- **design and site layout which reflects the traditional grid pattern and integrates with the rural landscape character and the layout and character of neighbouring buildings with frontages onto Coupar Angus Road. The design and site layout must not prejudice future expansion and connection to adjacent areas of land;**
- **the preservation and enhancement of landscape features such as the existing green railway embankment, hedgerows, trees and the mature tree lined avenue adjacent to Coupar Angus Road;**
- **new defined, permanent and appropriate boundaries which will be consistent with traditional landscape patterns and will create an appropriate urban edge and transition to the rural landscape;**
- **provision of vehicular, cycle and pedestrian access arrangements to the satisfaction of the Council;**
- **provision of SUDS in the shape of traditional roadside and field edge ditches (swales) which would create an appropriate transition, planted boundary and form of green infrastructure and help integrate the development and its access roads with the rural landscape context; and**
- **supporting information including a Drainage Impact Assessment, Landscape Assessment and a Tree Survey as necessary.**

N1 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+/?	+	0/+	-/+	0/+	0/+	0/+	0	-/+	+

Additional land for housing is also allocated north of Eassie Road. This allocation will provide for a range and choice of housing sites and will complement recently completed residential developments at Bulb Park and Kinpurnie Gardens. Structural landscaping, new boundary planting and the preservation of existing landscape features such as the mature tree lined avenue adjacent to Eassie Road, will create new defined and permanent boundaries which will be consistent with the existing landscape patterns. The site benefits from good accessibility by a range of transport modes and is located within close proximity to the primary school and/or services and facilities.

N2 Housing – Land north of Eassie Road

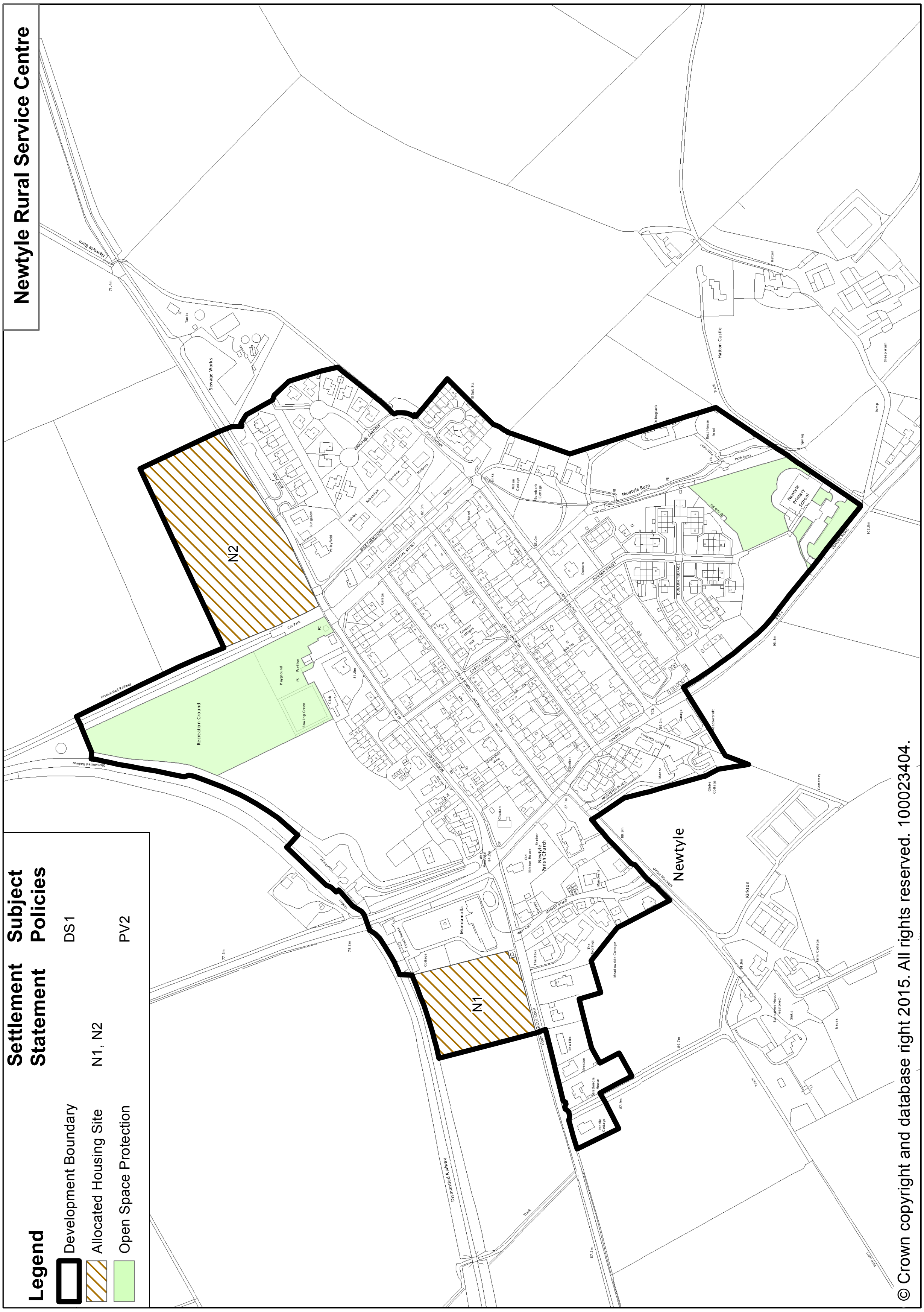
2 ha of land north of Eassie Road is allocated for residential development of around 30 dwellings.

Proposals should be in accordance with the development brief which will be prepared for this site and should include:

- **design and site layout which reflects the traditional grid pattern and integrates with the rural landscape character and the layout and character of neighbouring buildings with frontages onto Eassie Road. The design and site layout must not prejudice future expansion and connection to adjacent areas of land;**
- **the preservation and enhancement of landscape features such as the existing green railway embankment, field patterns and the mature tree lined avenue adjacent to Eassie Road;**
- **new defined, permanent and appropriate boundaries which will be consistent with traditional landscape patterns and will create an appropriate urban edge and transition to the open rural landscape;**
- **provision of vehicular, cycle and pedestrian access arrangements to the satisfaction of the Council;**
- **provision of SUDS in the shape of traditional roadside and field edge ditches (swales) which would create an appropriate transition, planted boundary and form of green infrastructure and help integrate the development and its access roads with the rural landscape context; and**
- **supporting information including a Drainage Impact Assessment, Landscape Assessment and a Tree Survey as necessary.**

N2 SEA Implications

Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+/?	+	0/+	-/+	0/+	0/+	0/+	0	-/+	+


Newtyle Rural Service Centre
Legend
Development Boundary
Allocated Housing Site
Open Space Protection
Settlement Statement
N1, N2
Subject Policies
DS1
PV2
N1
N2
Newtyle
Recreation Ground
Newtyle Burn
Dismantled Railway
Hatton Castle
Sewage Works
Kirkton
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SETTLEMENT STATEMENTS, VILLAGE DIRECTORY & DEVELOPMENT BOUNDARY MAPS

A statement is provided for those settlements shown in bold where land has been allocated for development. Development Boundary maps have been prepared for all other settlements listed.

Villages

Aberlemno
Airlie
Arbirlot
Auchmithie
Auchterhouse

Balgray (by Tealing)
Balhall
Balkeerie and Eassie
Ballumbie
Barnhead
Birkhill / Muirhead
Bogindollo*
Bowriefauld
Braehead of Lunan
Bridge of Dun*
Bridgend of Lethnot
Bridgend of Lintrathen*
Bridgefoot & Strathmartine
Bucklerheads
Burnside of Duntrune

Charleston
Colliston
Cortachy*
Craichie
Craigo
Craigton of Airlie
Craigton of Monikie

Douglastown*
Dunnichen
Dykehead

Eassie Muir*
Easthaven

Farnell*
Fern
Finavon*
Folda
Fowlis Easter

Gateside
Glamis
Greystone
Guthrie and Cotton of Guthrie

Inchbare
Inveraldie
Inverarity*
Inverkeilor

Kellas
Kingsmuir
Kinnell
Kirkinch
Kirkton of Auchterhouse
Kirkton of Craig
Kirkton of Glenisla
Kirkton of Kingoldrum
Kirkton of Kinnettles*
Kirkton of Menmuir
Kirkton of Tealing

Letham Grange
Leysmill
Liff
Lunanhead
Lundie

Maryton
Marywell
Memus
Milton of Ogilvie
Monikie
Muirdrum
Murroes

Newbigging (by Monifieth)
Newbigging (by Tealing)
North Craigo
North Dronley

Oathlaw

Padanaram
Panbride
Piperdam
Prosen Village*

Redford
Ruthven*

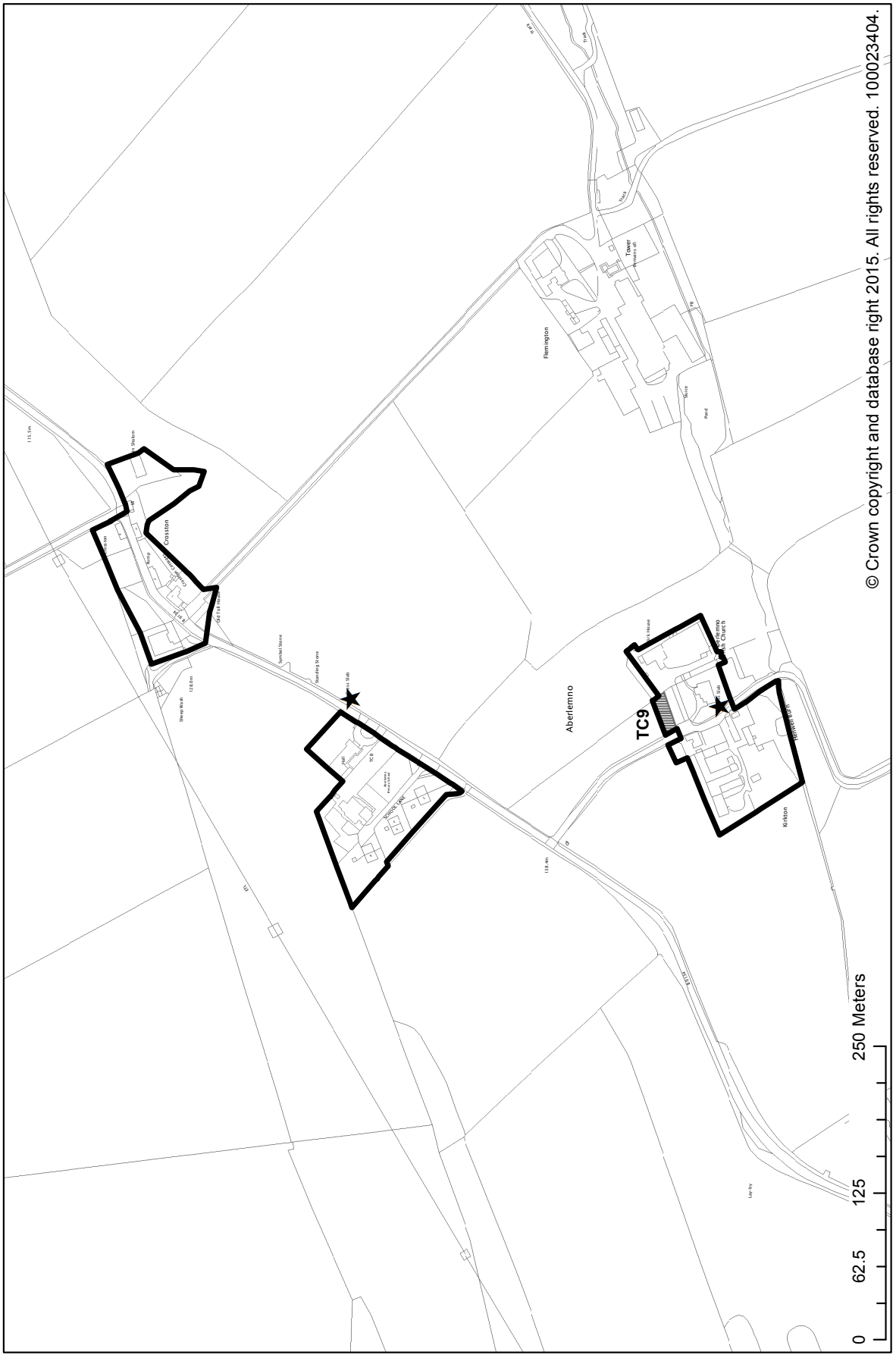
South Kingennie
Strathmartine Hospital

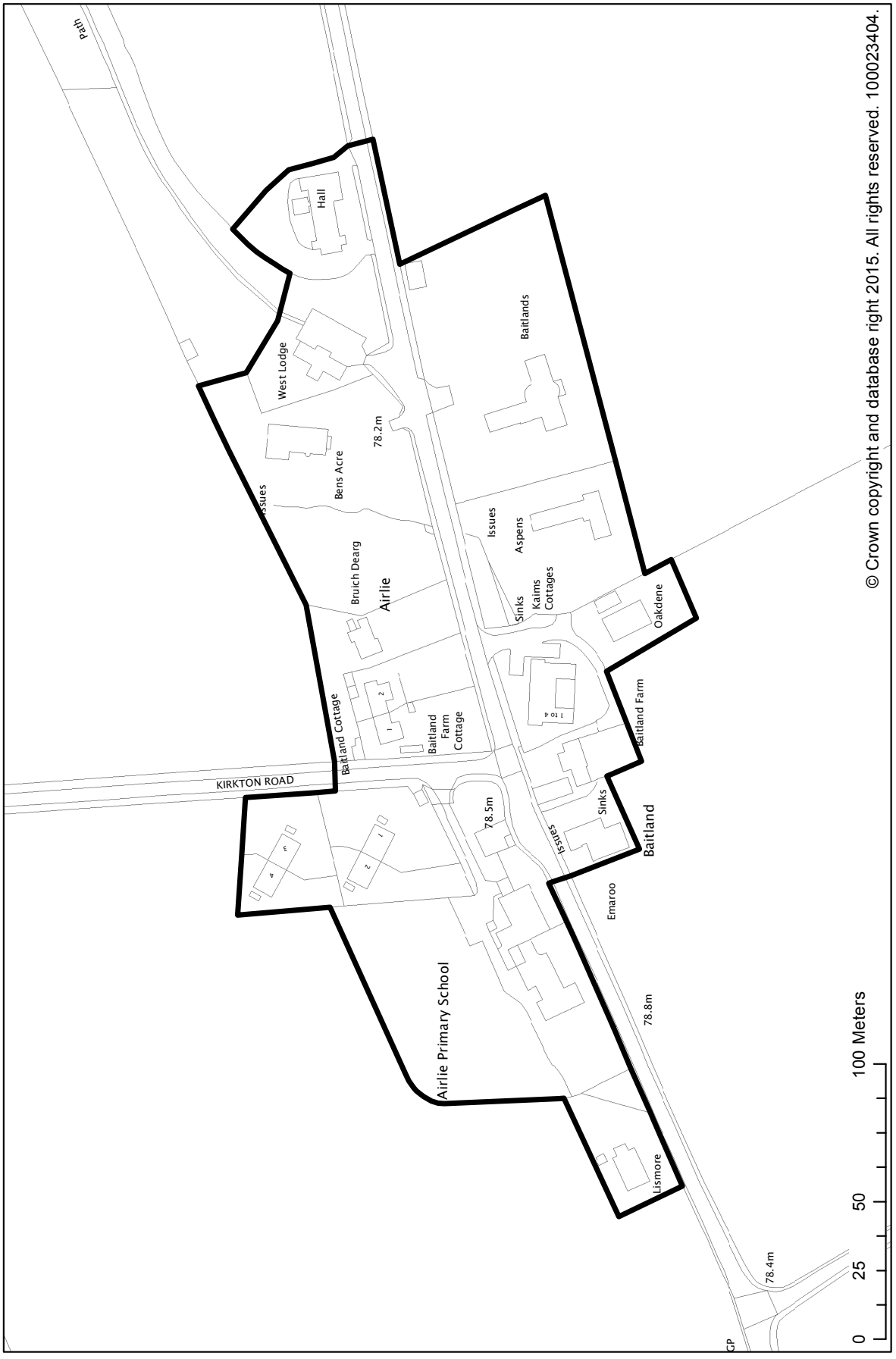
Tannadice*
Tarfside
Tealing
Tigerton
Trinity

Wellbank
Westhall Terrace
Westmuir
Whigstreet
Woodville

** Within these villages, further consideration will need to be given to any likely significant effects on the River South Esk and River Tay Special Areas of Conservation which could be caused by any development proposals.*

Aberlemno




Hall
West Lodge
Baitlands
78.2m
Bens Acre
Issues
Bruich Dearg
Airlie
Issues
Aspens
Sinks
Kaims Cottages
Oakdene
Baitland Cottage
Baitland Farm Cottage
Baitland Farm
KIRKTON ROAD
78.5m
Issues
Sinks
Baitland
Emaroo
Airlie Primary School
78.8m
Lismore
78.4m
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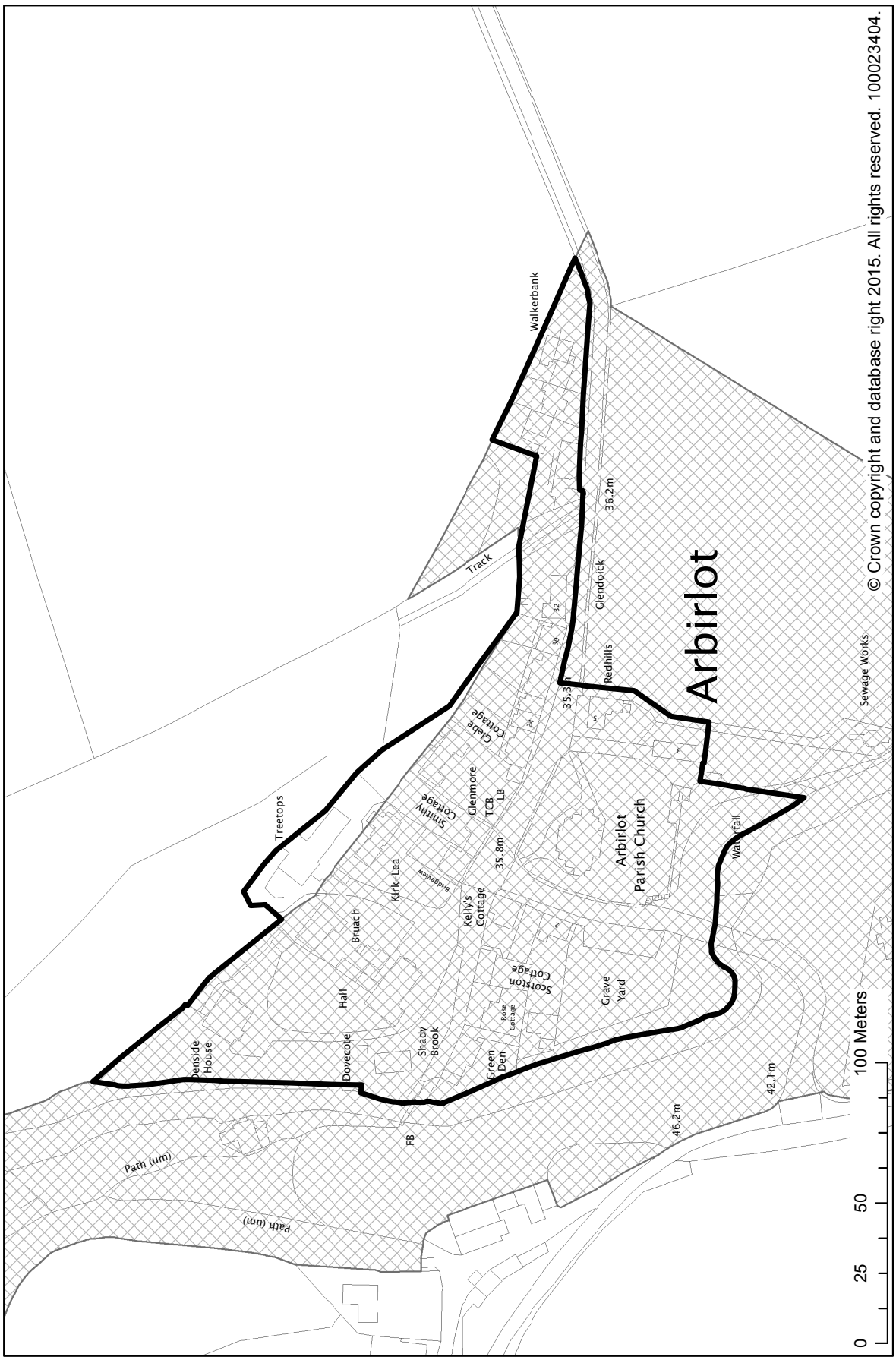
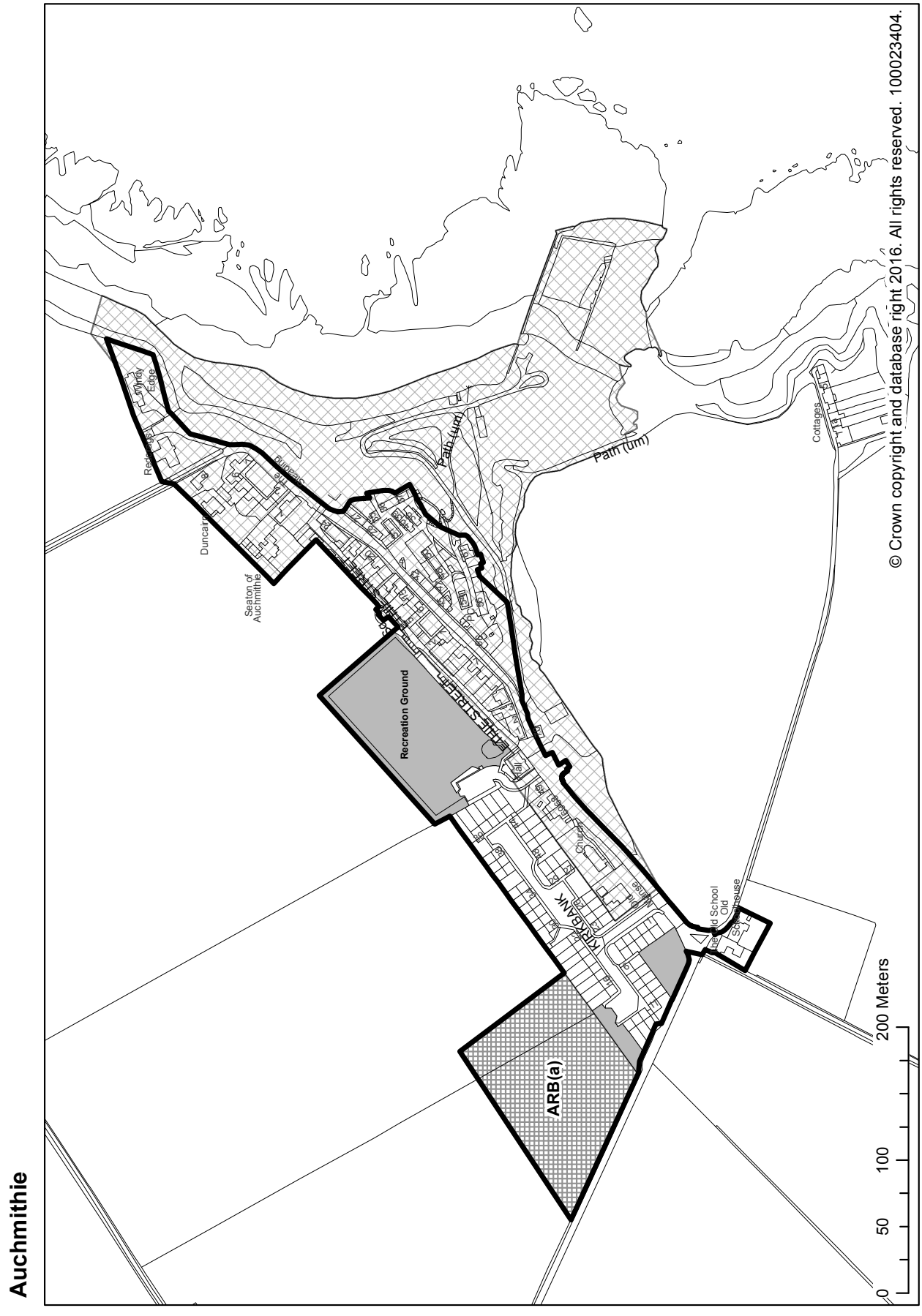
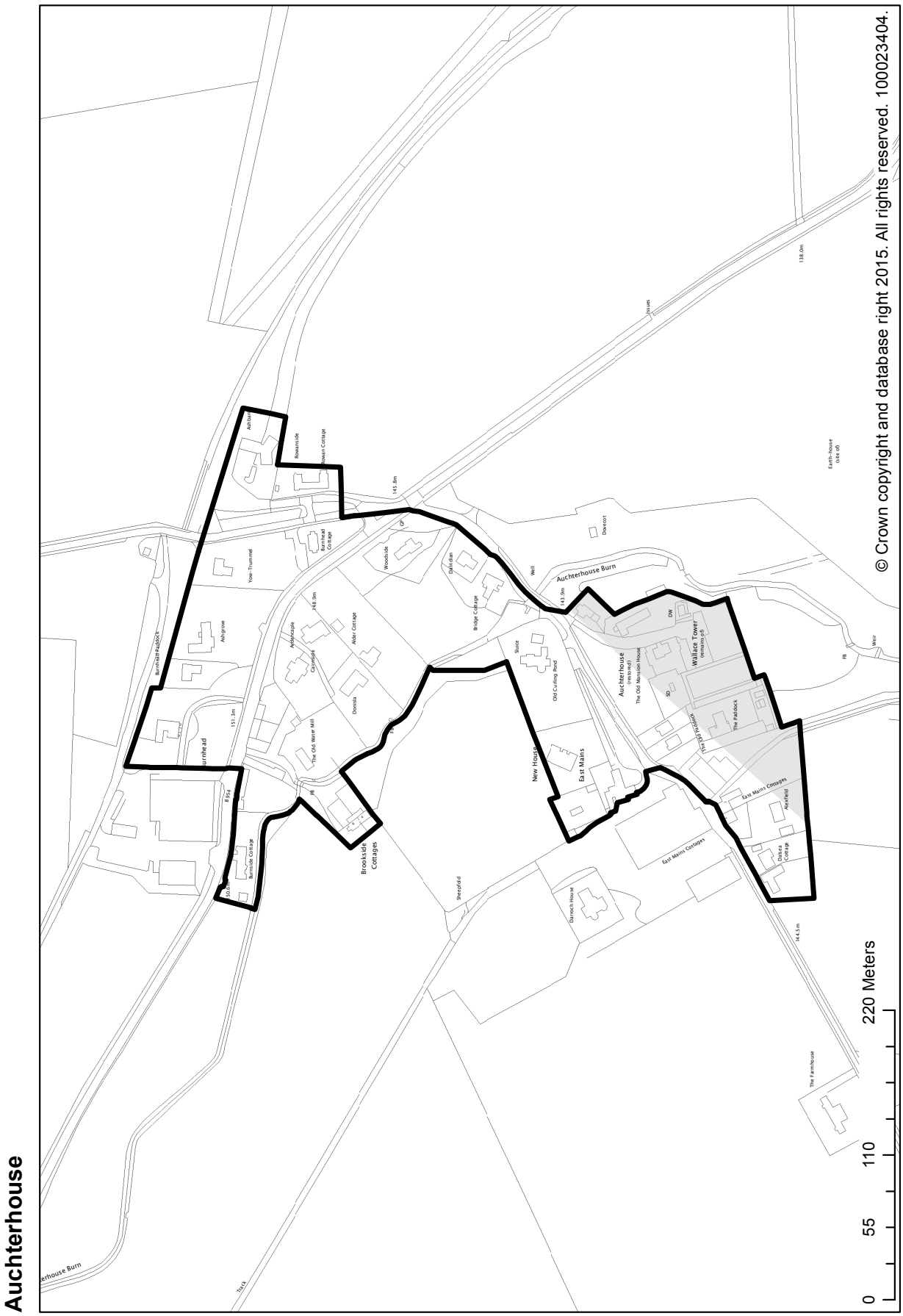
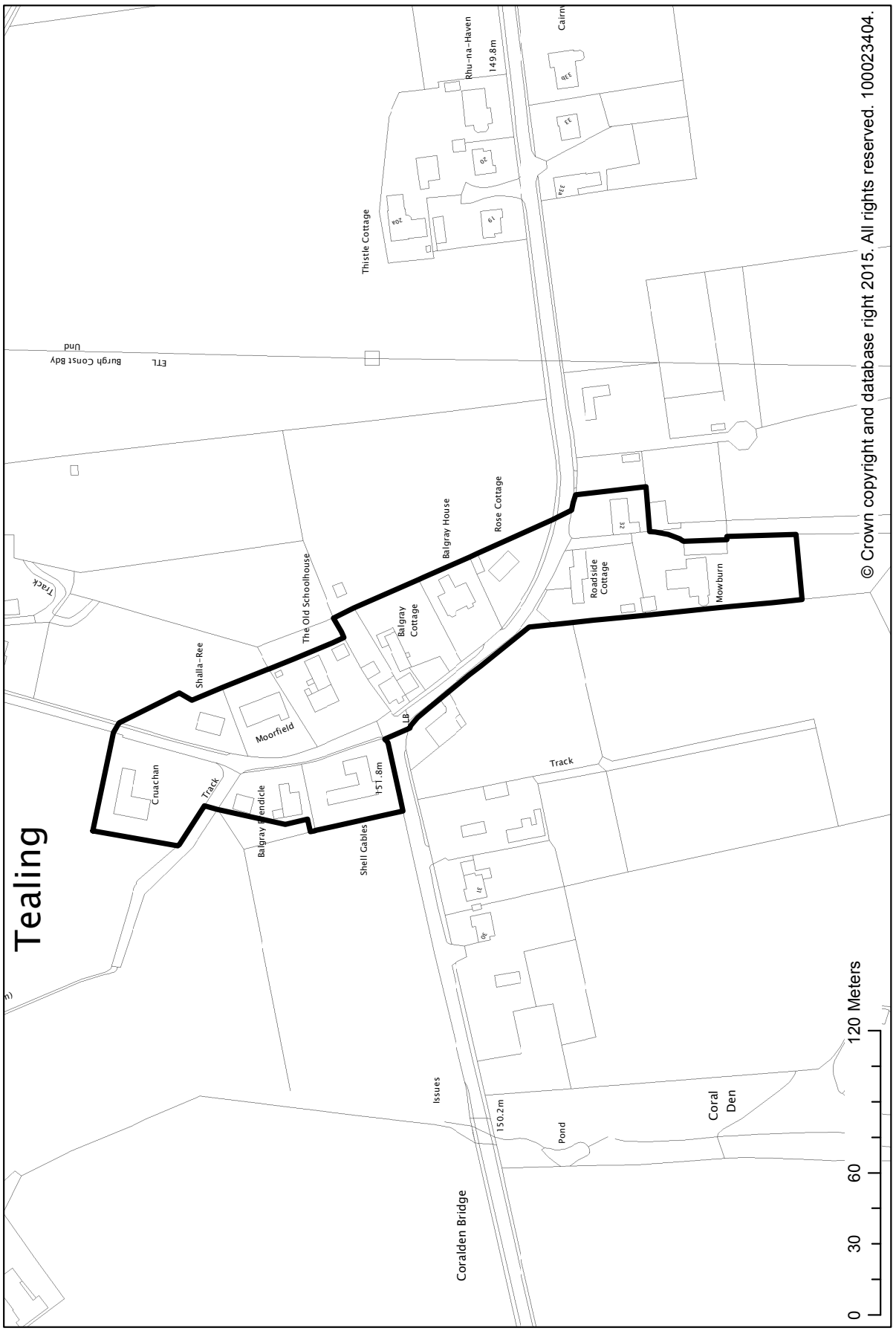
0
25
50
100 Meters

Airlie








Balgray (by Tealing)
Tealing
Rhu-na-Haven
149.8m
Thistle Cottage
Balgray House
Rose Cottage
Roadside Cottage
Mowburn
The Old Schoolhouse
Balgray Cottage
Shalla-Ree
Moorfield
Cruachan
Track
Shell Gables
151.8m
Track
Issues
150.2m
Pond
Coral Den
Coralden Bridge
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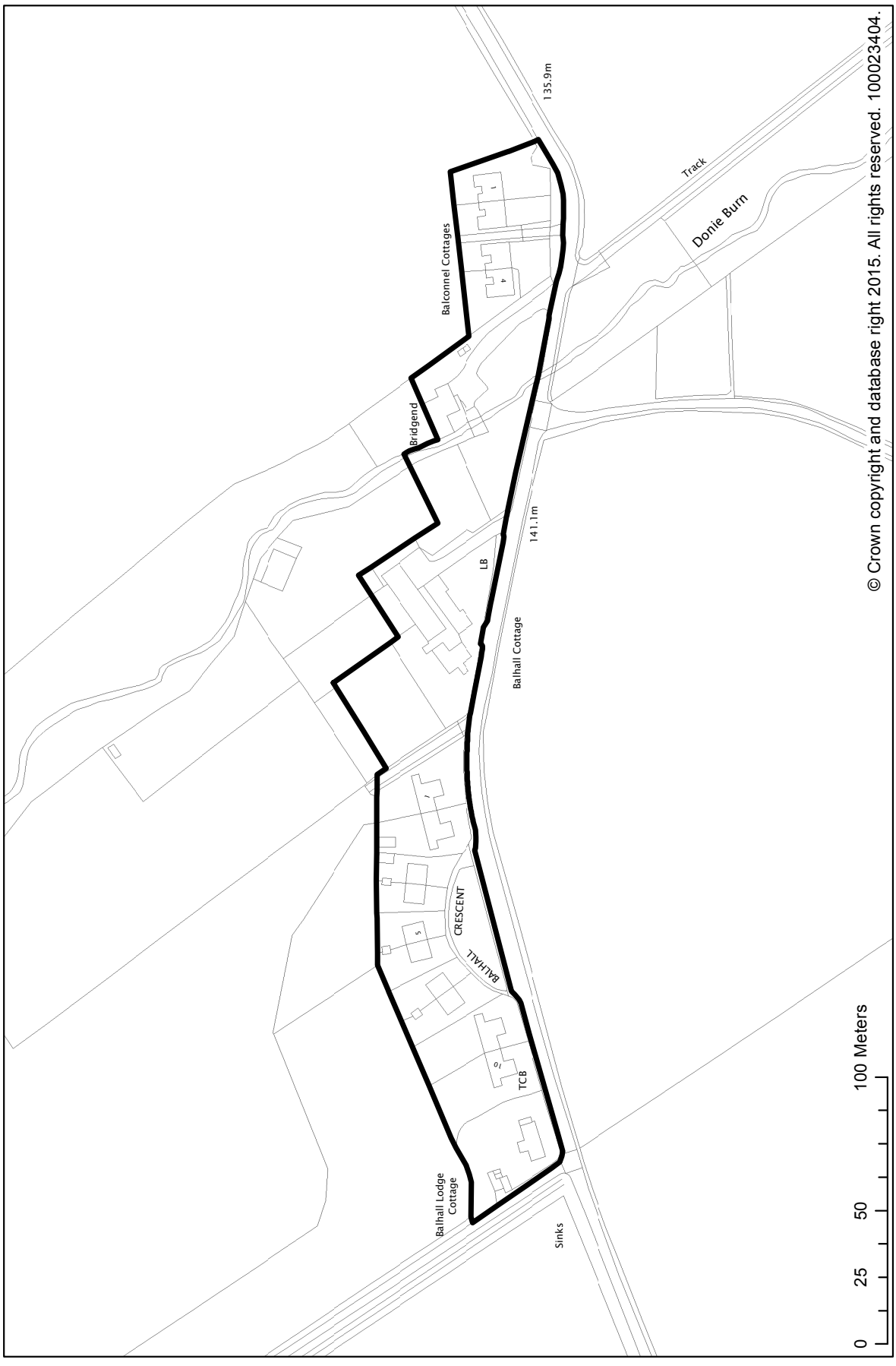
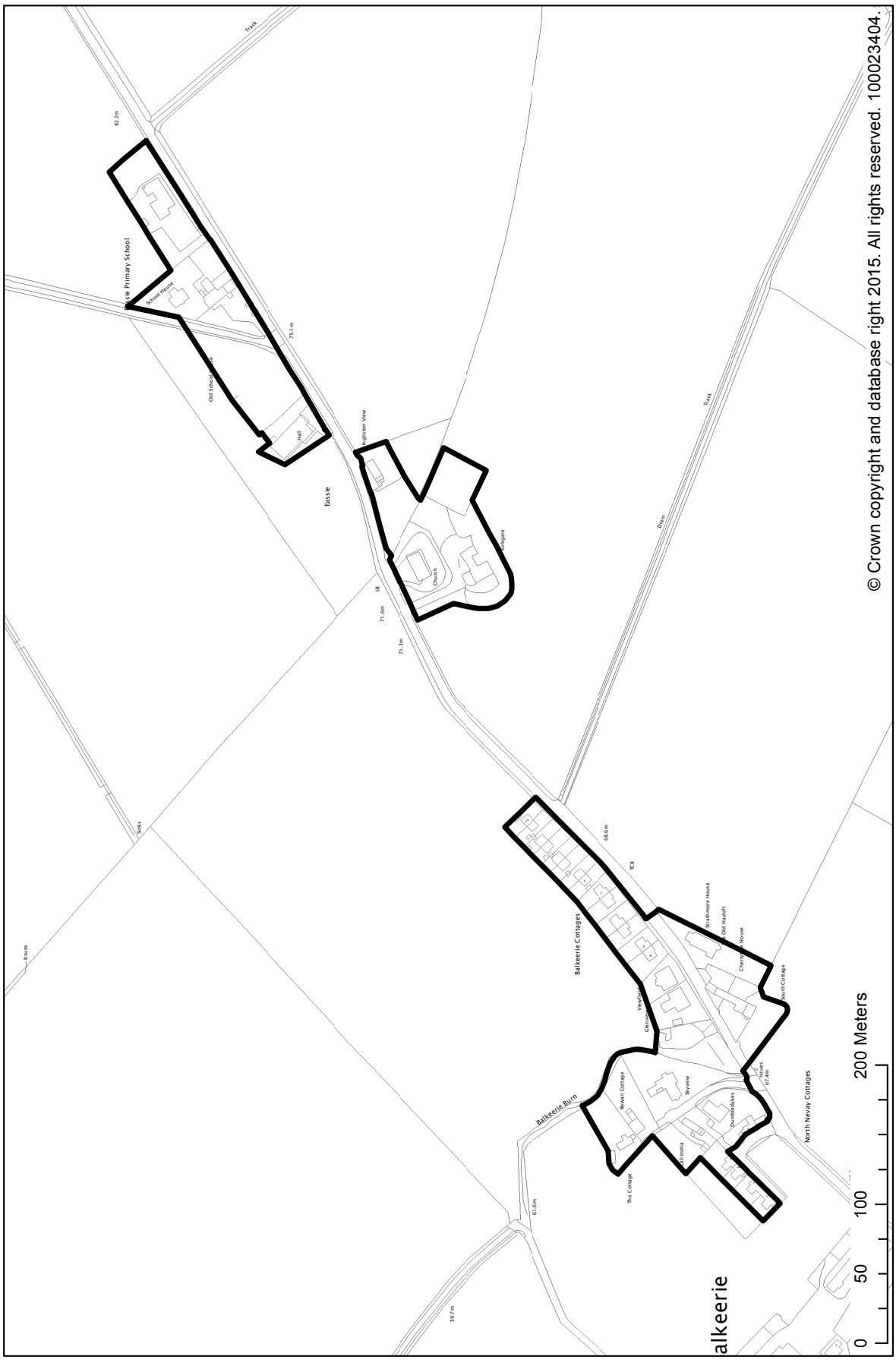
0
30
60
120 Meters

Balhall



Balkeerie & Eassie



Ballumbie

Ballumbie is located on the southern boundary of Angus and lies partly within Dundee City. This statement applies only to that part within Angus. Planning permission was granted by Angus Council for a mixed residential and golf course development set in around 95 ha of land. The site includes the former Ballumbie House, a Category B listed building. The approved residential development, including restoration and conversion of the former Ballumbie House, has been completed.

DEVELOPMENT STRATEGY

The development strategy for Angus is set out in the introduction to the ALDP, for Ballumbie this means:

- Supporting proposals which enhance or maintain the recreational potential of the golf course and associated facilities.
- Additional residential development outwith the development boundaries at Ballumbie will not be supported.

SPORT AND RECREATION

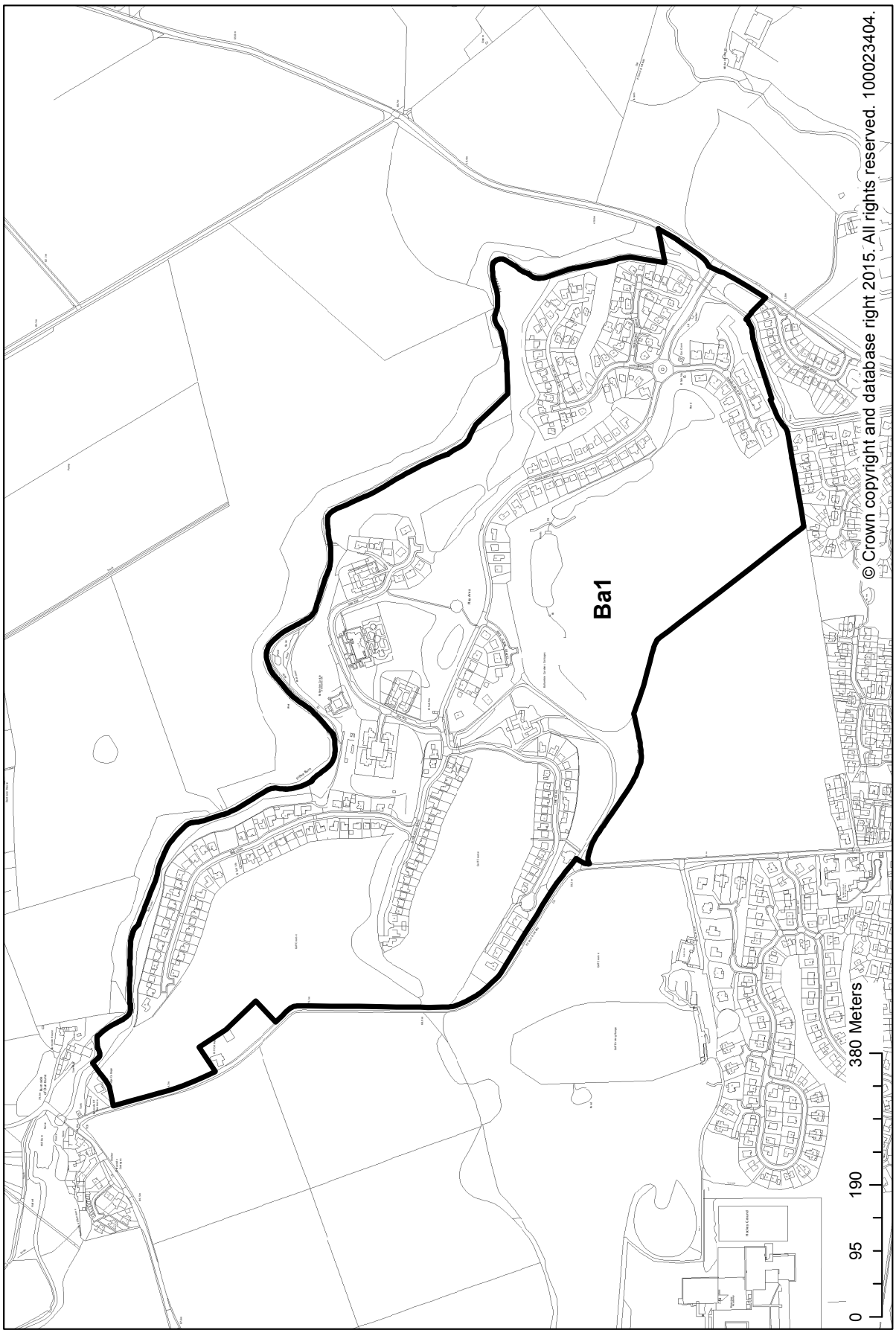
The golf course and associated facilities contribute to the recreation and tourism resource of Angus. Proposals that support or enhance the recreational potential of Ballumbie will be supported where they are compatible with existing land uses and do not adversely impact on the amenity and environment of the area.

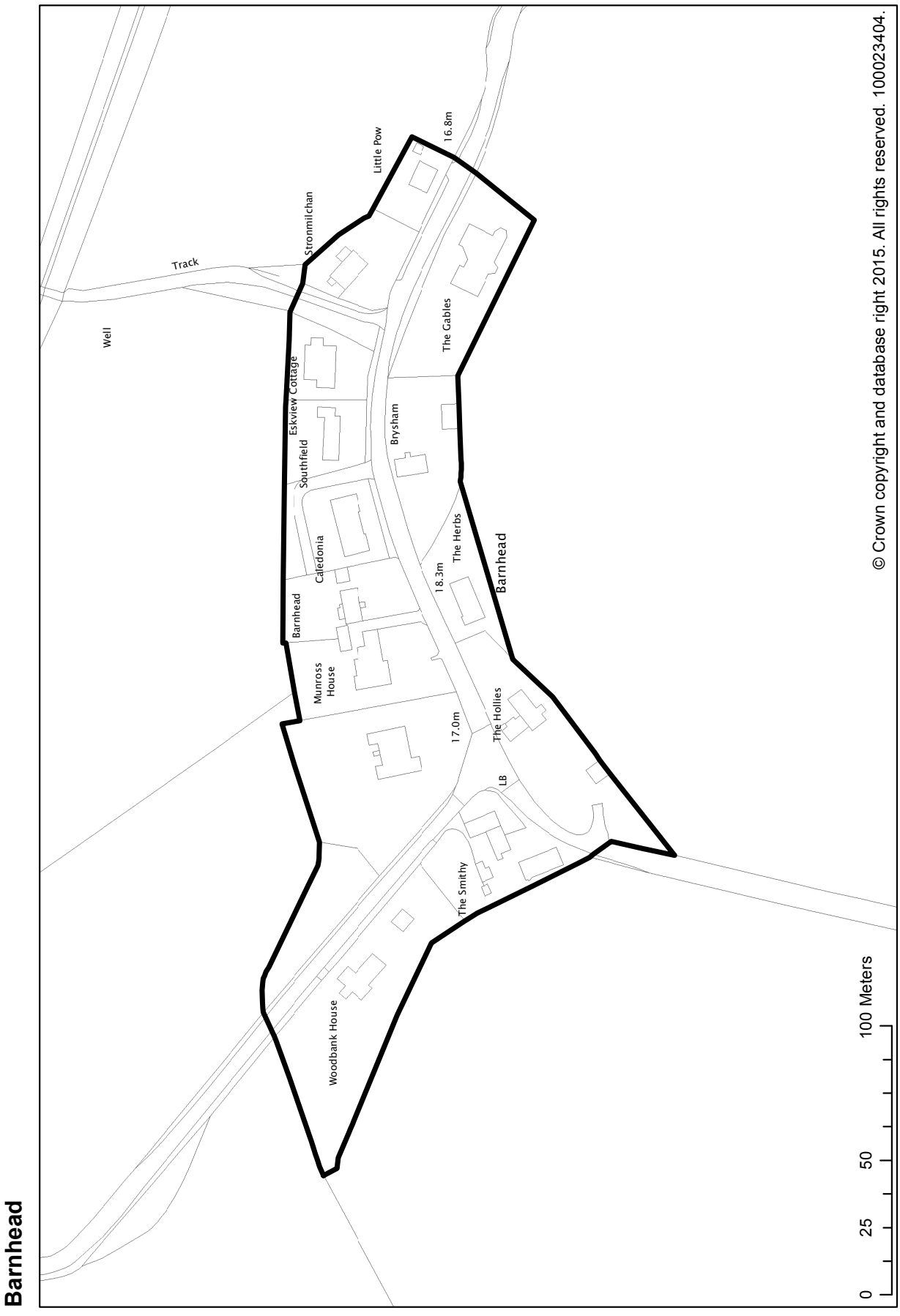
Ba1: Recreation Development

Proposals which extend the recreational potential of the golf related development at Ballumbie will be supported where they are compatible with the existing land uses/activities and are not detrimental to the area's setting and environment.

Ba1 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
?/0	0/+	+/?	+/?	?	+/?	?	0/+	+/?	+/?

Ballumbie




Barnhead
Track
Well
Stronnilchan
Little Pow
16.8m
The Gables
Eskview Cottage
Southfield
Brysham
Caledonia
Barnhead
Munross House
18.3m
The Herbs
Barnhead
17.0m
The Hollies
LB
The Smithy
Woodbank House
0
25
50
100 Meters
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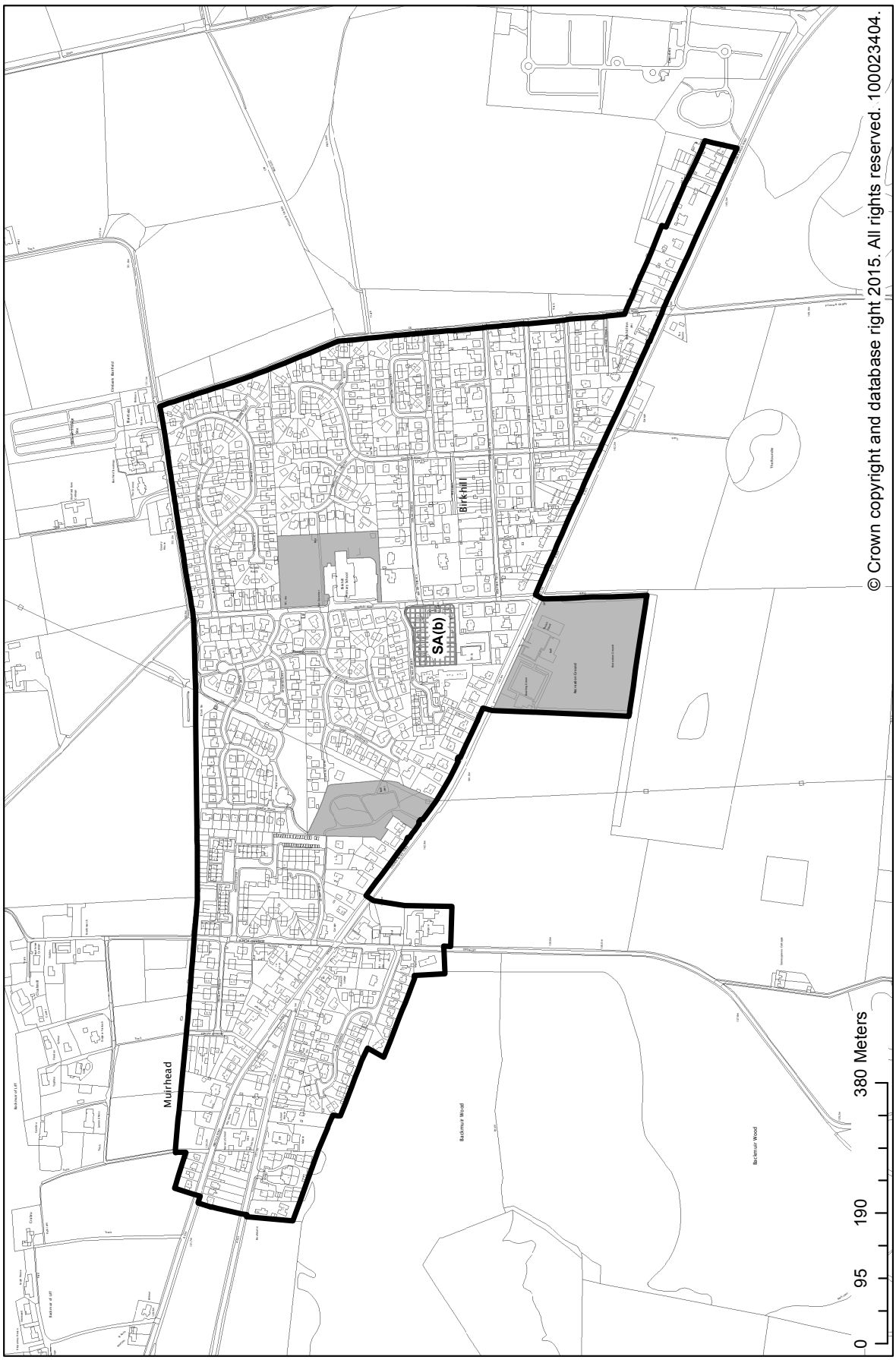
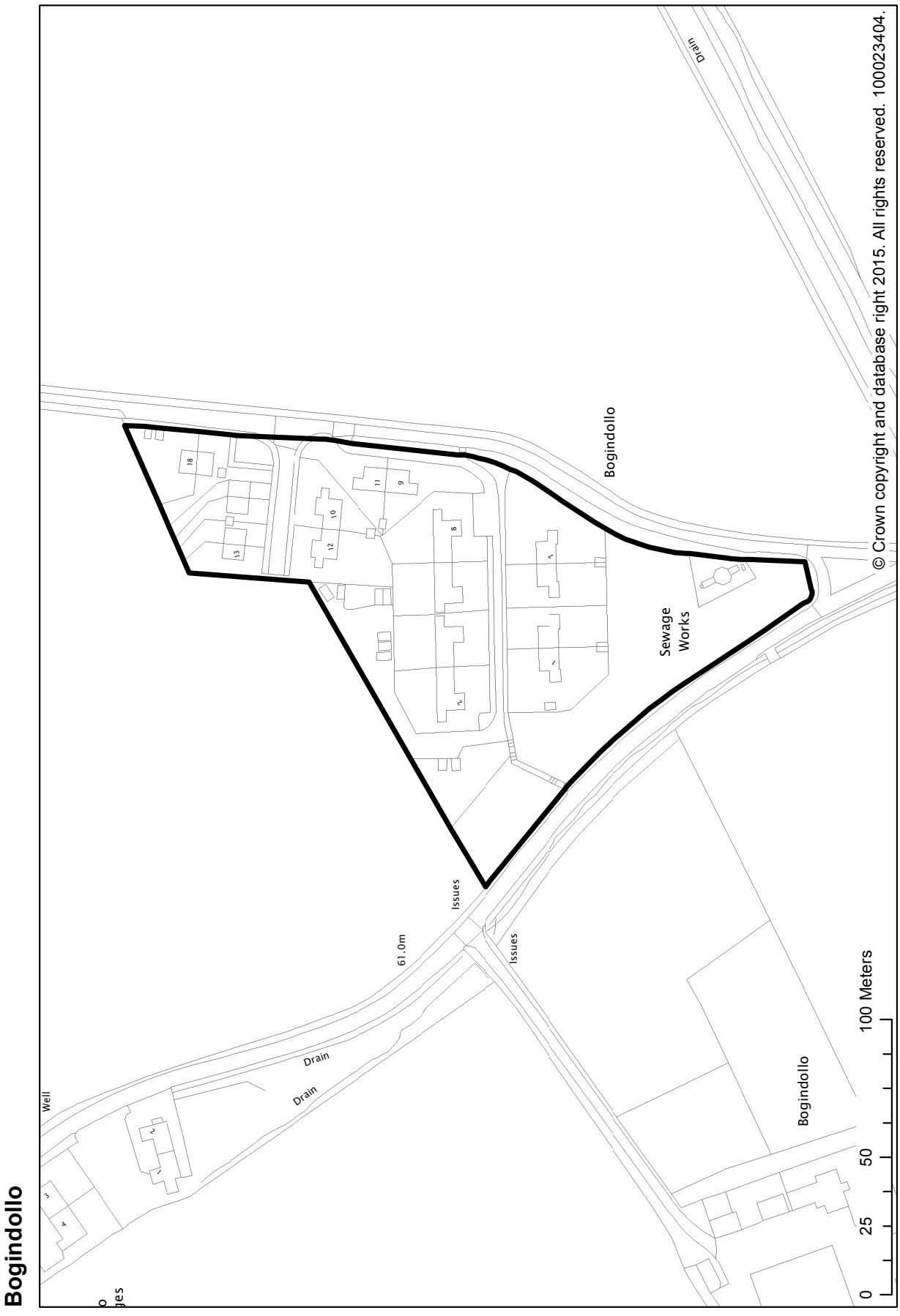
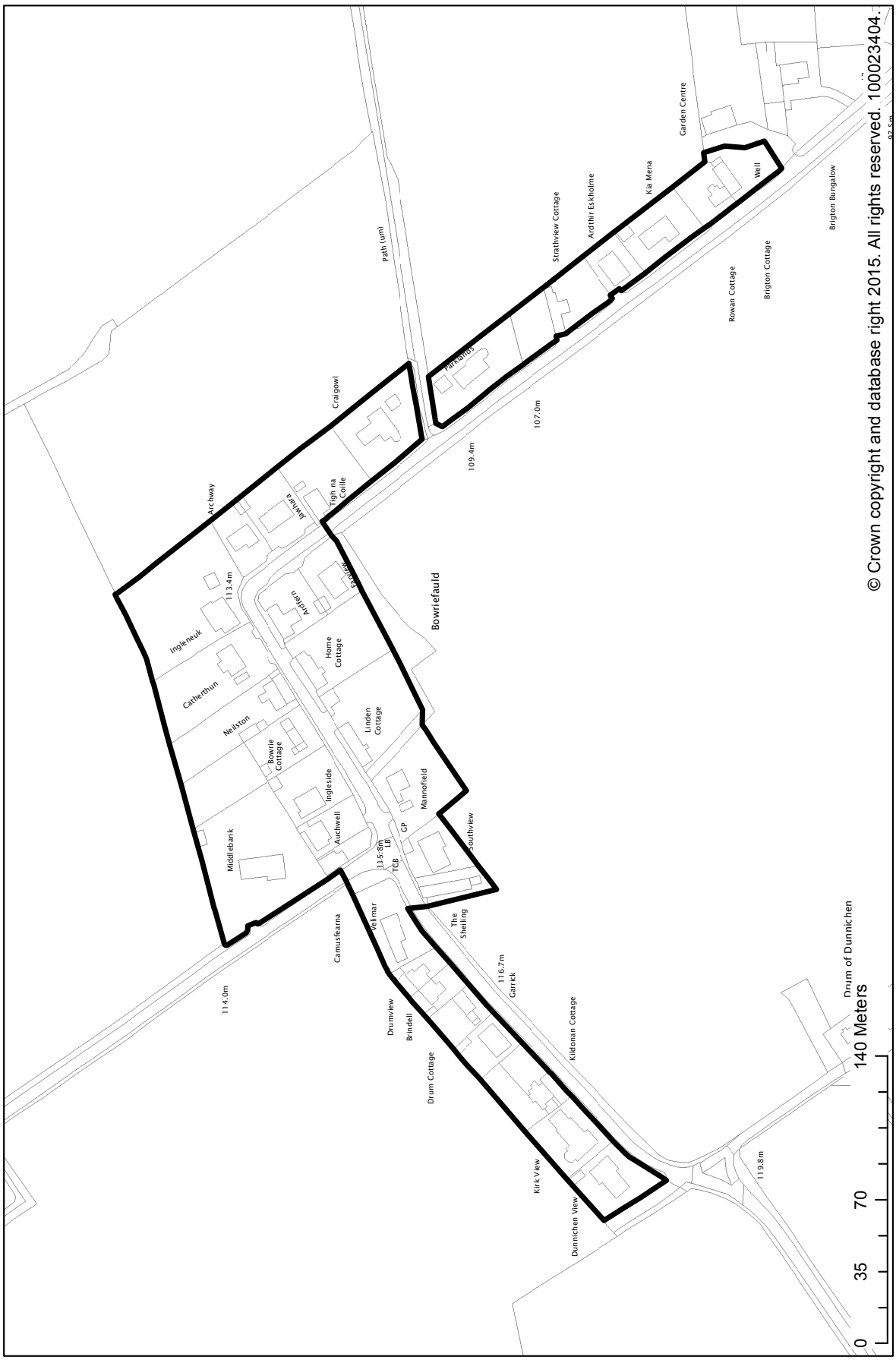
Birkhill & Muirhead




Bogindollo
Drain
Bogindollo
Sewage Works
Issues
61.0m
Issues
Drain
Drain
Well
Bogindollo
100 Meters
0
25
50
© Crown copyright and database right 2015. All rights reserved. 100023404.


Bowriefauld
Bowriefauld
Craigowl
Archway
Lamnara
Tigh na Coille
Ardfern
Ingleneuk
Catherthun
Nellston
Home Cottage
Linden Cottage
Bowrie Cottage
Ingleside
Auchwell
Middlebank
Mannofield
Southview
GP
TCB
LB
115.5m
113.4m
114.0m
116.7m
109.4m
107.0m
119.8m
Camusfearna
Vellmar
The Shelling
Garrick
Kildonan Cottage
Drumview
Brindell
Drum Cottage
Kirk View
Dunnichen View
Drum of Dunnichen
Path (um)
Parklands
Strathview Cottage
Ardthir Eskholme
Kia Mena
Garden Centre
Well
Brigton Bungalow
Rowan Cottage
Brigton Cottage
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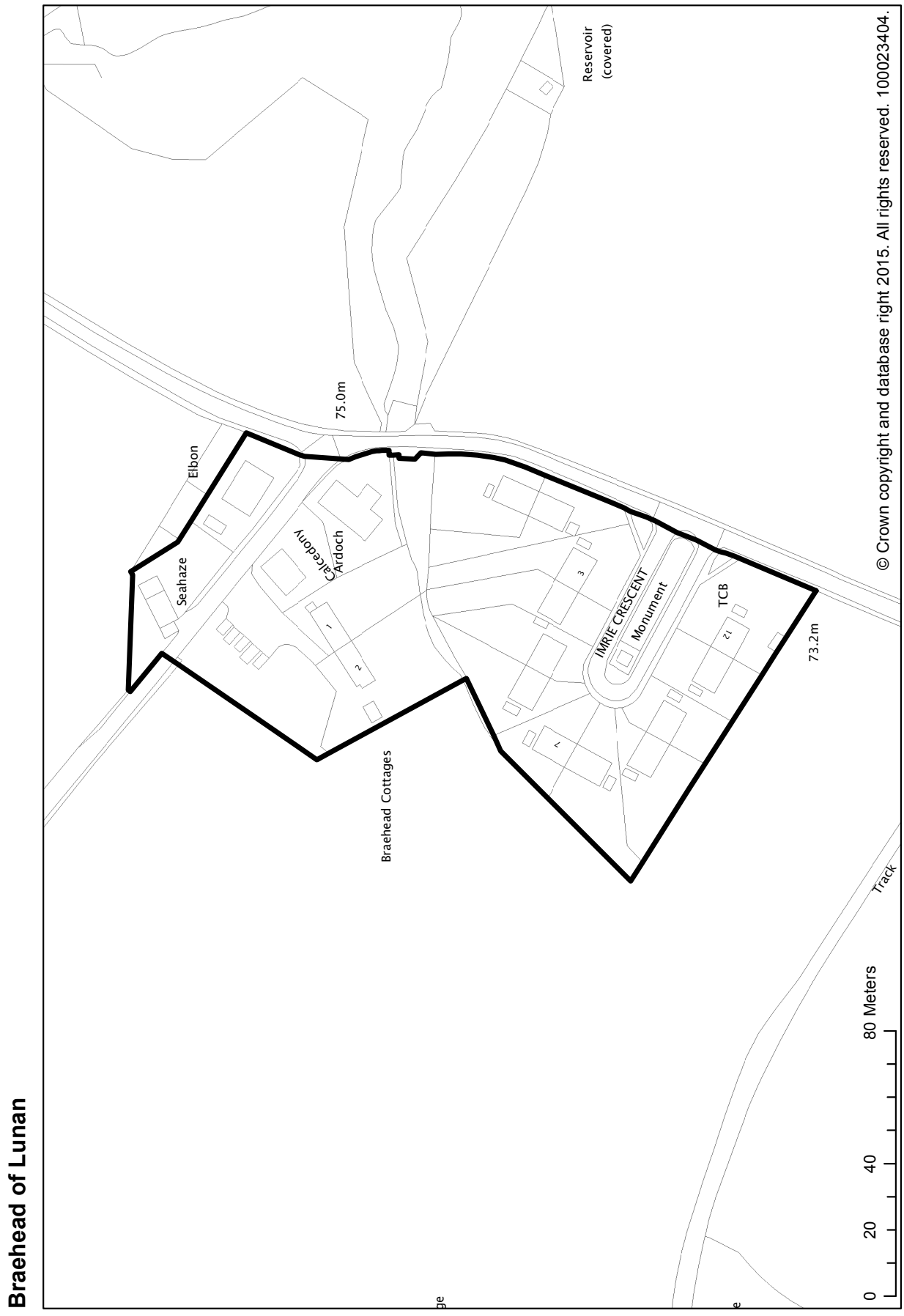
0
35
70
140 Meters


Braehead of Lunan
Reservoir (covered)
75.0m
Elbon
Seahaze
Caledony
Ardoch
1
2
3
7
IMRIE CRESCENT
Monument
TCB
21
73.2m
Braehead Cottages
Track
0
20
40
80 Meters
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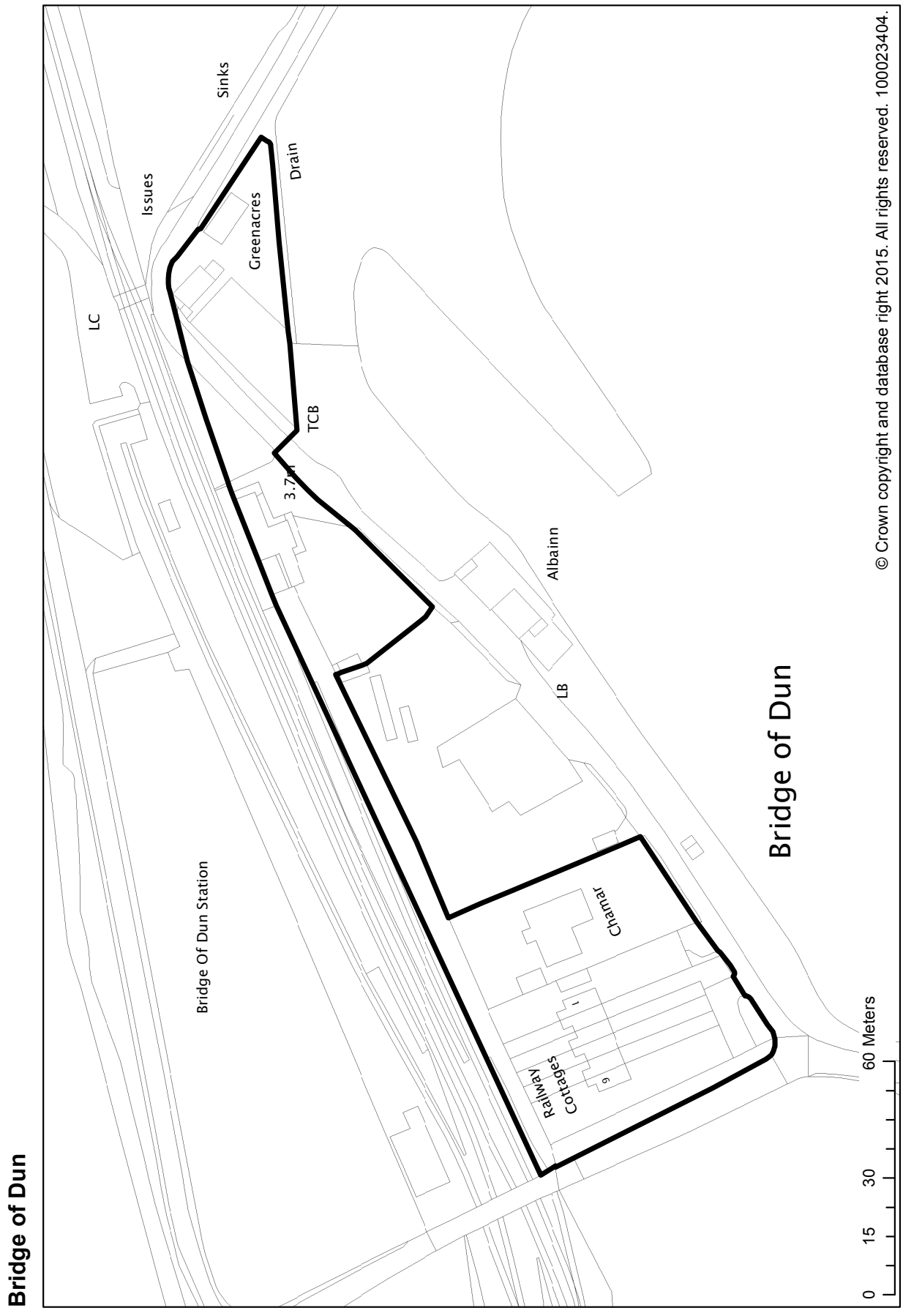
Bridge of Dun
Sinks
Issues
Drain
Greenacres
LC
TCB
3.7m
Albainn
LB
Bridge Of Dun Station
Chamar
Railway Cottages
1
9
Bridge of Dun
0 15 30 60 Meters
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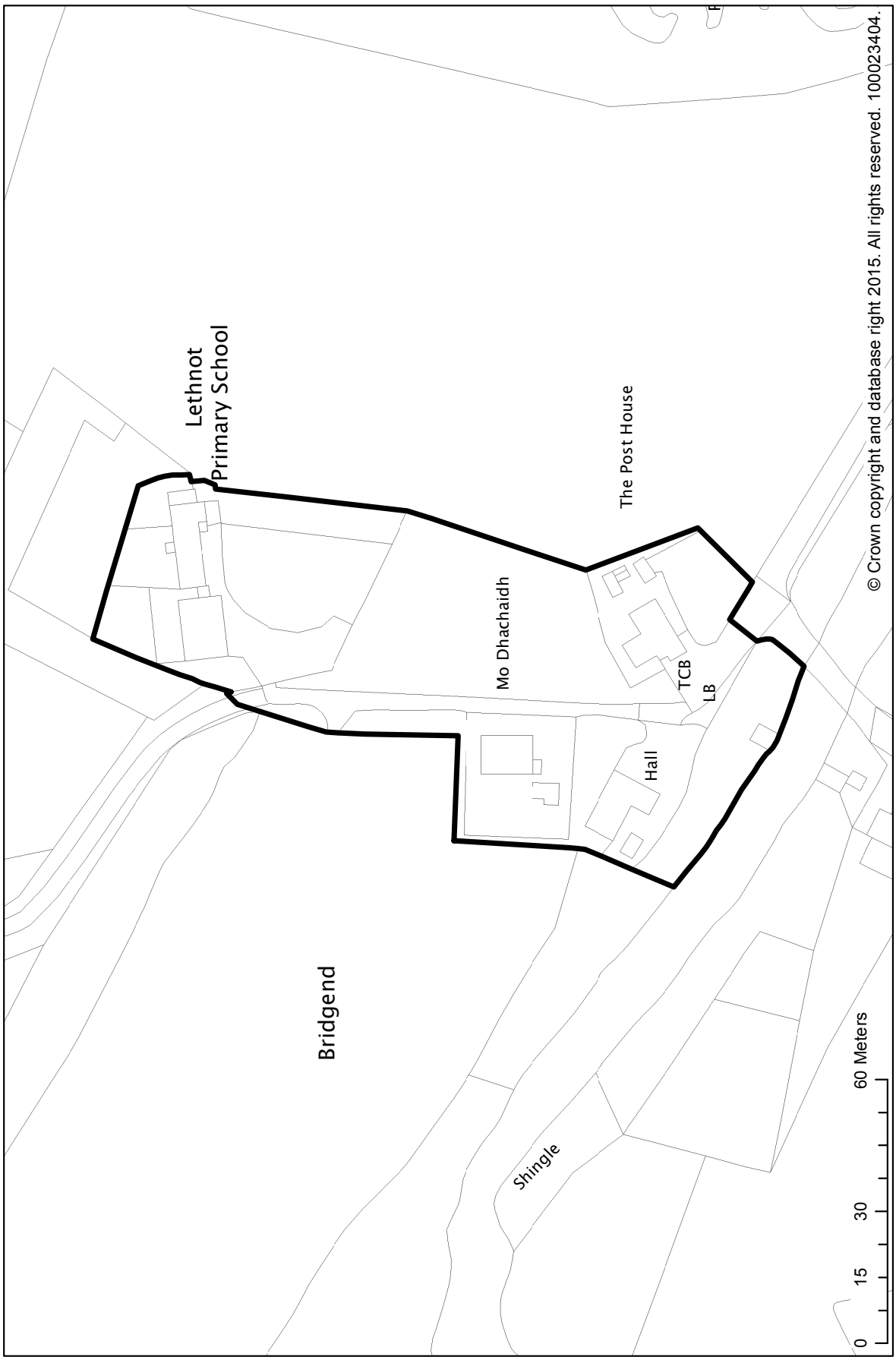
Bridgend of Lethnot
Lethnot Primary School
The Post House
Mo Dhachaidh
TCB
LB
Hall
Bridgend
Shingle
0
15
30
60 Meters
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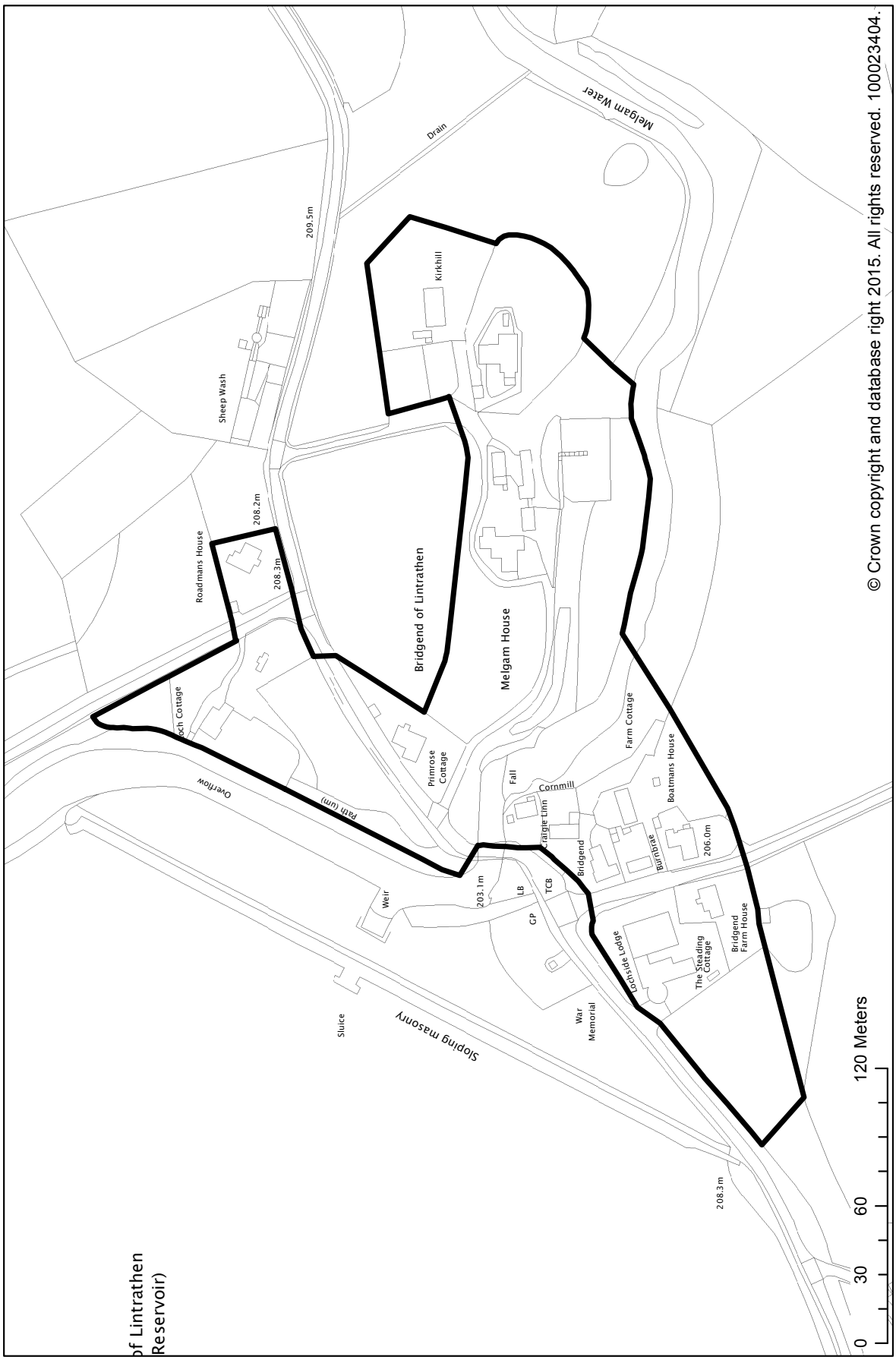
Bridgend of Lintrathen
of Lintrathen (Reservoir)
Melgam Water
Drain
209.5m
Kirkhill
Sheep Wash
208.2m
208.3m
Roadmans House
Bridgend of Lintrathen
Melgam House
Farm Cottage
Boatmans House
Primrose Cottage
Fall
Cornmill
Craigie Linn
Bridgend
Burnbrae
206.0m
Overflow
Path (um)
Weir
203.1m
LB
TCB
GP
Sluice
Sloping masonry
War Memorial
Orchside Lodge
The Steading Cottage
Bridgend Farm House
208.3m
0
30
60
120 Meters
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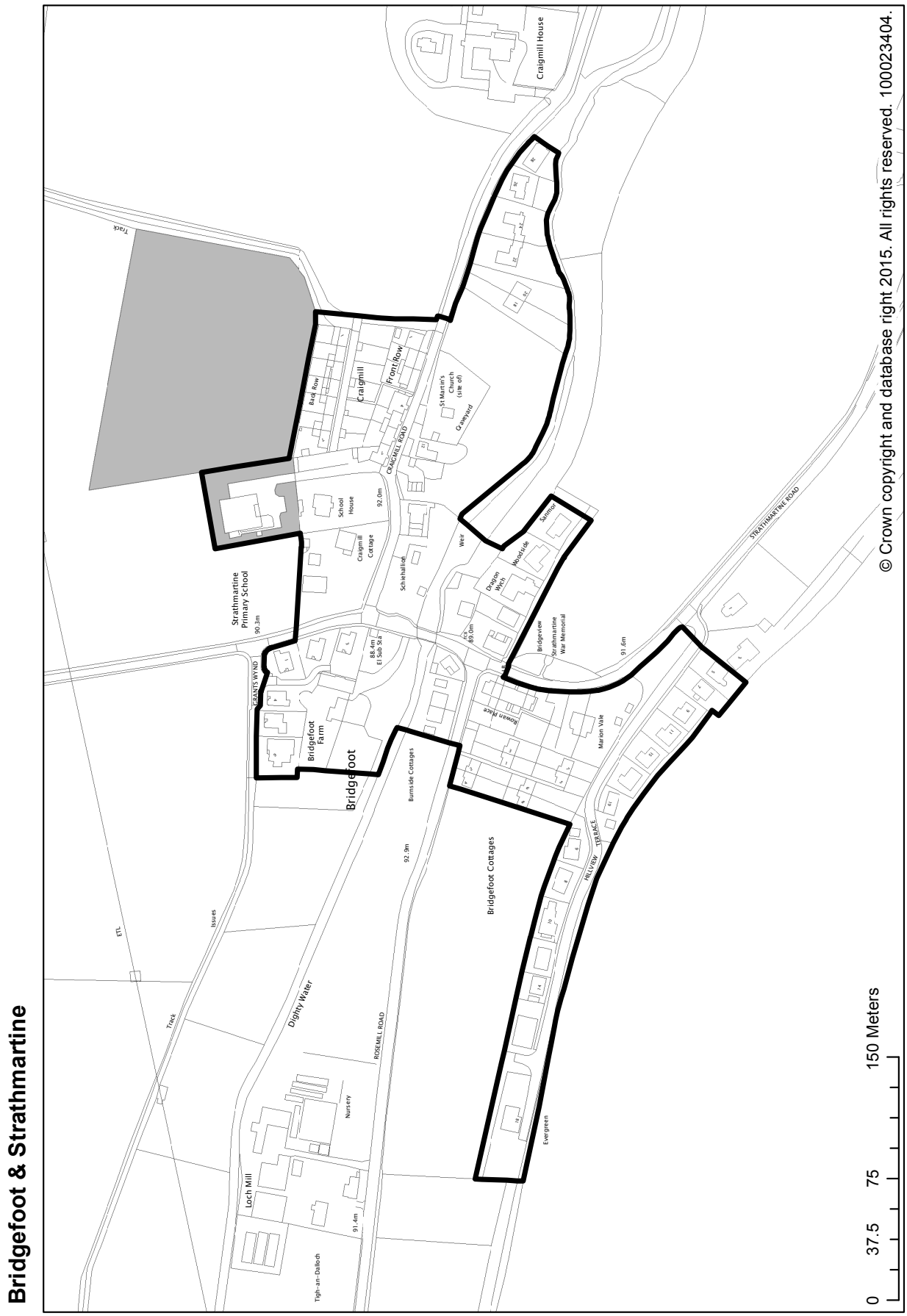
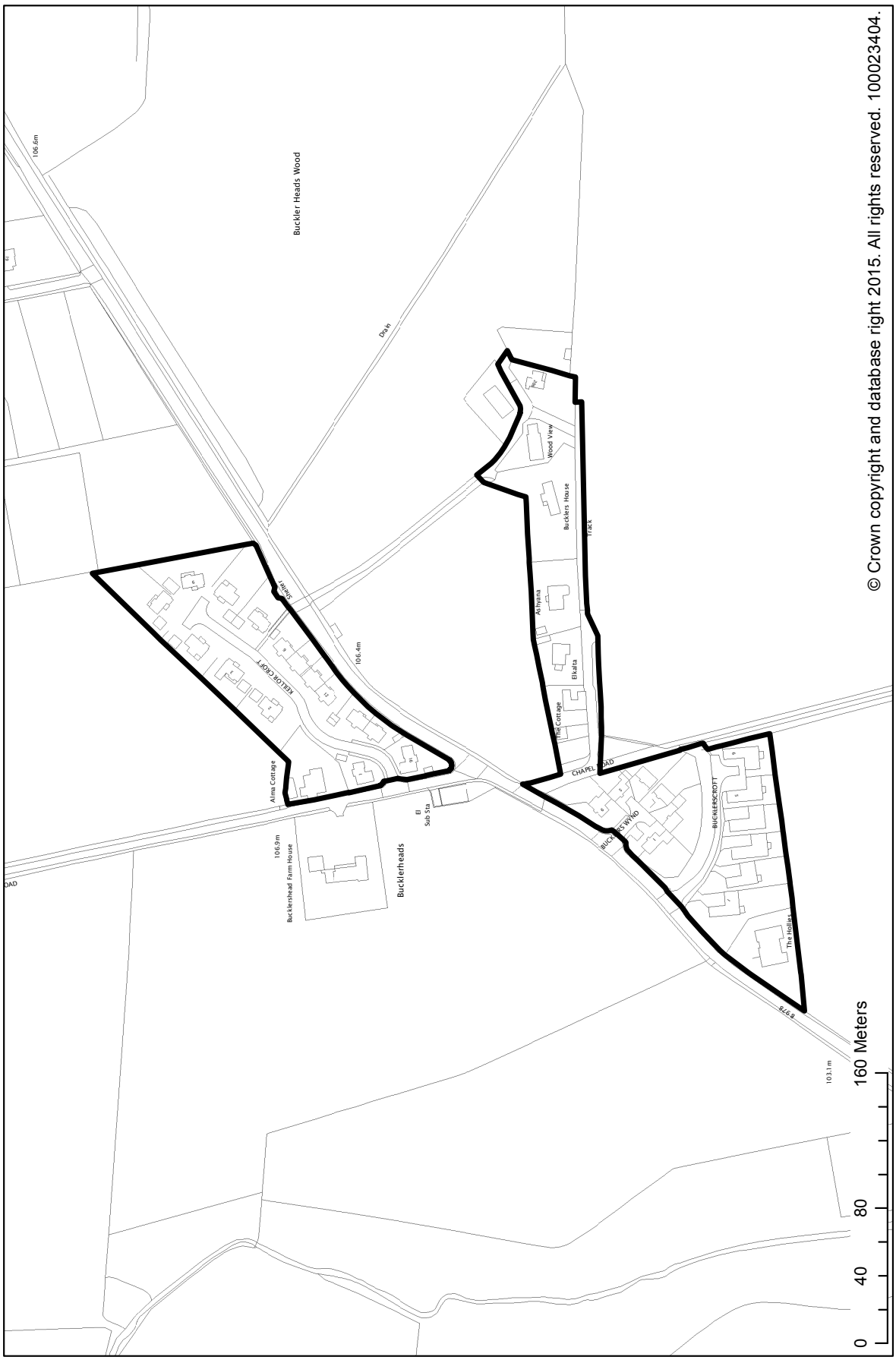
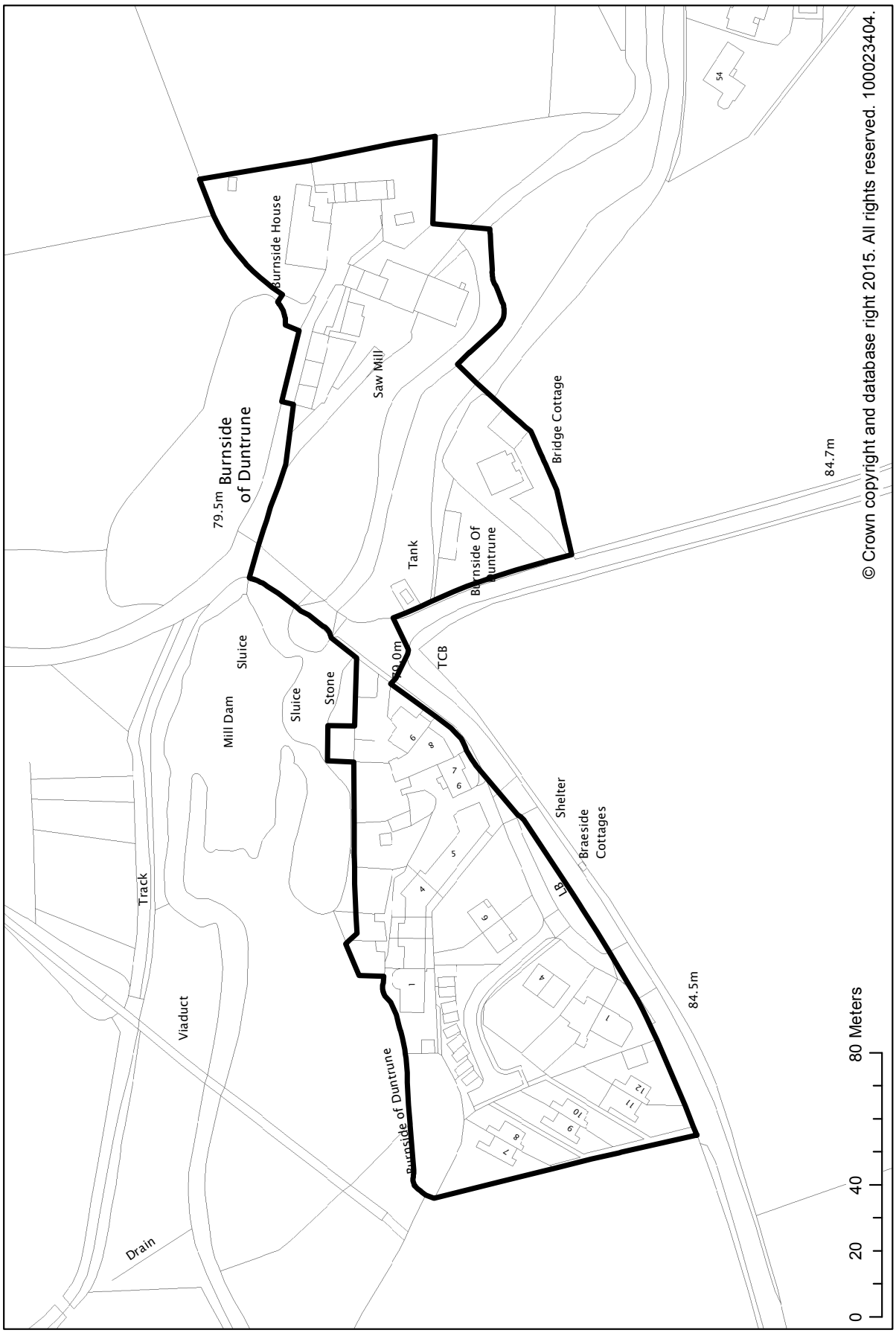
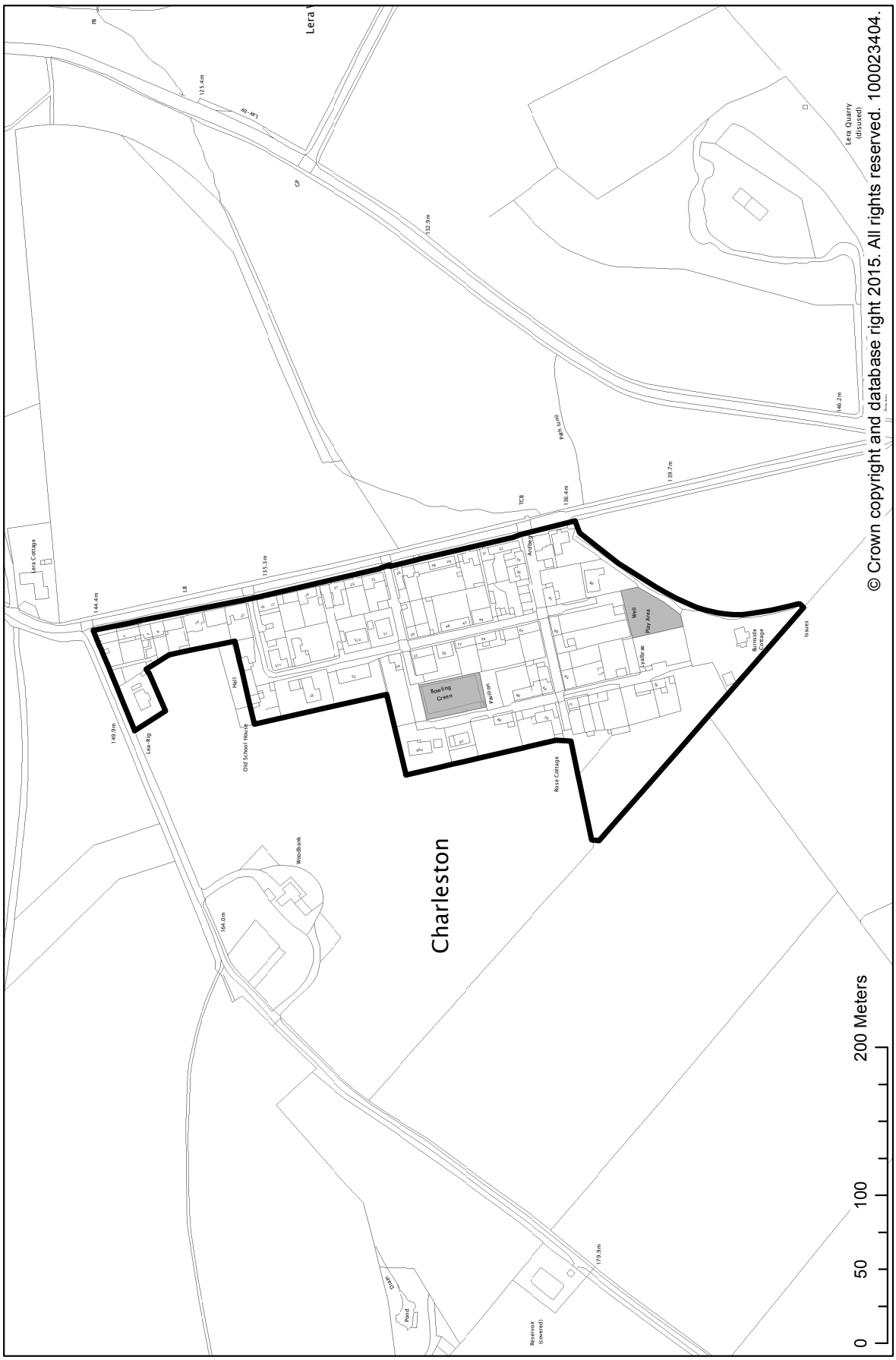

Bridgefoot & Strathmartine
Craigmill House
Track
Back Row
Craigmill
Front Row
St Martin's Church (site of)
Graveyard
CRAIGMILL ROAD
School House
92.0m
Craigmill Cottage
Schiehallion
Weir
Strathmartine Primary School
90.3m
Meadside
Dalgon Wech
Bridgeview
Strathmartine War Memorial
88.4m El Sub Sta
GRANTS WYND
Bridgefoot Farm
Bridgefoot
Bowan Place
Marion Vale
Burnside Cottages
92.9m
Bridgefoot Cottages
HILLVIEW
TERRACE
Evergreen
ETL
Issues
Track
Dighty Water
ROSEMILL ROAD
Nursery
Loch Mill
91.4m
Tigh-an-Dalloch
STRATHMARTINE ROAD
91.6m
© Crown copyright and database right 2015. All rights reserved. 100023404.
0
37.5
75
150 Meters

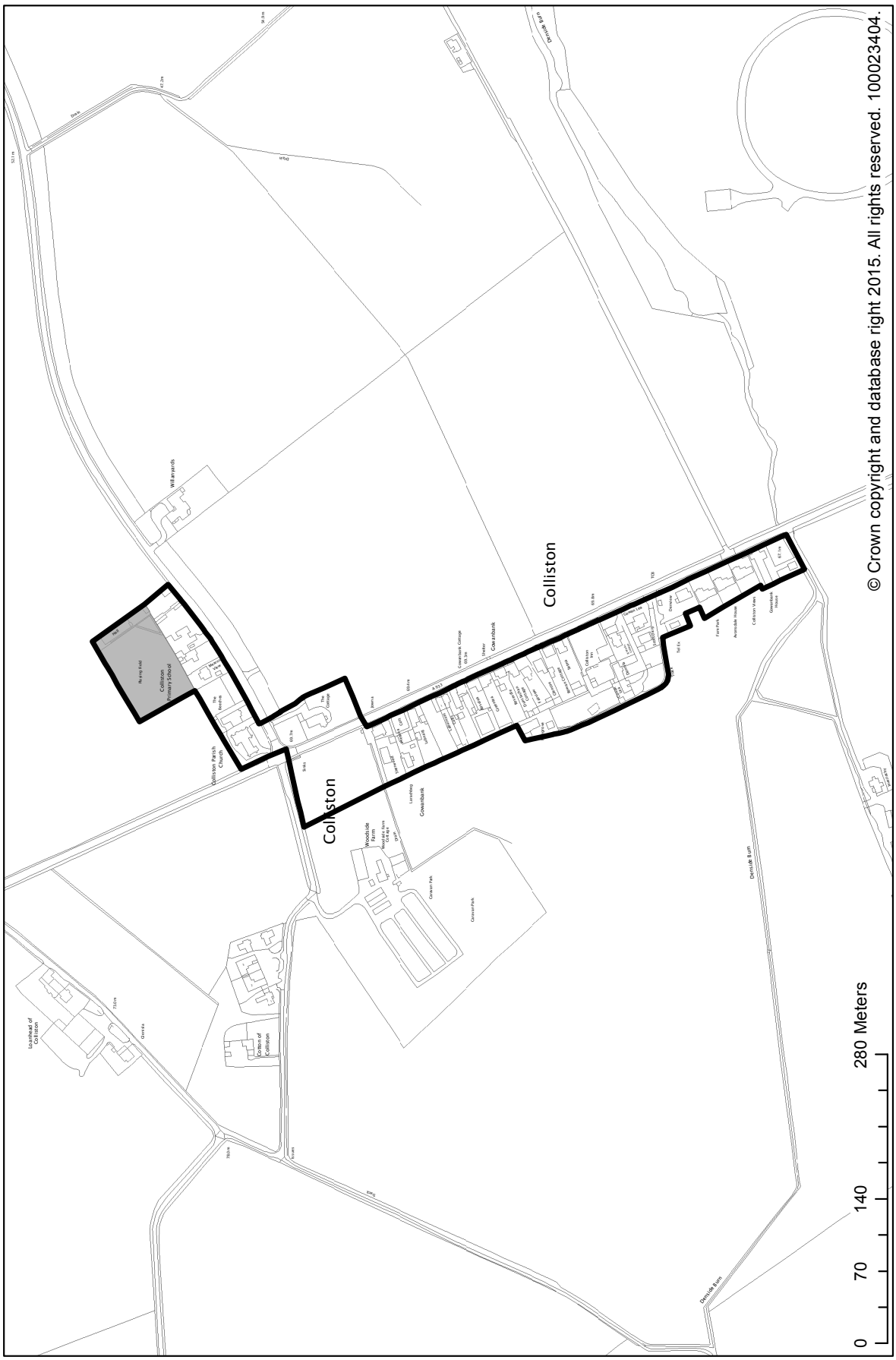


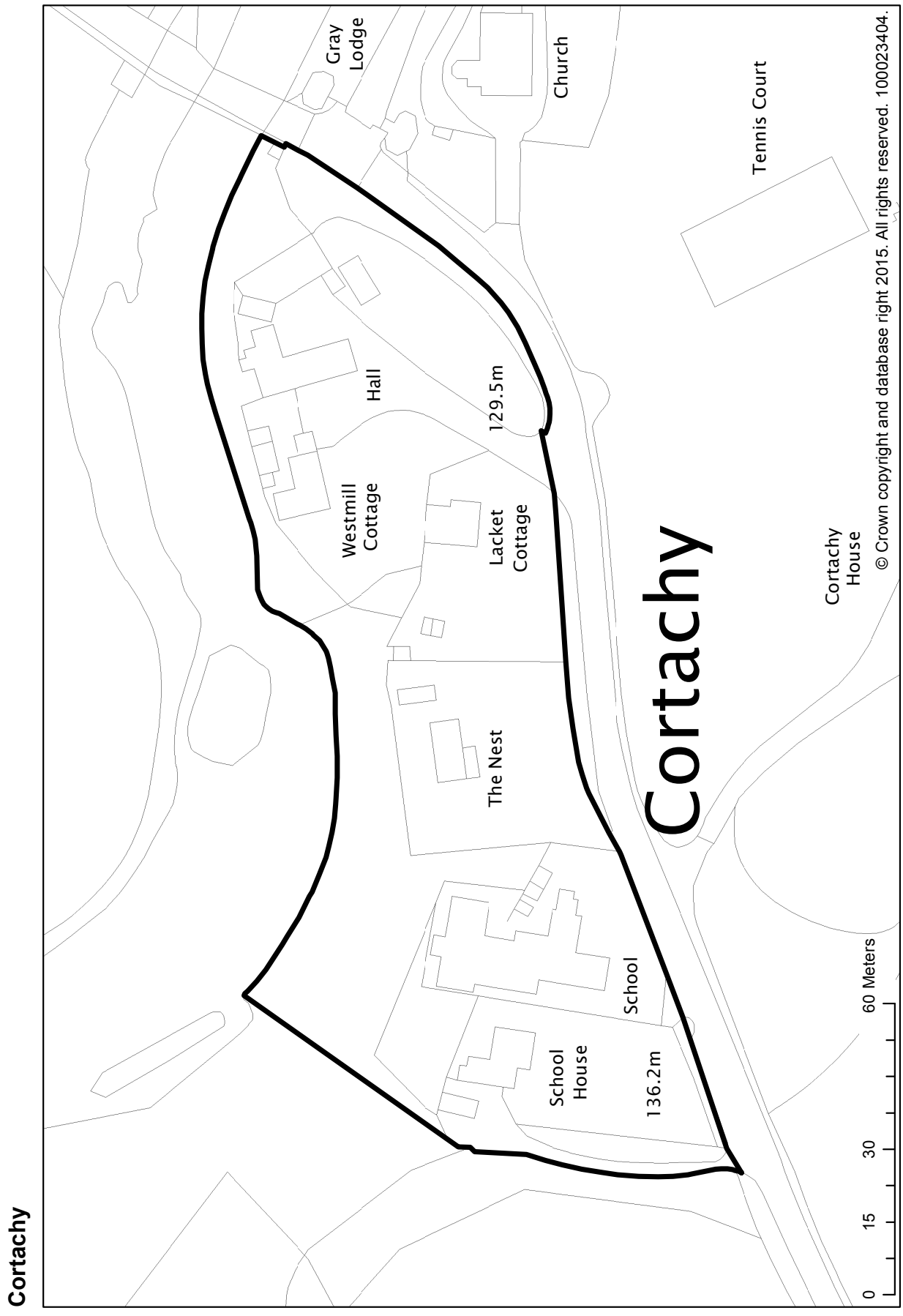
Burnside of Duntrune





Colliston




Cortachy
Gray Lodge
Church
Tennis Court
Hall
129.5m
Westmill Cottage
Lacket Cottage
Cortachy House
The Nest
School
School House
136.2m
0
15
30
60 Meters
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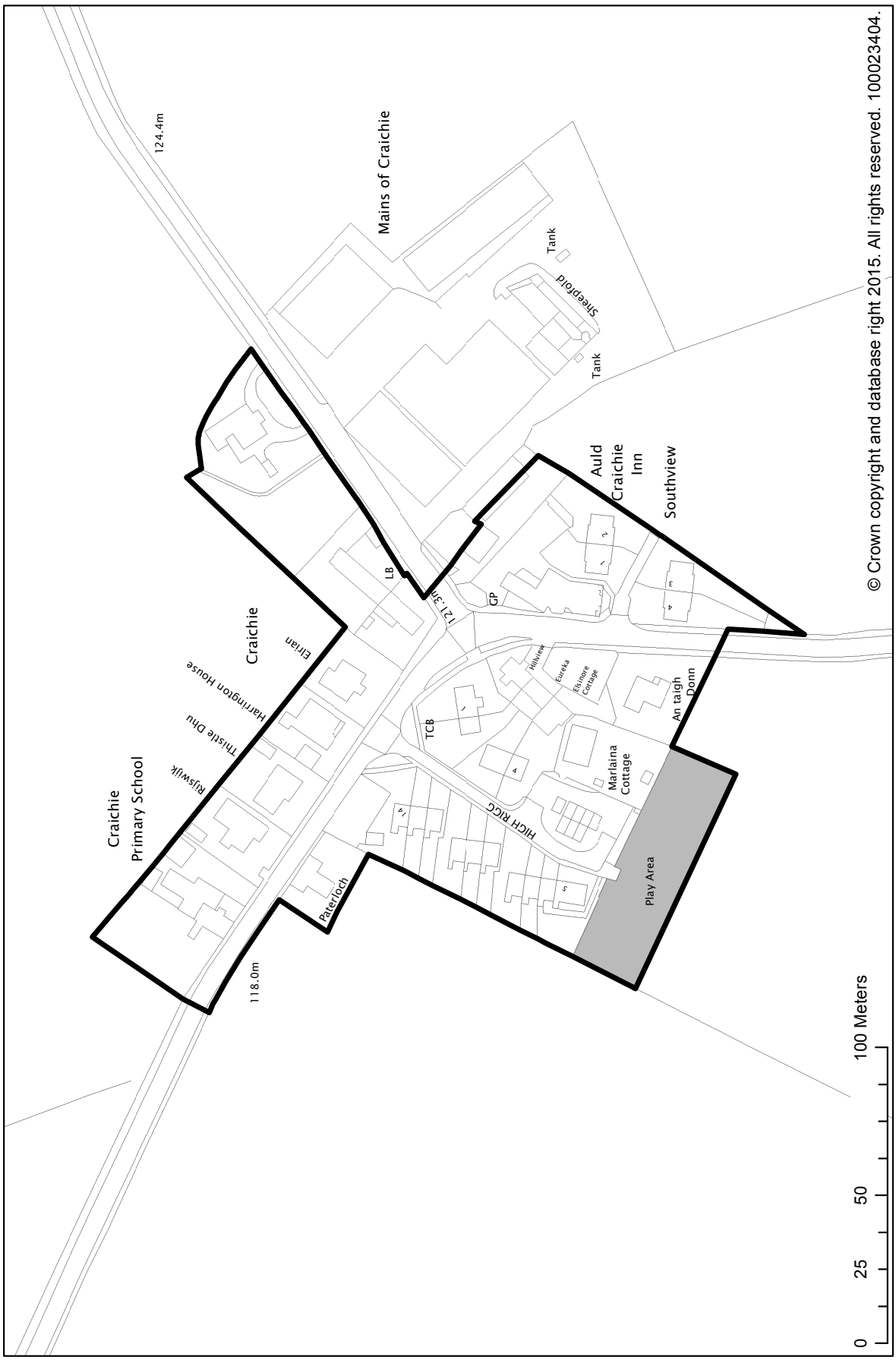
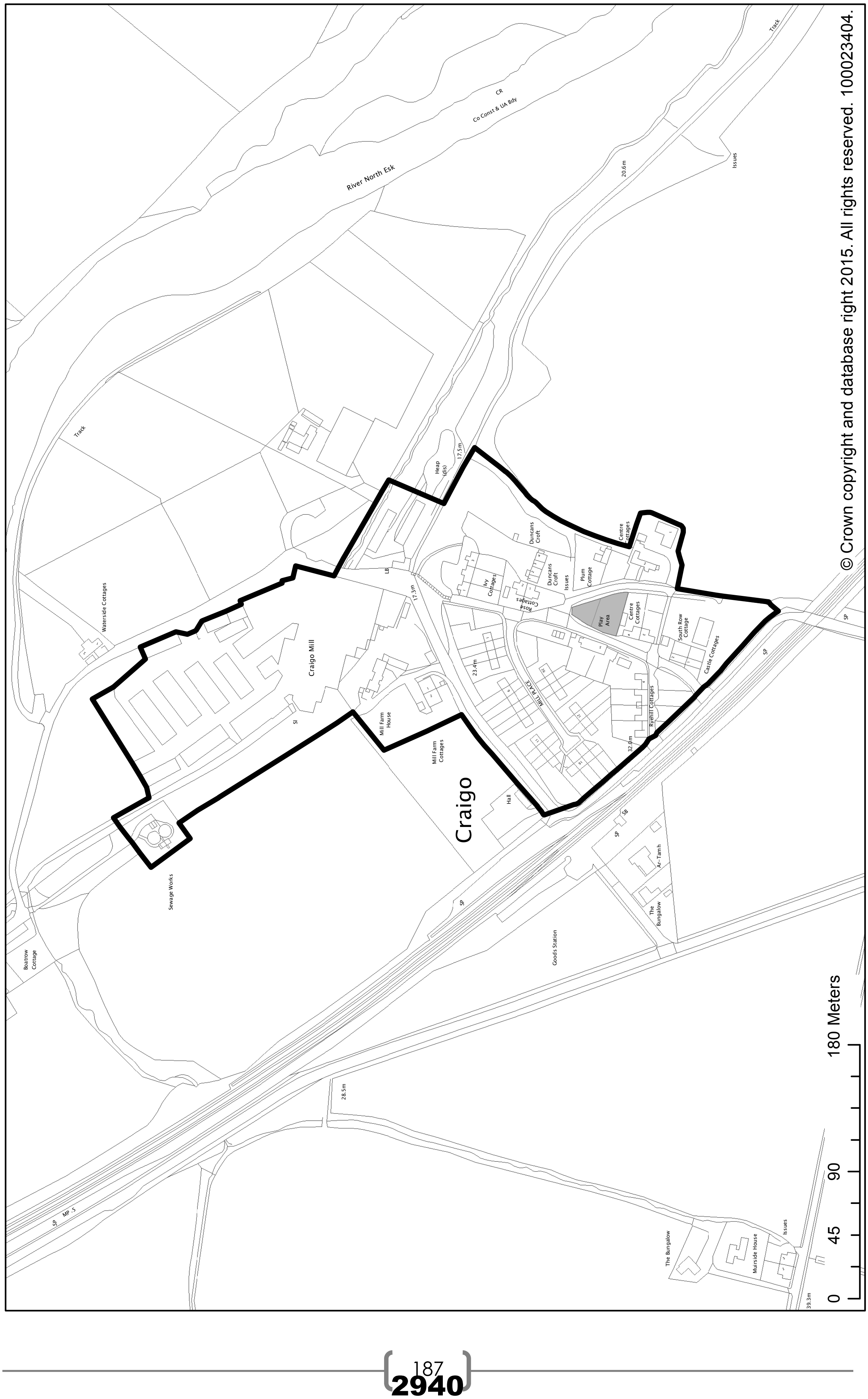
Cortachy


Craichie
124.4m
Mains of Craichie
Tank
Shreepbld
Tank
Auld Craichie Inn
Southview
LB
CP
TCB
Hillview
Eureka
Etsimore Cottage
An taigh Donn
Marlaina Cottage
HIGH RIGG
Play Area
Craichie Primary School
Kilswylk
Thistle Dhu
Harrington House
Elrian
Craichie
Paterloch
118.0m
© Crown copyright and database right 2015. All rights reserved. 100023404.
0
25
50
100 Meters

Craigo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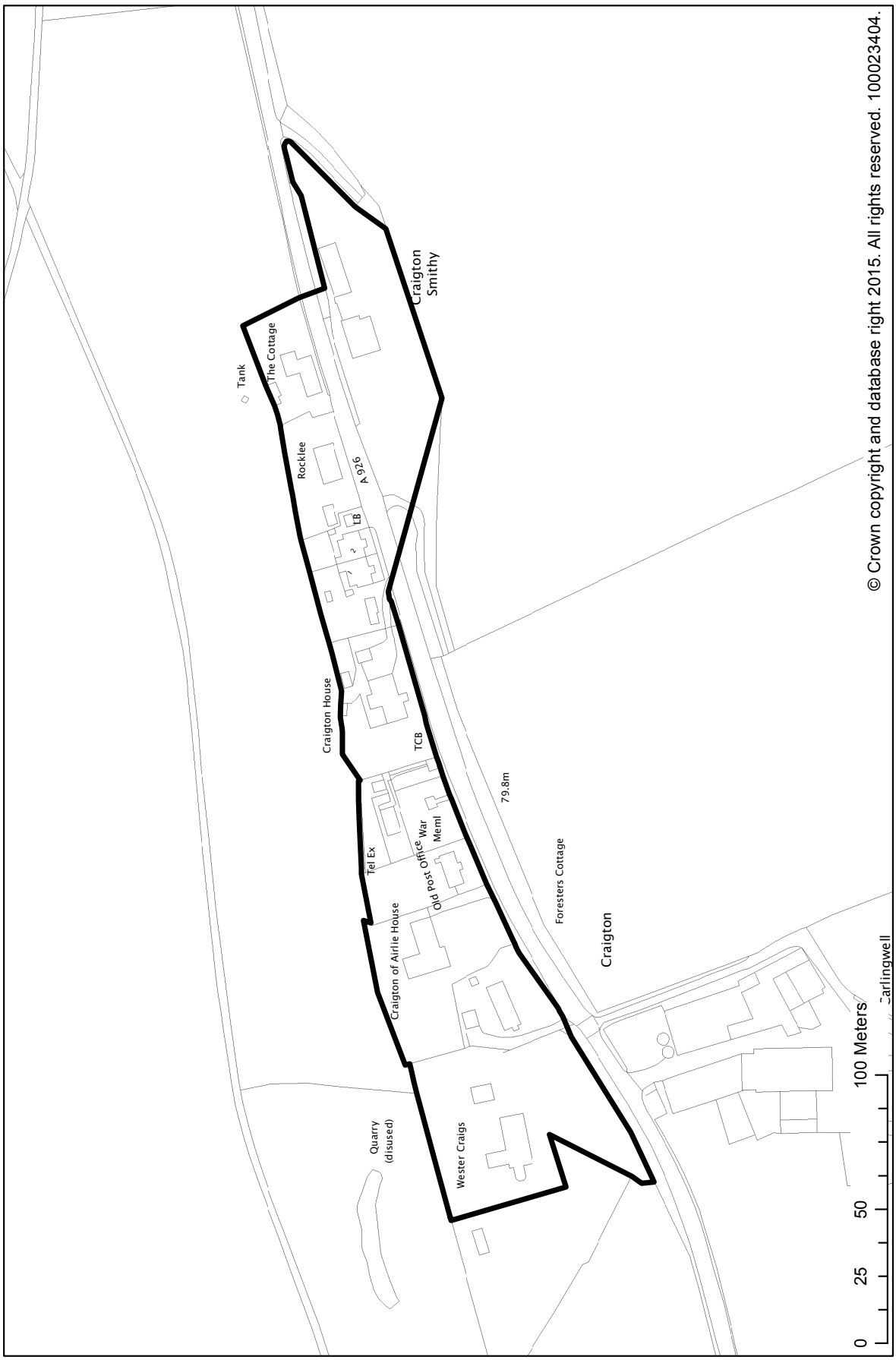
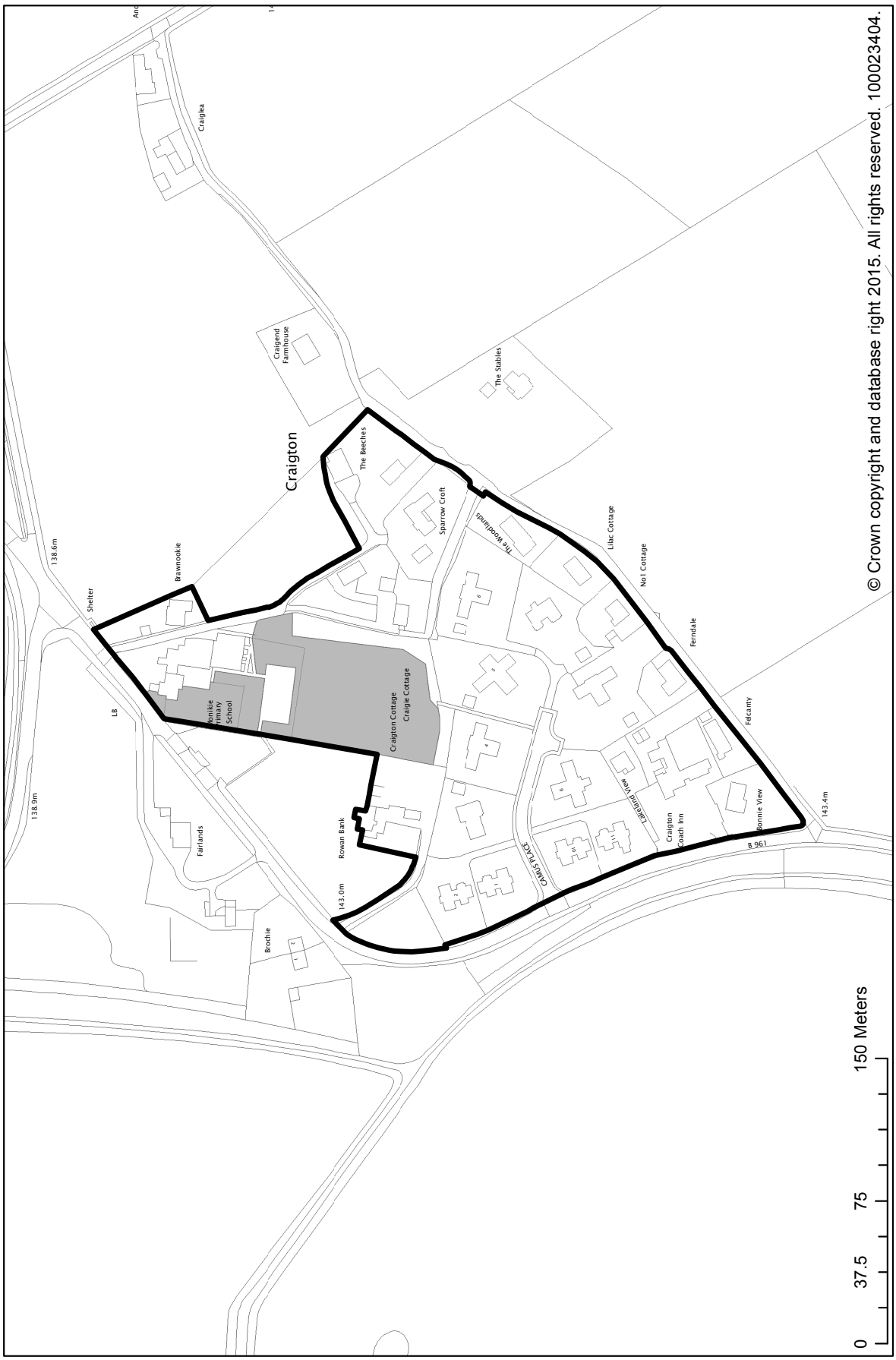
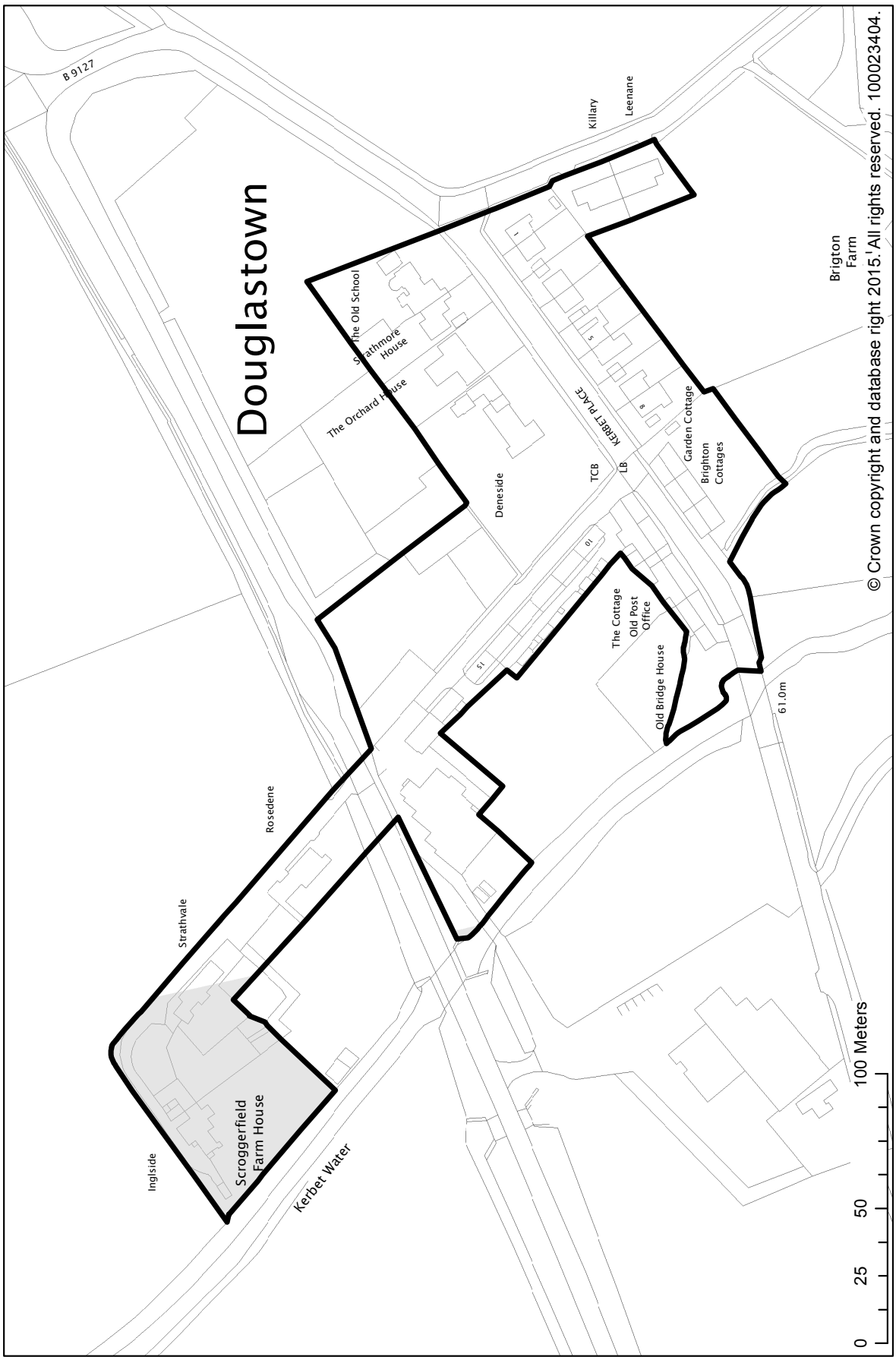
River North Esk
Craigo Mill
Craigo
Mill Farm House
Mill Farm Cottages
Sewage Works
Goods Station
Watersyde Cottages
Boatrow Cottage
Muirside House
The Bungalow
180 Meters
90
45
0

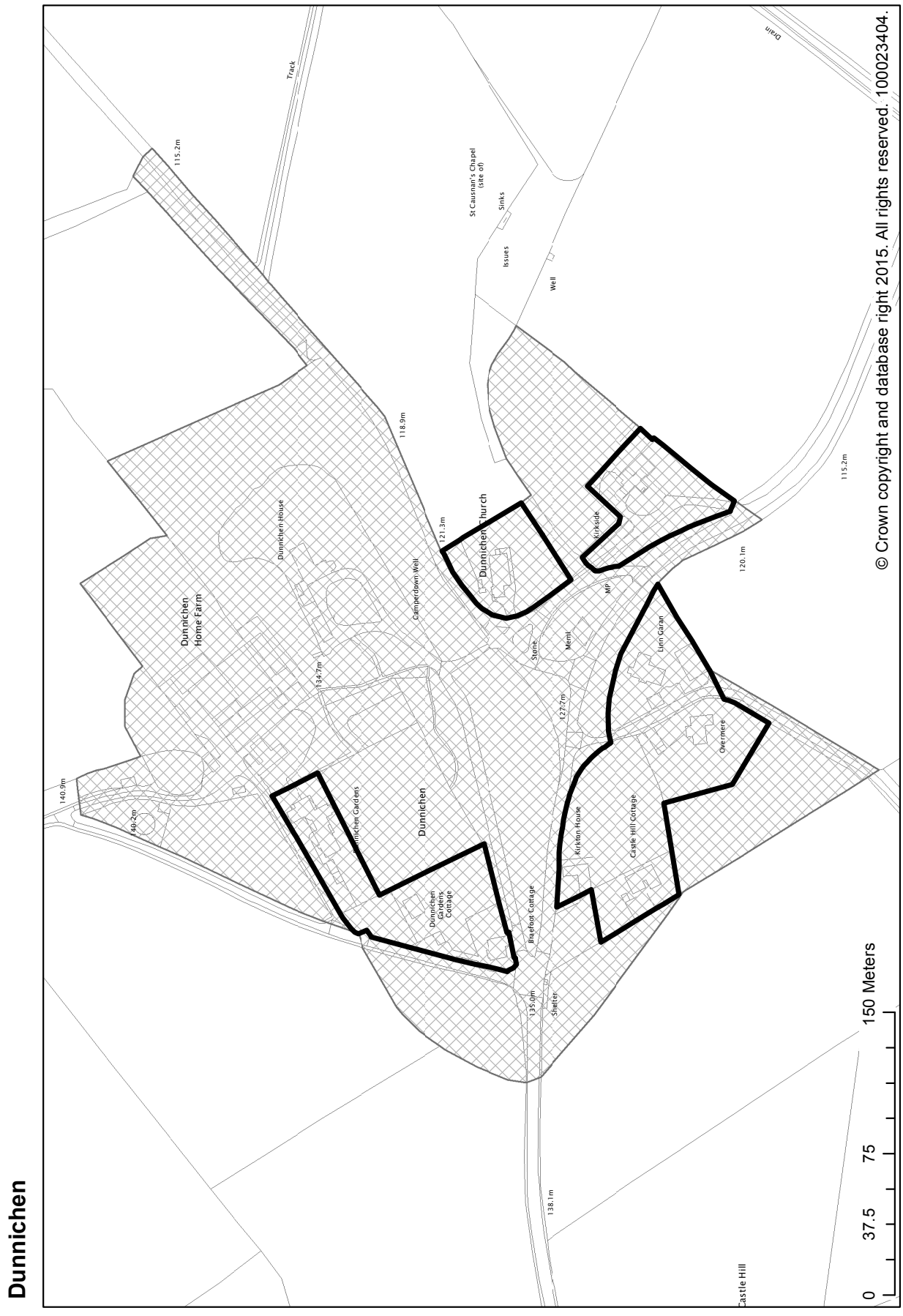
Craigton of Airlie





Douglastown




Dunnichen
Track
Drain
St Causnan's Chapel (site of)
Sinks
Issues
Well
115.2m
118.9m
121.3m
120.1m
115.2m
Dunnichen Home Farm
Dunnichen House
Campendown Well
Dunnichen Church
Kirkside
MP
Stone
Menhir
Linn Garan
134.7m
127.7m
Dunnichen Gardens
Dunnichen
Dunnichen Gardens Cottage
Braefoot Cottage
Kirkton House
Castle Hill Cottage
Dwr mers
140.9m
140.2m
135.0m
Shelter
138.1m
Castle Hill
0
37.5
75
150 Meters
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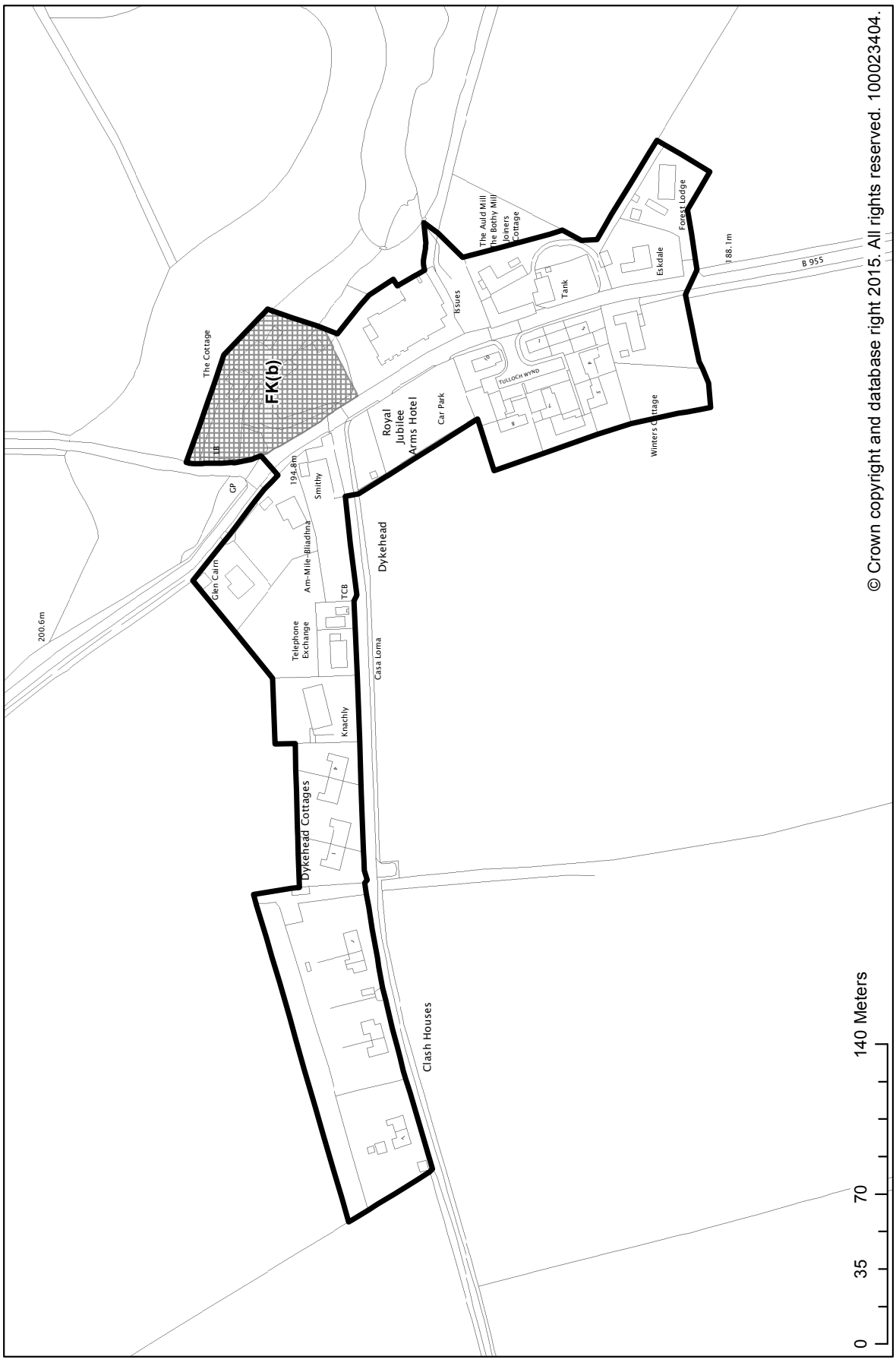
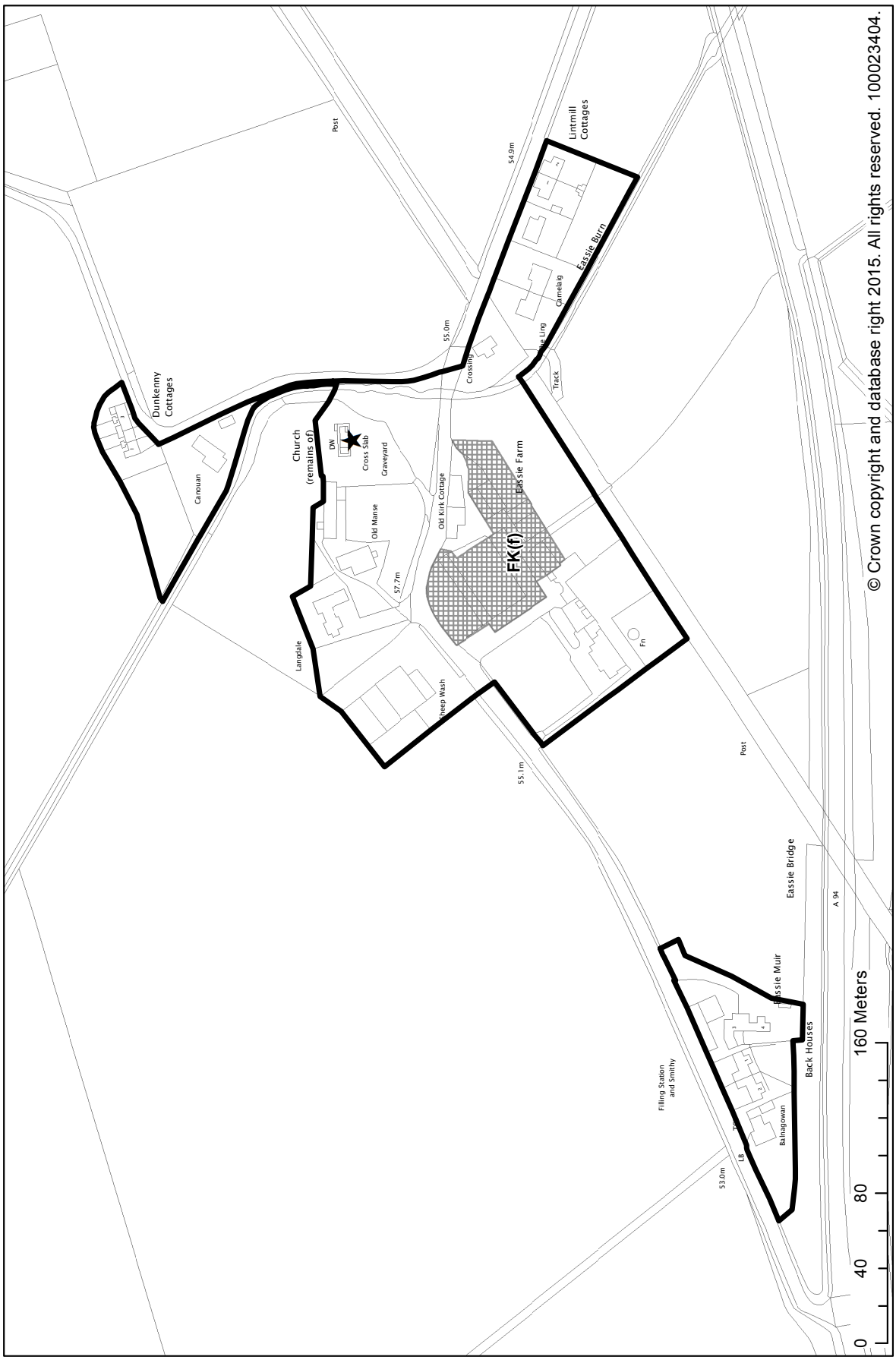
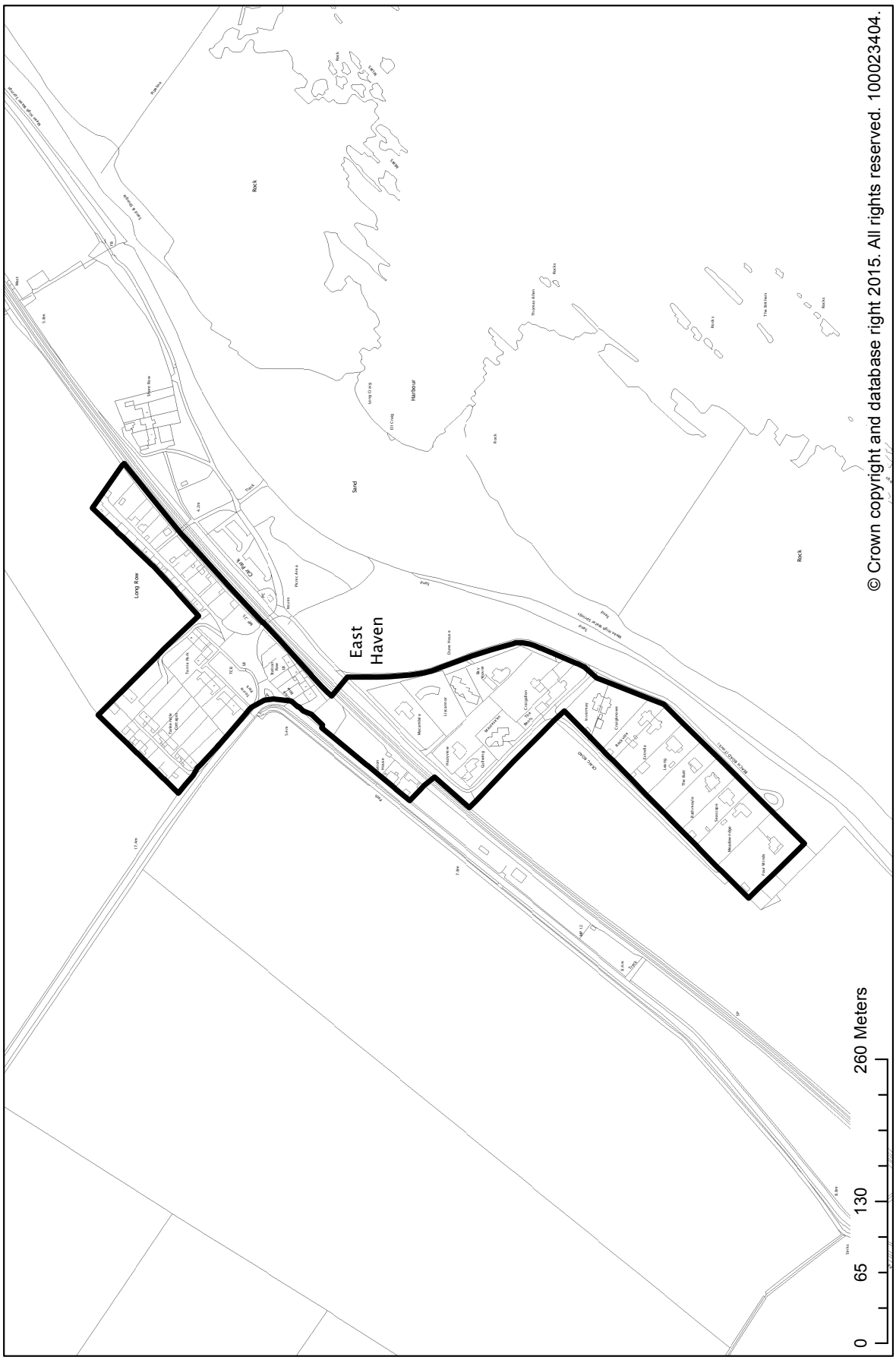


Eassie Muir




East Haven
East Haven
Long Row
Harbour
Rock
Sand
0
65
130
260 Meters
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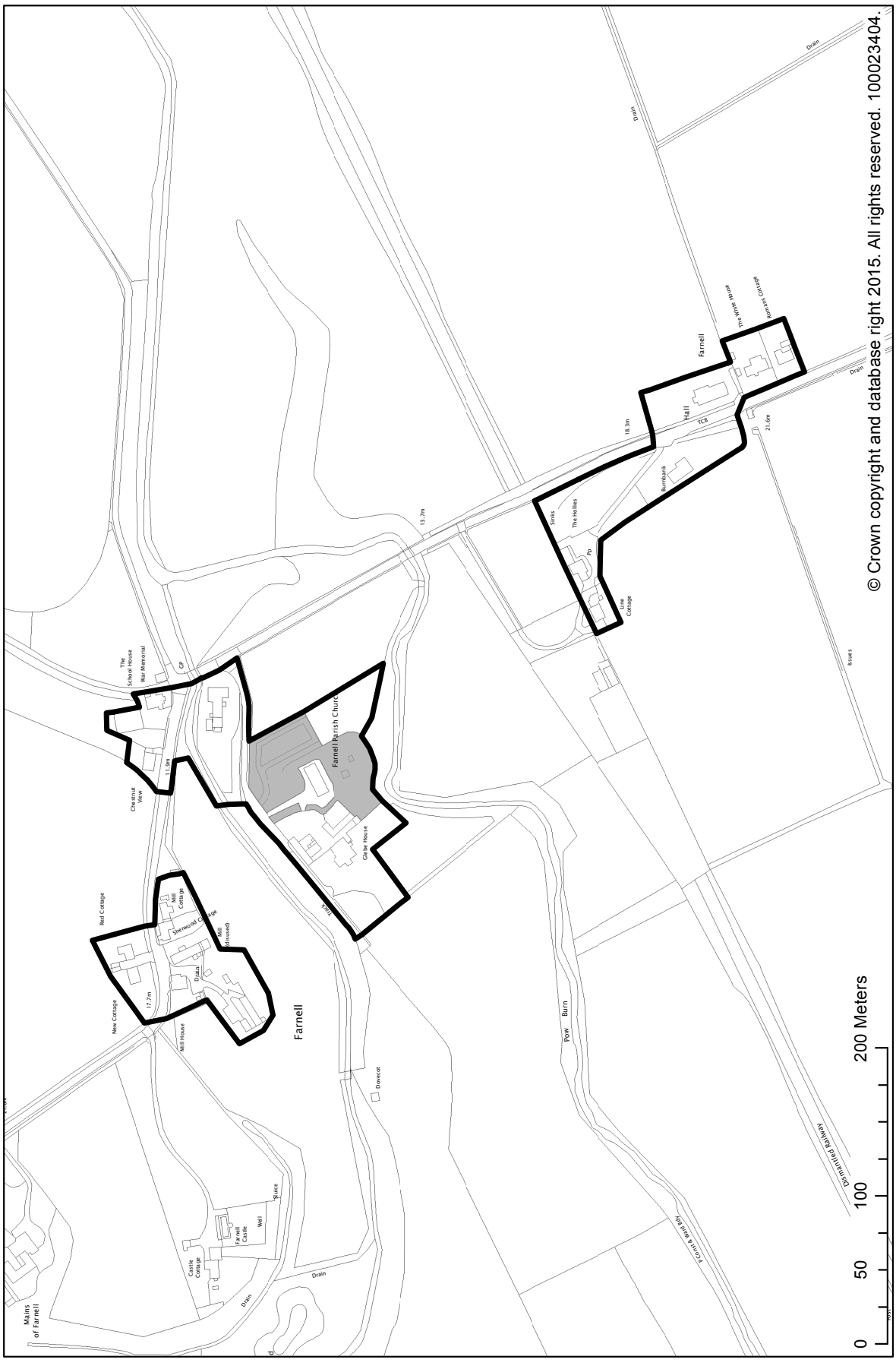
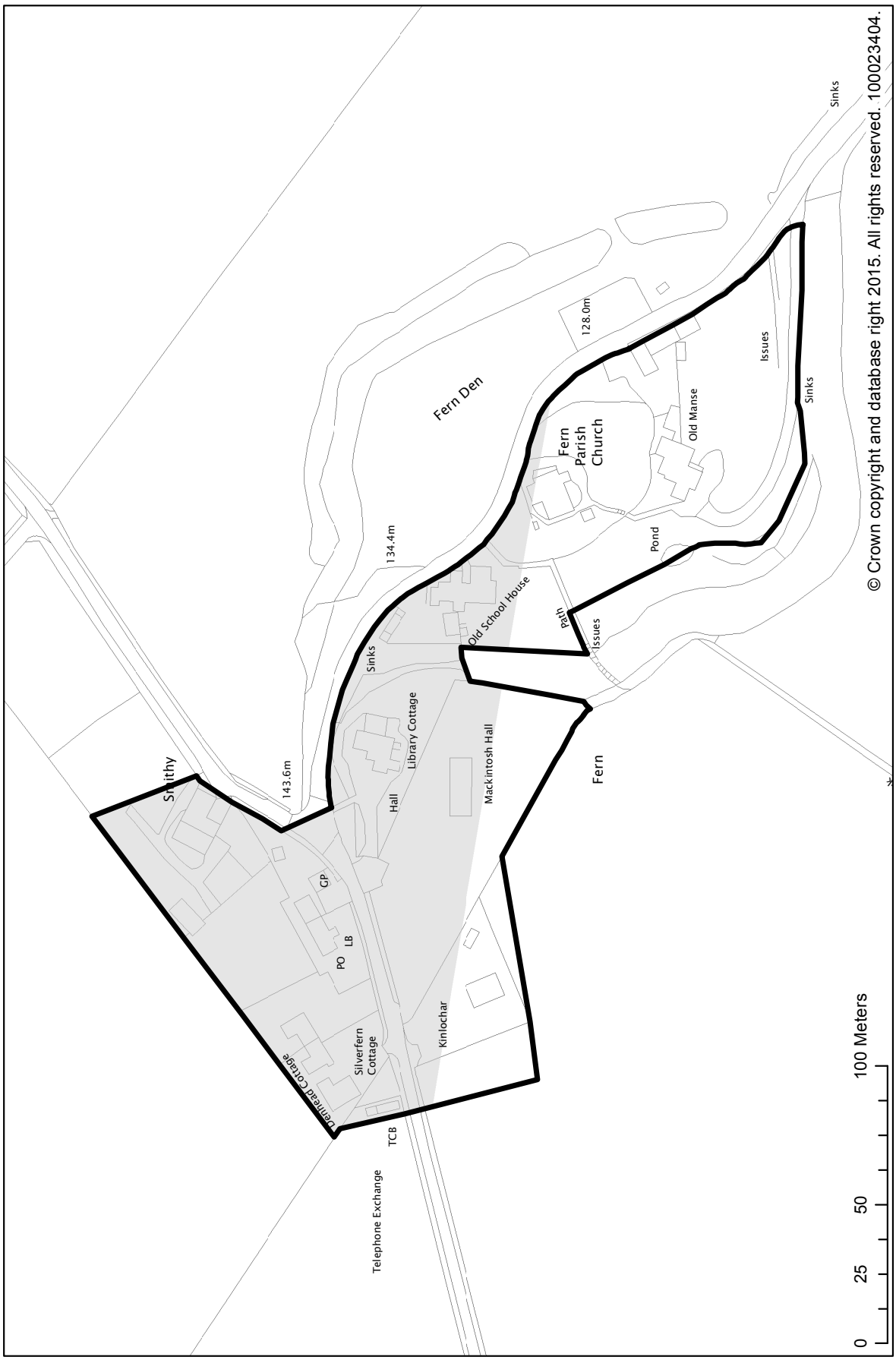
SETTLEMENT STATEMENTS, VILLAGE DIRECTORY & DEVELOPMENT BOUNDARY MAPS




Fern
Fern Den
Fern Parish Church
Old Manse
Pond
Issues
Sinks
128.0m
134.4m
143.6m
Old School House
Path
Library Cottage
Hall
Mackintosh Hall
Smithy
GP
PO
LB
Silverfern Cottage
Kinlochar
Dellhead Cottage
TCB
Telephone Exchange
Fern
0
25
50
100 Meters
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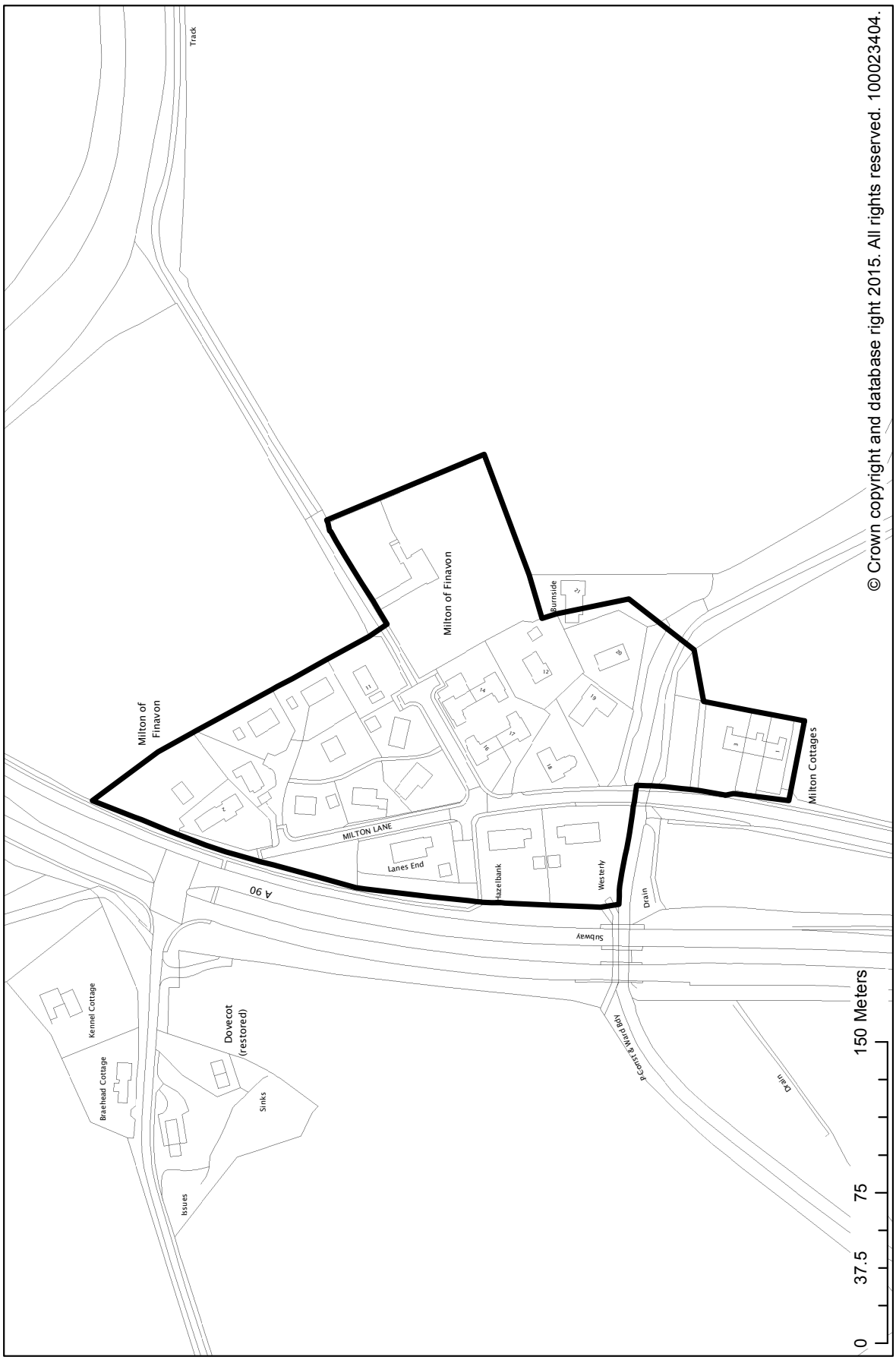
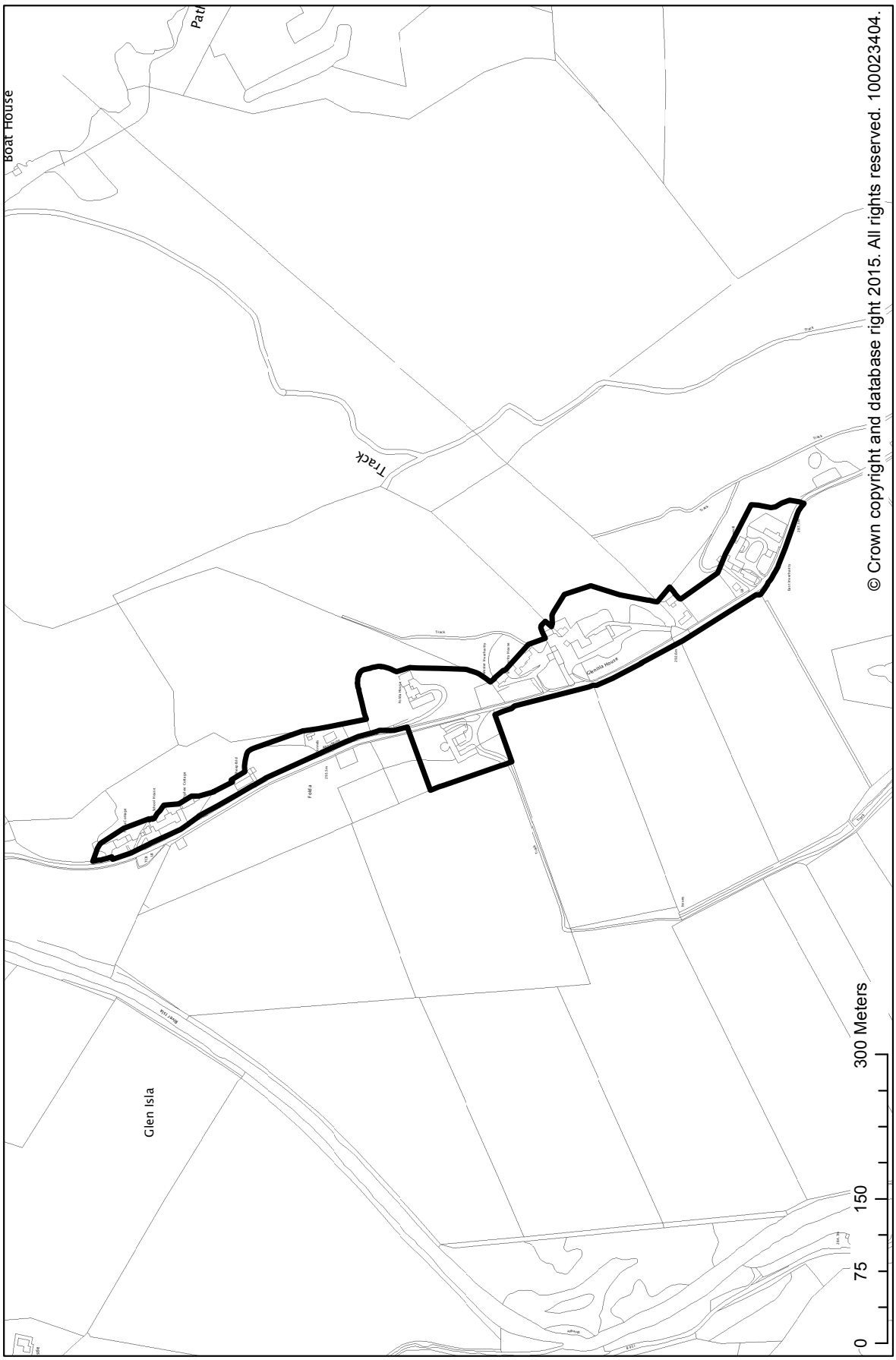


Finavon


Boat House
Track
Glen Isla
Folda
0
75
150
300 Meters
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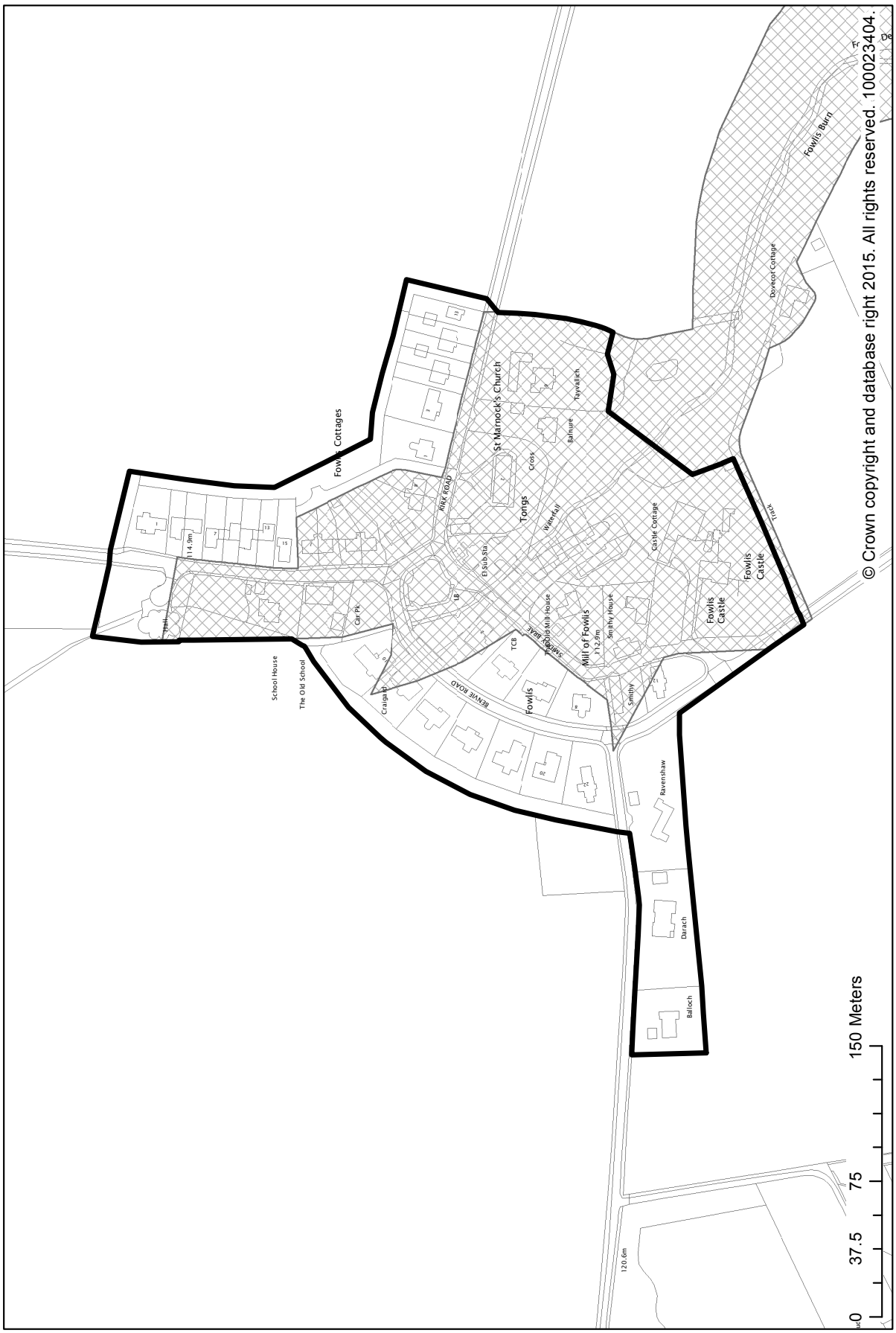
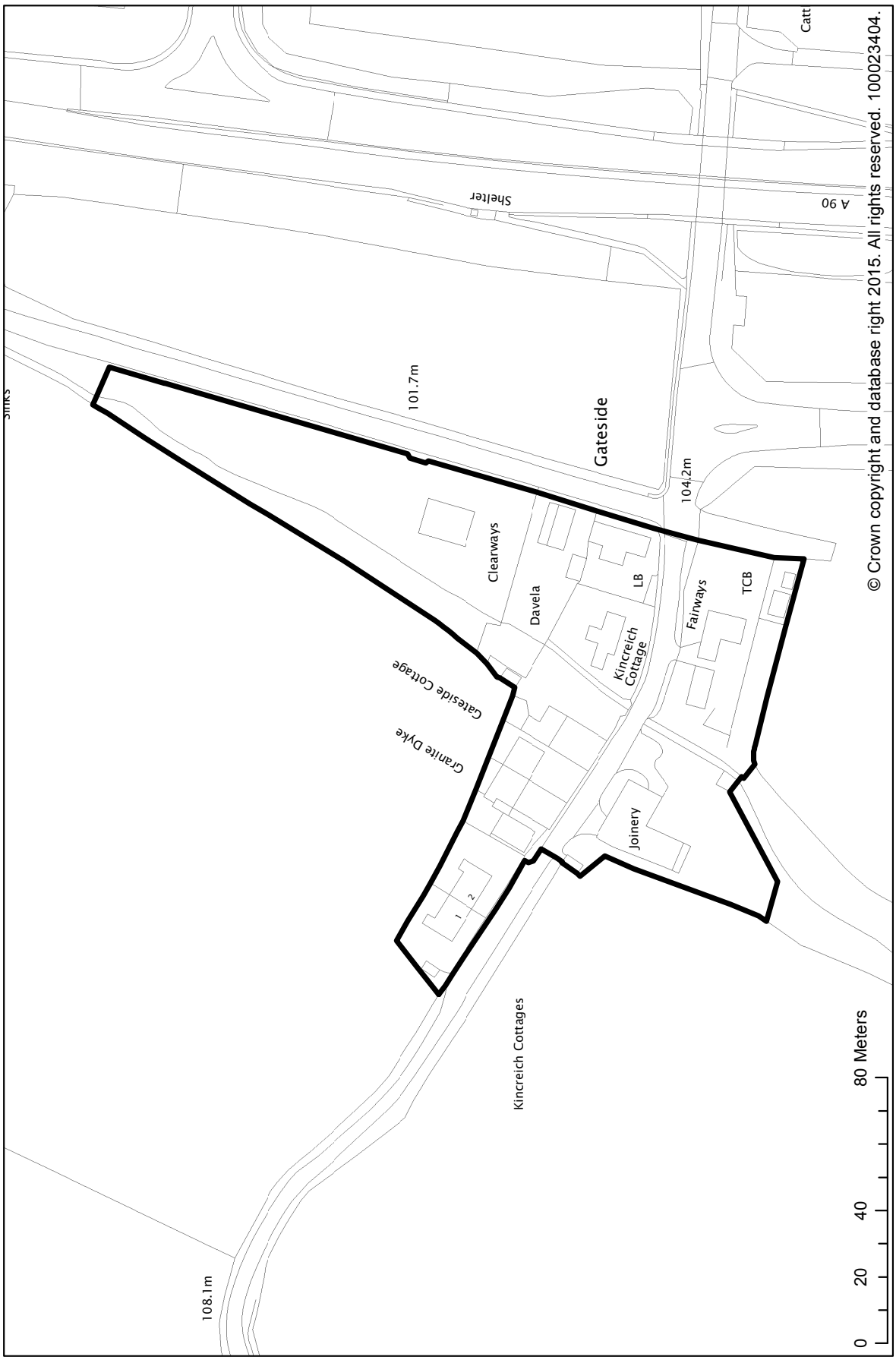
Folda


Fowlis Easter
© Crown copyright and database right 2015. All rights reserved. 100023404.
150 Meters
0
37.5
75
St Marnock's Church
Fowlis Cottages
KIRK ROAD
Torgs
Waterfall
Cross
Tayvallich
Balmore
Fowlis Burn
Dovecot Cottage
Castle Cottage
Fowlis Castle
Mill of Fowlis
Smithy House
Smithy
BENVIE ROAD
Fowlis
TCB
School House
The Old School
Craigie
Car Pk
Ravenshaw
Darach
Balloch
120.6m


Gateside
A 90
Shelter
101.7m
Gateside
104.2m
Clearways
Davela
LB
Kincreich Cottage
Fairways
TCB
Gateside Cottage
Granite Dyke
Joinery
1
2
Kincreich Cottages
108.1m
0
20
40
80 Meters
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Glamis

The village of Glamis sits at the gates of Glamis Castle, home of the Earl of Strathmore and valuable to the tourism economy of Angus. Any future development should be of high quality and should respect the historical character and setting of the village as well as not detracting from its role as a focus for tourism. There is scope for limited areas of new development within the village which if sensitively designed will complement the existing role and function of the village. Modest new housing development will be supported where it is ancillary to the provision of local business or tourism uses.

DEVELOPMENT STRATEGY

The development strategy for Angus is set out in the introduction to the ALDP, for Glamis this means:

- Continuing support for the ongoing housing development at Dundee Road.
- Safeguard an area at Dundee Road East suitable to accommodate new local business and/or tourism uses as well as a limited number of houses that are ancillary to other uses.
- Safeguarding and enhancing the natural and built features which are a key part of the character and identity of the village including having regard to its status as an outstanding conservation area.
- Supporting the valuable tourism role of the village by making provision for additional facilities or services in support of that function.

HOUSING

EXISTING SITES

Sites with planning permission or under construction as identified in the Housing Land Audit July 2014, are shown in Table G1.

Table G1: Existing Sites

Name / reference	Capacity
G(a) Dundee Road *	16
Total	**16**

* *A further planning permission to increase the housing numbers for this site was granted, subject to conclusion of a legal agreement in relation to open space and affordable housing. The capacity shown above is as published in the 2014 Housing Land Audit.*

A further planning permission to increase the housing numbers for this site was granted, subject to conclusion of a legal agreement in relation to open space and affordable housing. The numbers shown above are as published in the 2014 Housing Land Audit, although this position may change in advance of publication of the Proposed Plan.

OPPORTUNITY SITES

An area of land in the heart of Glamis may be appropriate for local employment/tourism related development in support of the existing role and function of the village. The development could also incorporate a limited number of houses ancillary to the employment/tourism uses. Notwithstanding the potential benefits to Glamis, proposals should

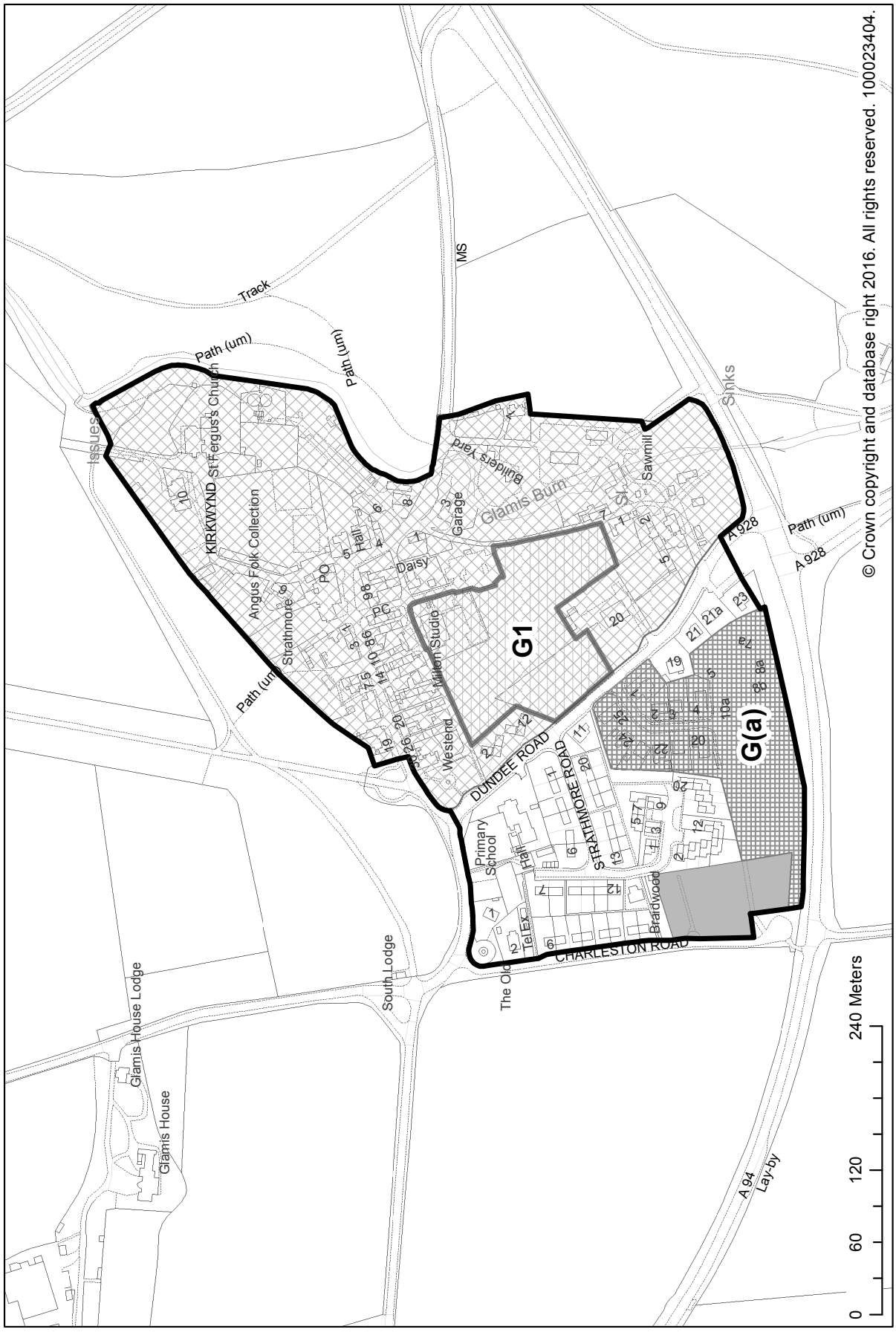
incorporate a high level of design and materials to respect the outstanding conservation area status of the village.

G1 Opportunity Site – Dundee Road East

1.8 ha of land in the core of the village provides the opportunity for local business or tourist related development. There may also be scope to achieve a mixed development incorporating a limited number of houses as part of the overall scheme. Given the Conservation Area location, development proposals should ensure the use of high quality design and materials. Proposals should also incorporate appropriate landscaping, footpath and green network linkages and have regard to the amenity of surrounding properties.

Supporting information including a Flood Risk Assessment and Drainage Impact Assessment will be required.

G1 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
0/+	+	+	0/+	0/-	+	0/+	0	0/+	0/+


Glamis
G1
G(a)
Track
Path (um)
MS
Sinks
Issues
KIRKWYND St Fergus's Church
Angus Folk Collection
Strathmore
PO
Hall
Garage
Glamis Burn
Builders Yard
Sawmill
Daisy
PC
Millen Studio
Westend
DUNDEE ROAD
STRATHMORE ROAD
Primary School
Hall
Bradwood
TelEx
CHARLESTON ROAD
A928
Path (um)
South Lodge
Glamis House Lodge
Glamis House
A94
Lay-by
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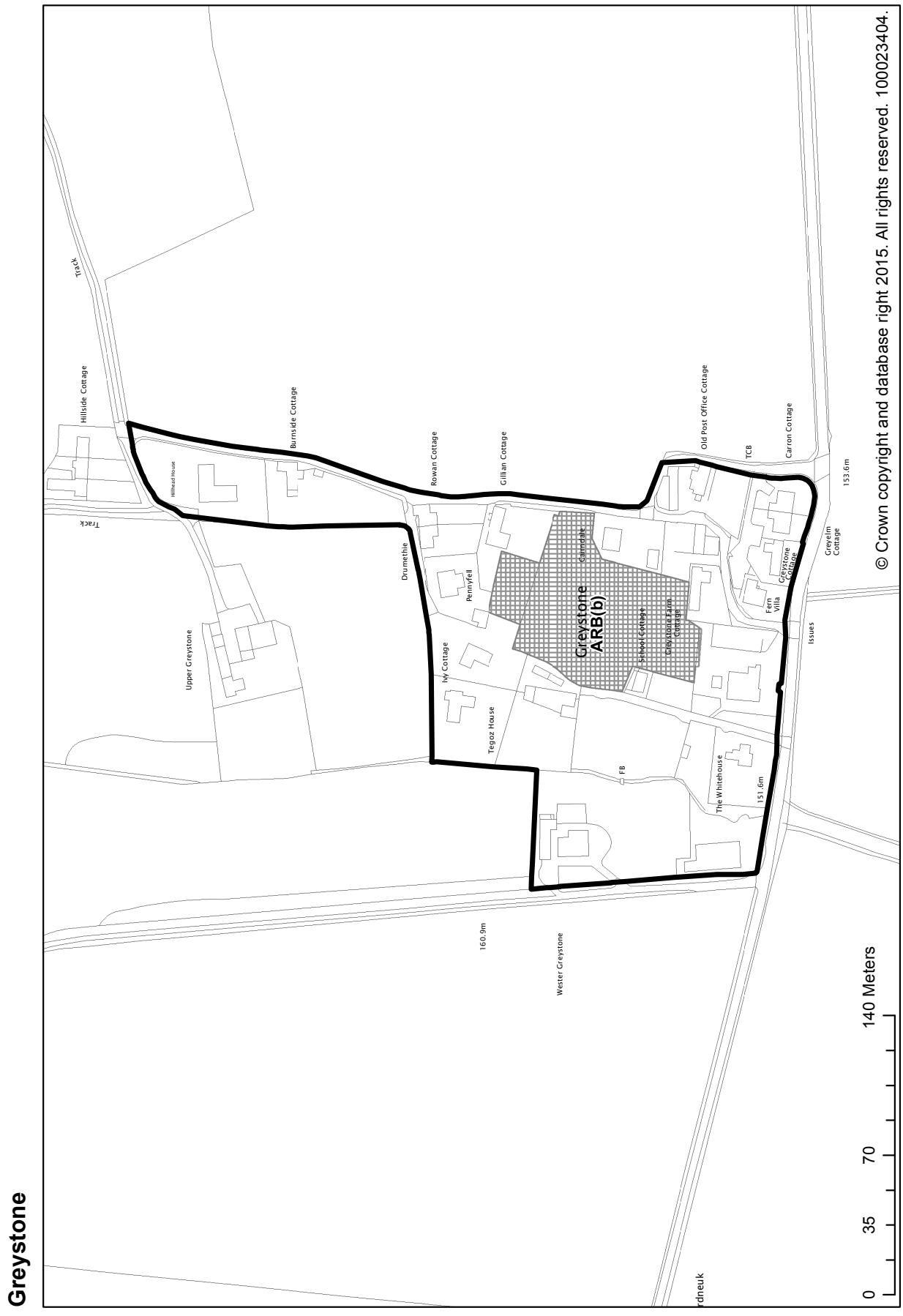
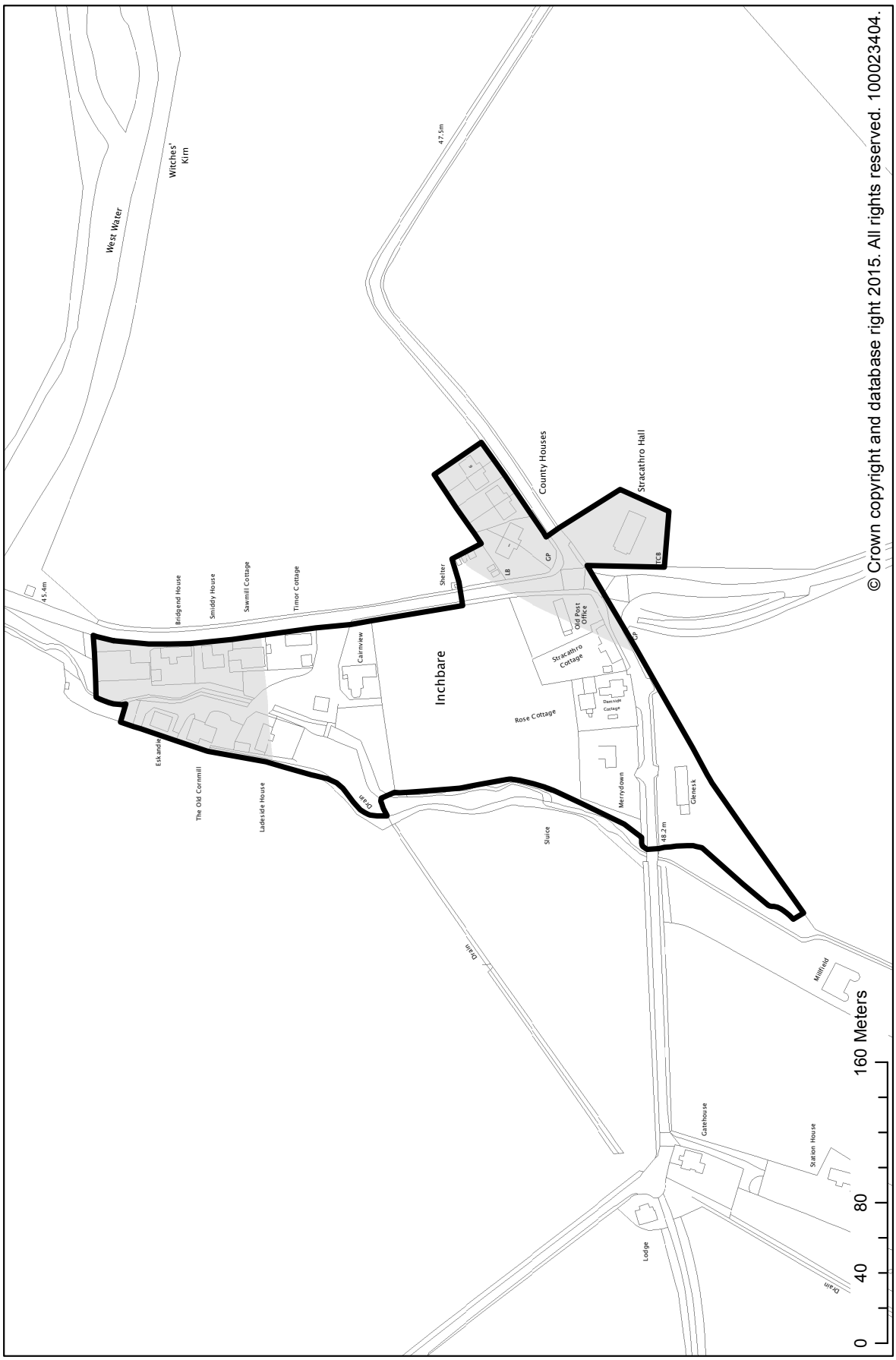
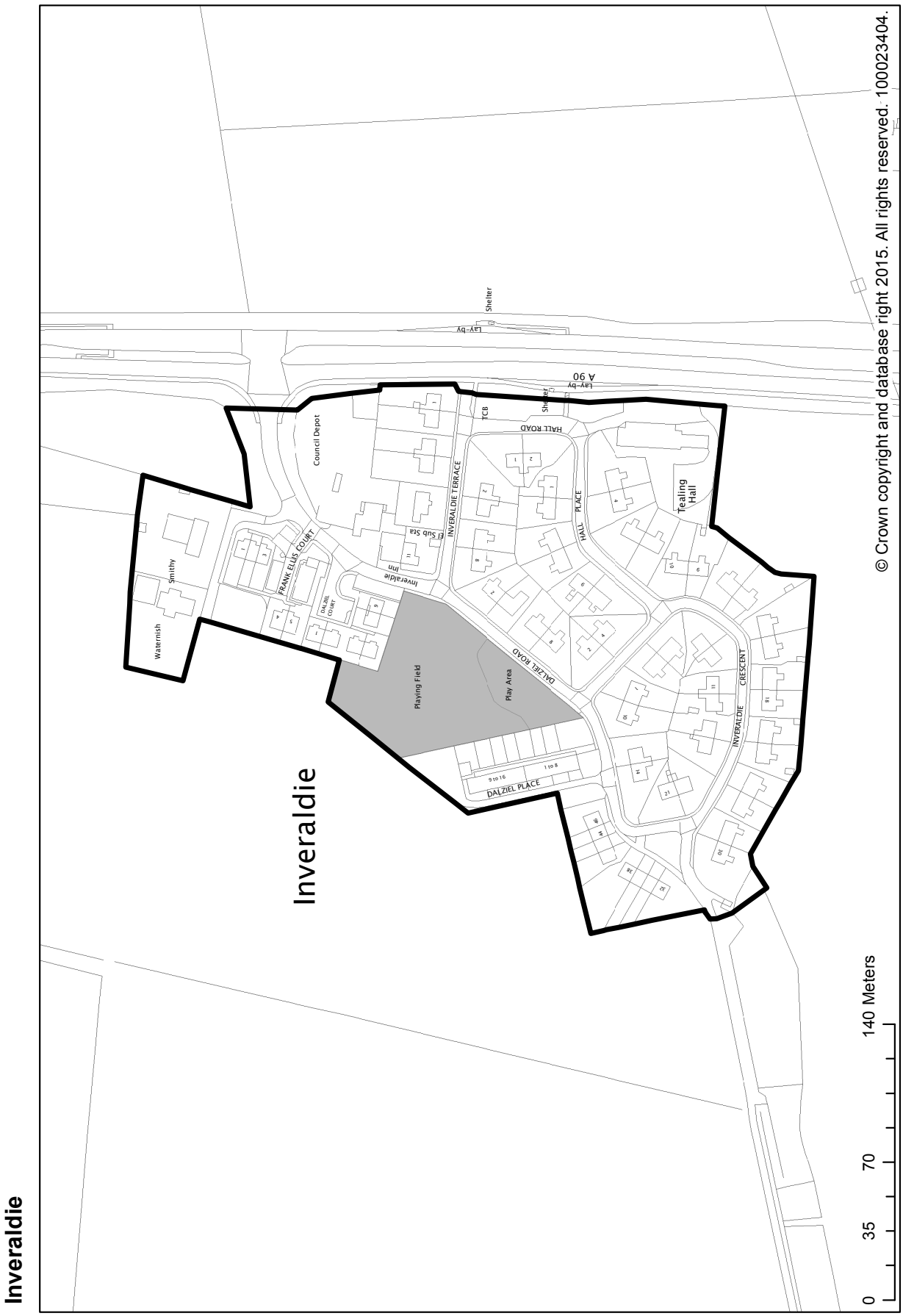
0
60
120
240 Meters


Greystone
Greystone ARB(b)
Track
Hillside Cottage
Hillhead House
Burnside Cottage
Rowan Cottage
Gillian Cottage
Old Post Office Cottage
TCB
Carron Cottage
153.6m
Greyelm Cottage
Greystone Cottage
Fern Villa
Issues
Drumethie
Pennyfell
Gairndale
School Cottage
Greystone Farm Cottage
Upper Greystone
Ivy Cottage
Tegoz House
FB
The Whitehouse
151.6m
160.9m
Wester Greystone
© Crown copyright and database right 2015. All rights reserved. 100023404.
0
35
70
140 Meters

Guthrie & Cotton of Guthrie



Inchbare


Inveraldie
Inveraldie
Shelter
Lay-by
A 90
Lay-by
Shelter
TCB
HALL ROAD
Council Depot
INVERALDIE TERRACE
Sub Sta
Inveraldie Inn
FRANK ELLIS COURT
DALZIEL COURT
Smithy
Watermish
HALL PLACE
Tealing Hall
DALZIEL ROAD
Playing Field
Play Area
INVERALDIE CRESCENT
DALZIEL PLACE
9 to 16
1 to 8
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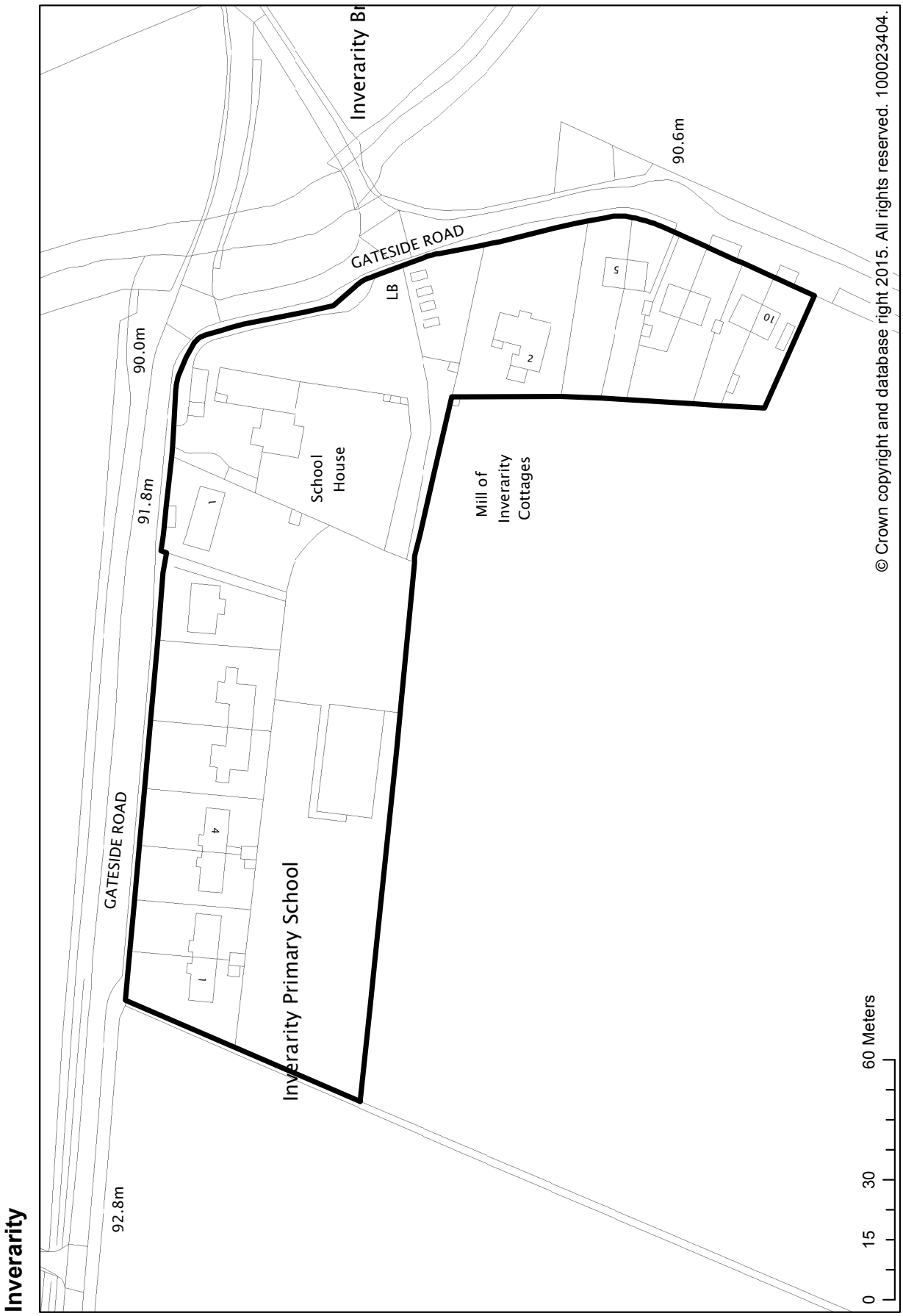
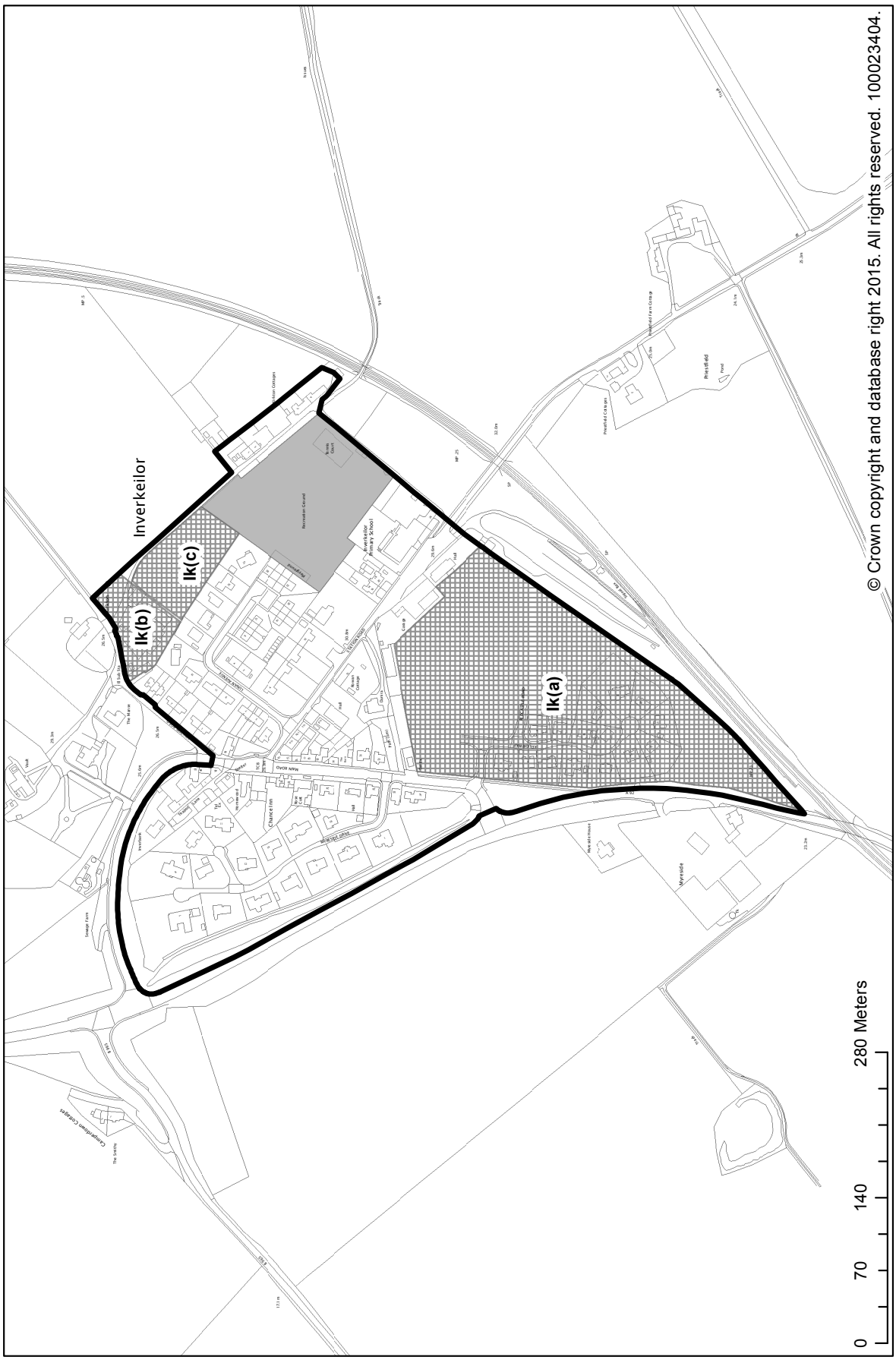
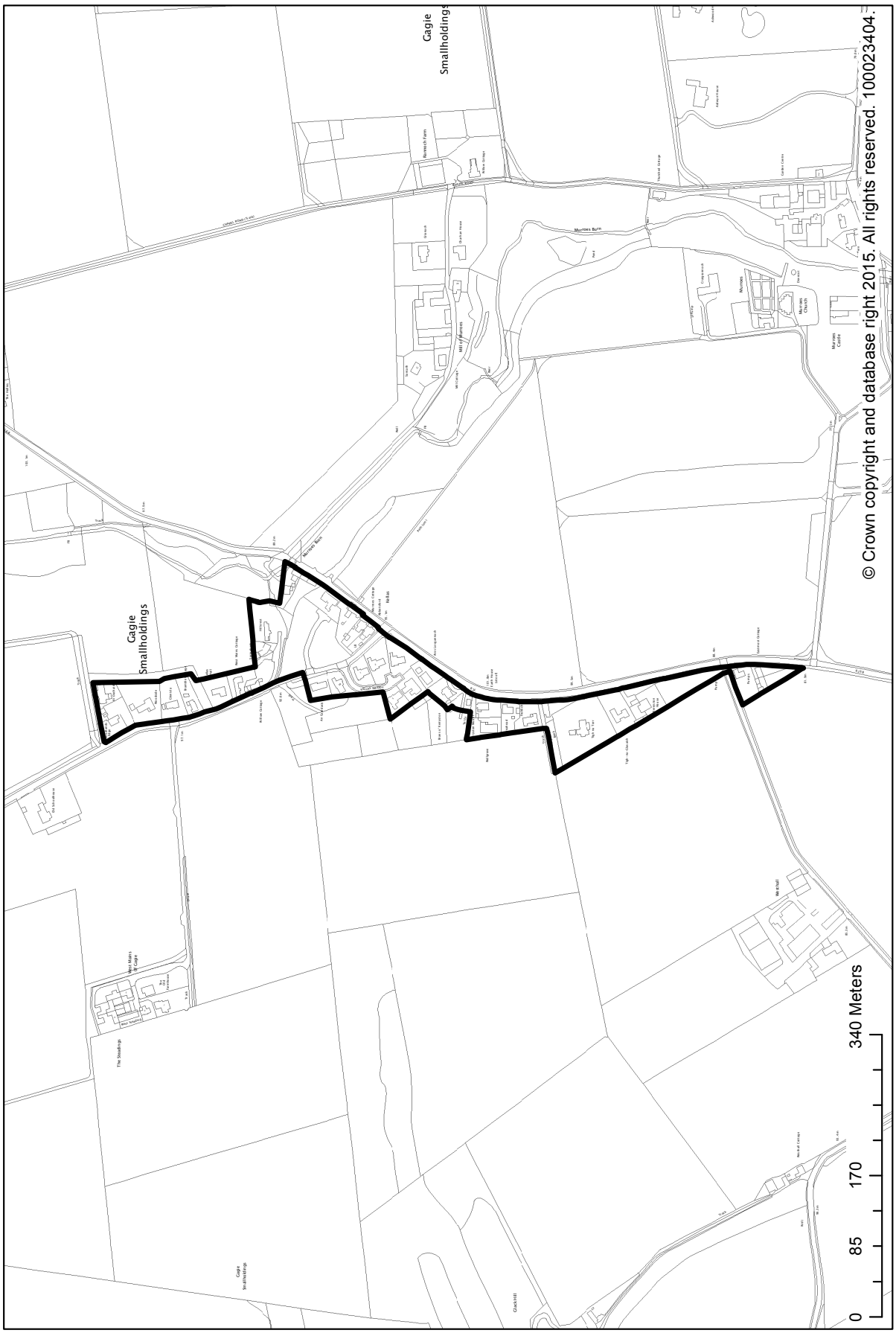
0
35
70
140 Meters

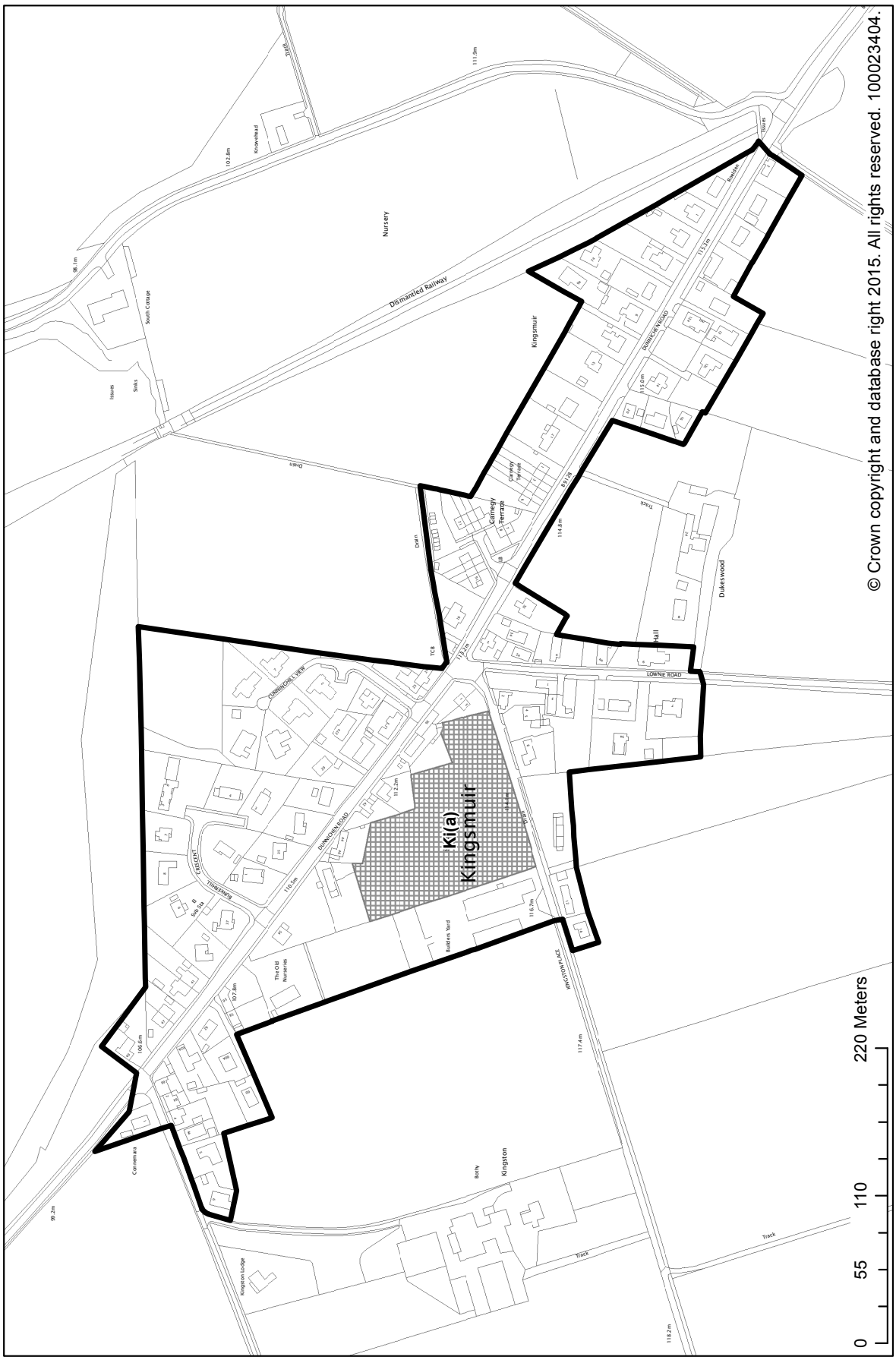

Inverarity
Inverarity Br
GATESIDE ROAD
90.6m
90.0m
91.8m
92.8m
LB
School House
Mill of Inverarity Cottages
Inverarity Primary School
GATESIDE ROAD
1
2
4
5
10
0
15
30
60 Meters
© Crown copyright and database right 2015. All rights reserved. 100023404.

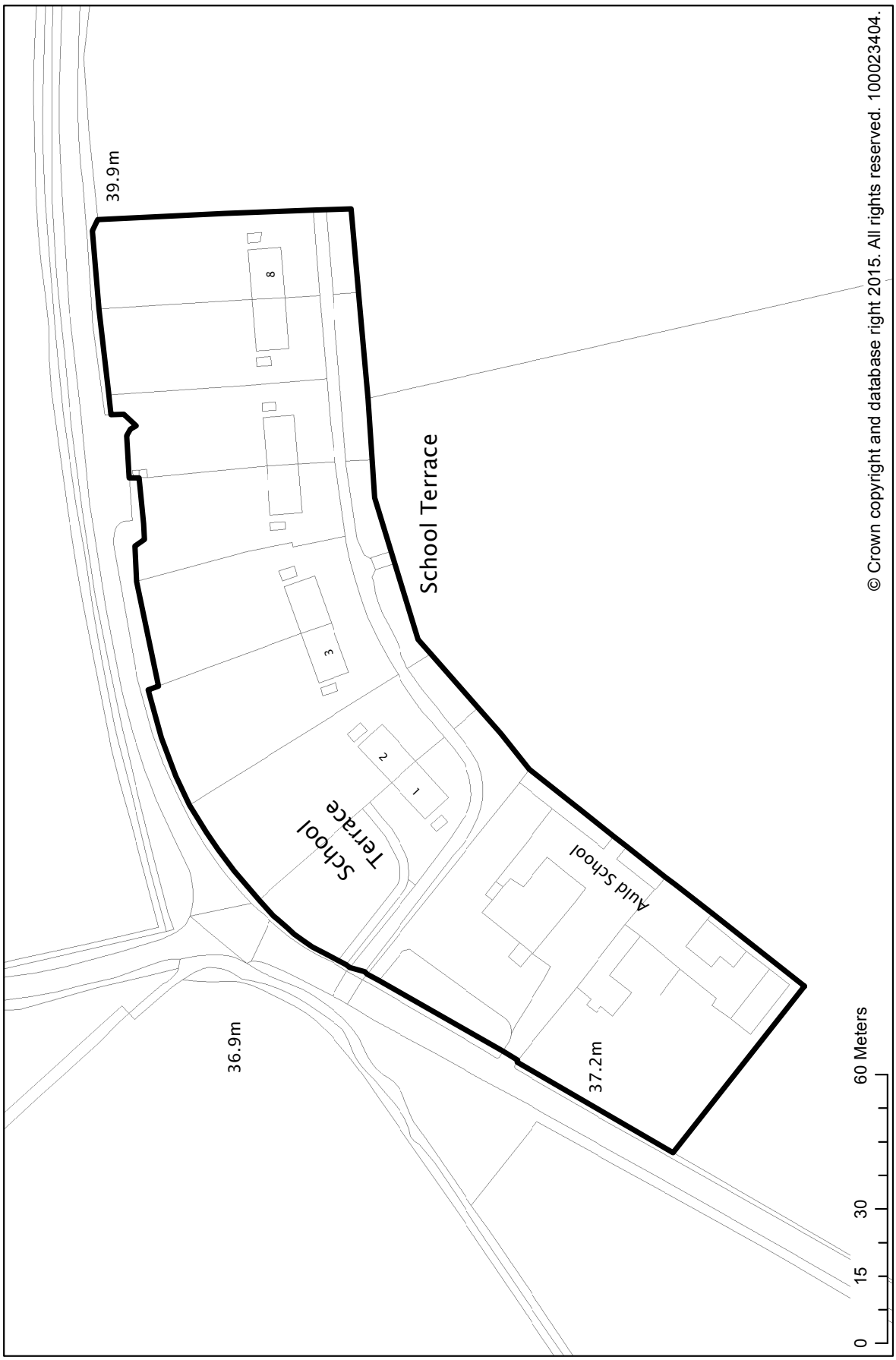


Inverkeilor

Kellas




Kingsmuir
Ki(a)
Kingsmuir
Dismantled Railway
Nursery
Kingsmuir
LOWNE ROAD
DUNNICHEN VIEW
DUNNICHEN ROAD
Carnegy Terrace
Dukeswood
Hall
Kingston
Kingston Lodge
Track
0
55
110
220 Meters
© Crown copyright and database right 2015. All rights reserved. 100023404.


Kinnell
39.9m
School Terrace
8
3
2
1
School Terrace
Auld School
36.9m
37.2m
0
15
30
60 Meters
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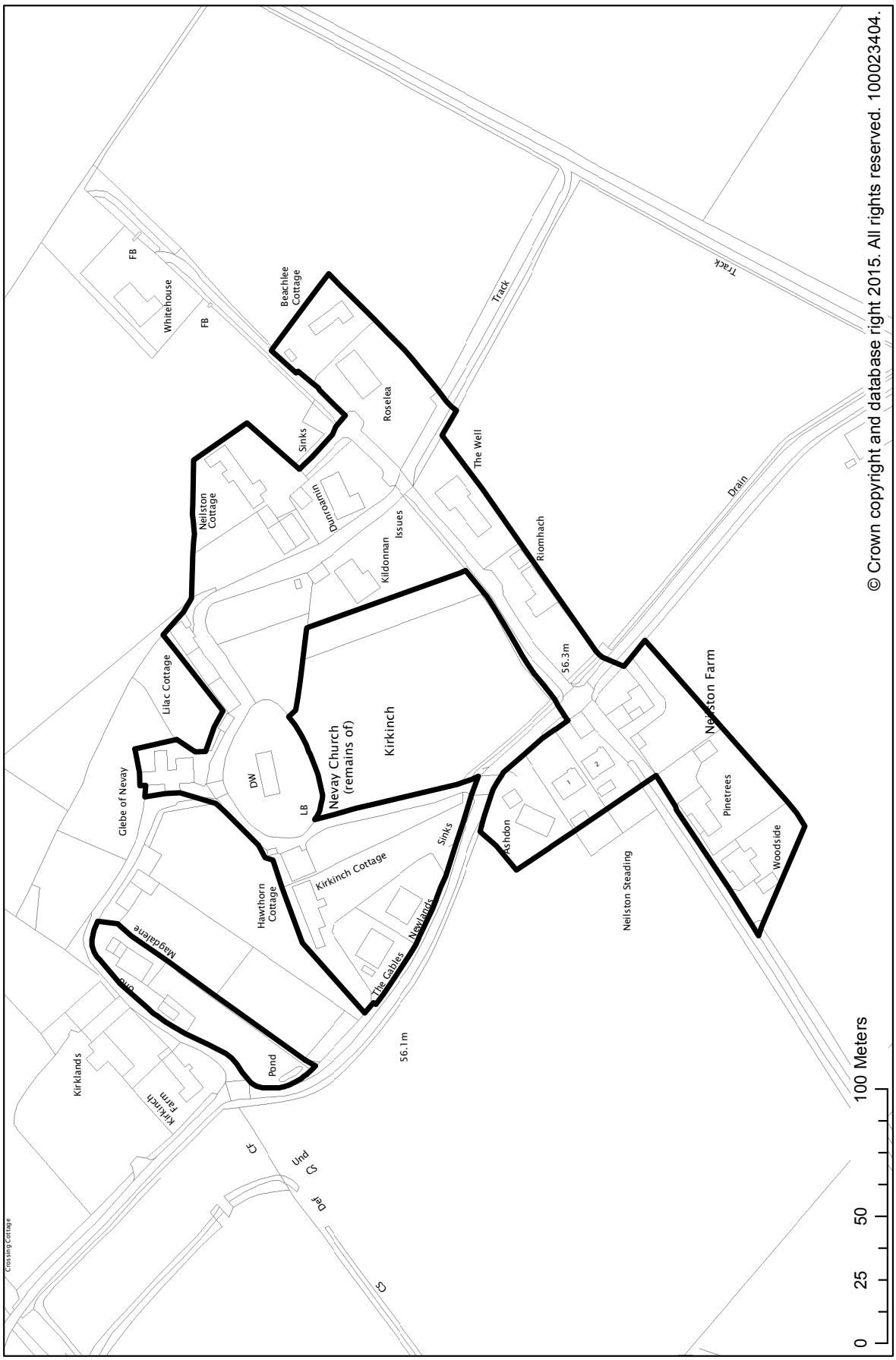
Kirkinch


Kirkinch
Nevay Church (remains of)
Kirkinch
Neilston Farm
Beachlee Cottage
Roselea
Sinks
Neilston Cottage
Dunrovanmh
Kildonnan
Issues
The Well
Riomhach
Track
Drain
Whitehouse
FB
Lilac Cottage
Glebe of Nevay
DW
LB
56.3m
Ashton
Pinetrees
Woodside
Neilston Steading
Kirkinch Cottage
Hawthorn Cottage
Newlands
The Gables
Magdalene
Pond
56.1m
Kirklands
Kirkinch Farm
Crossing Cottage
0
25
50
100 Meters
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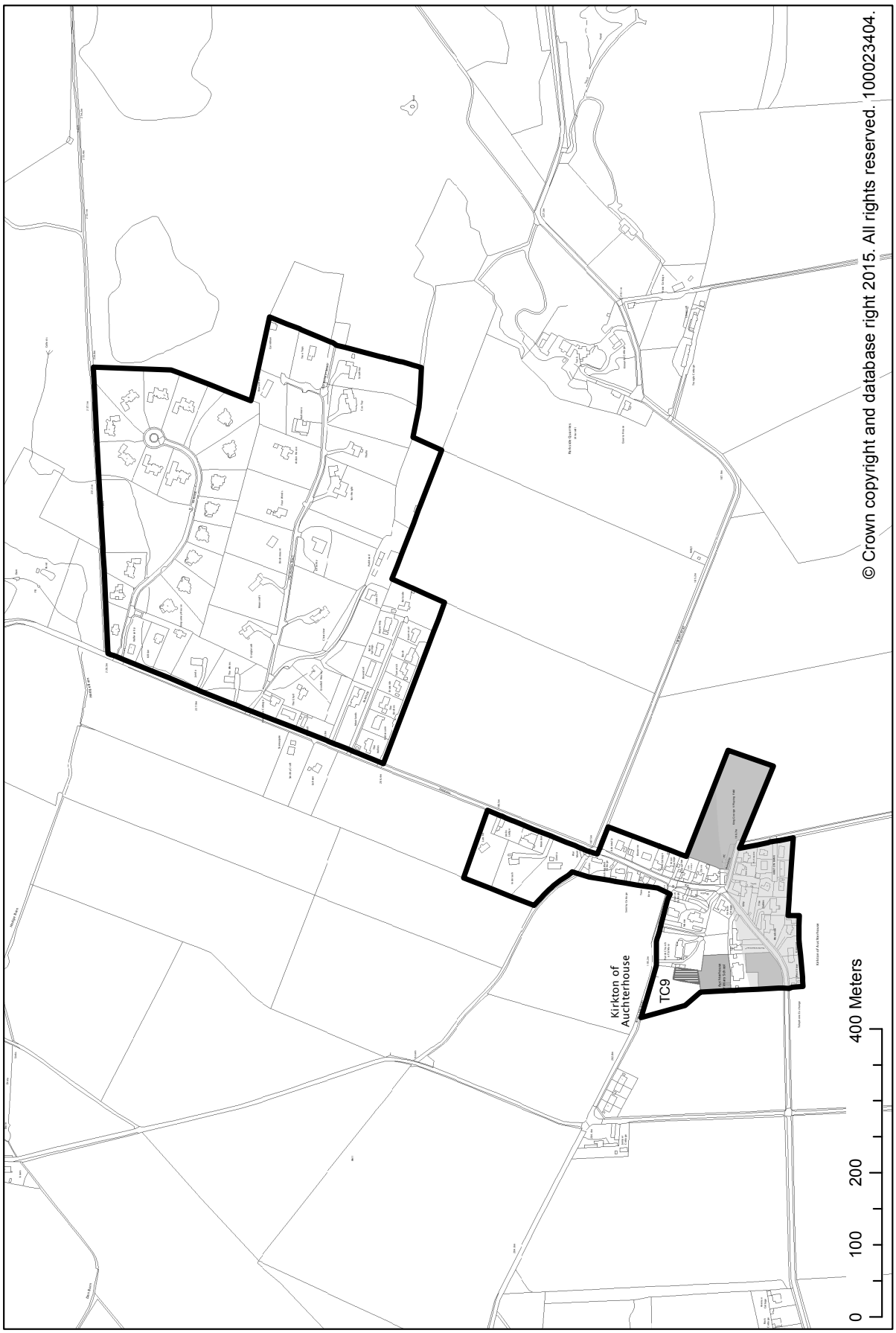
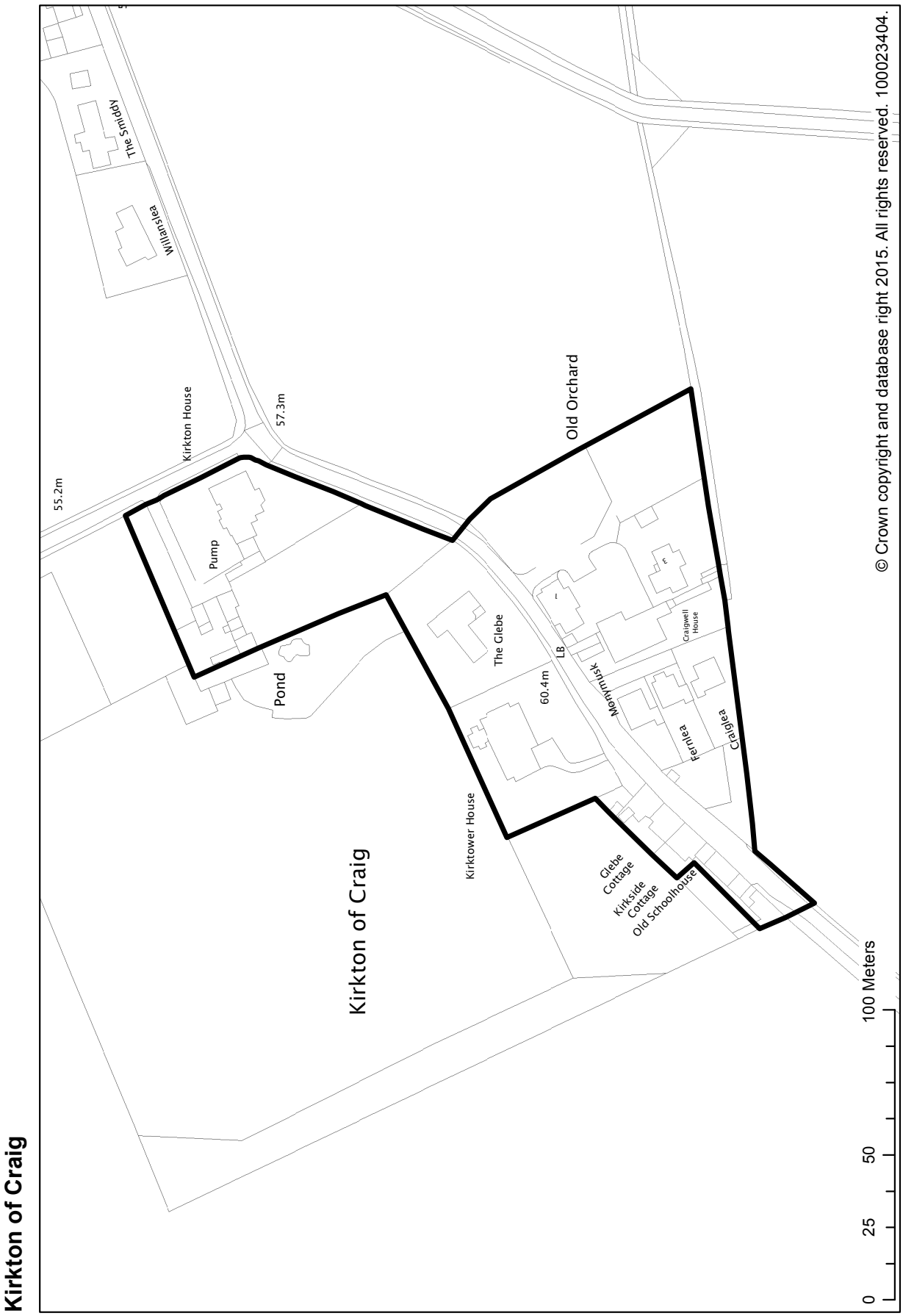
Kirkton of Auchterhouse




Kirkton of Craig
The Smiddy
Willanslea
Kirkton House
55.2m
57.3m
Old Orchard
Pump
Pond
The Glebe
LB
60.4m
Craigwell House
Meadowbank
Fernlea
Craiglea
Kirktower House
Kirkton of Craig
Glebe Cottage
Kirkside Cottage
Old Schoolhouse
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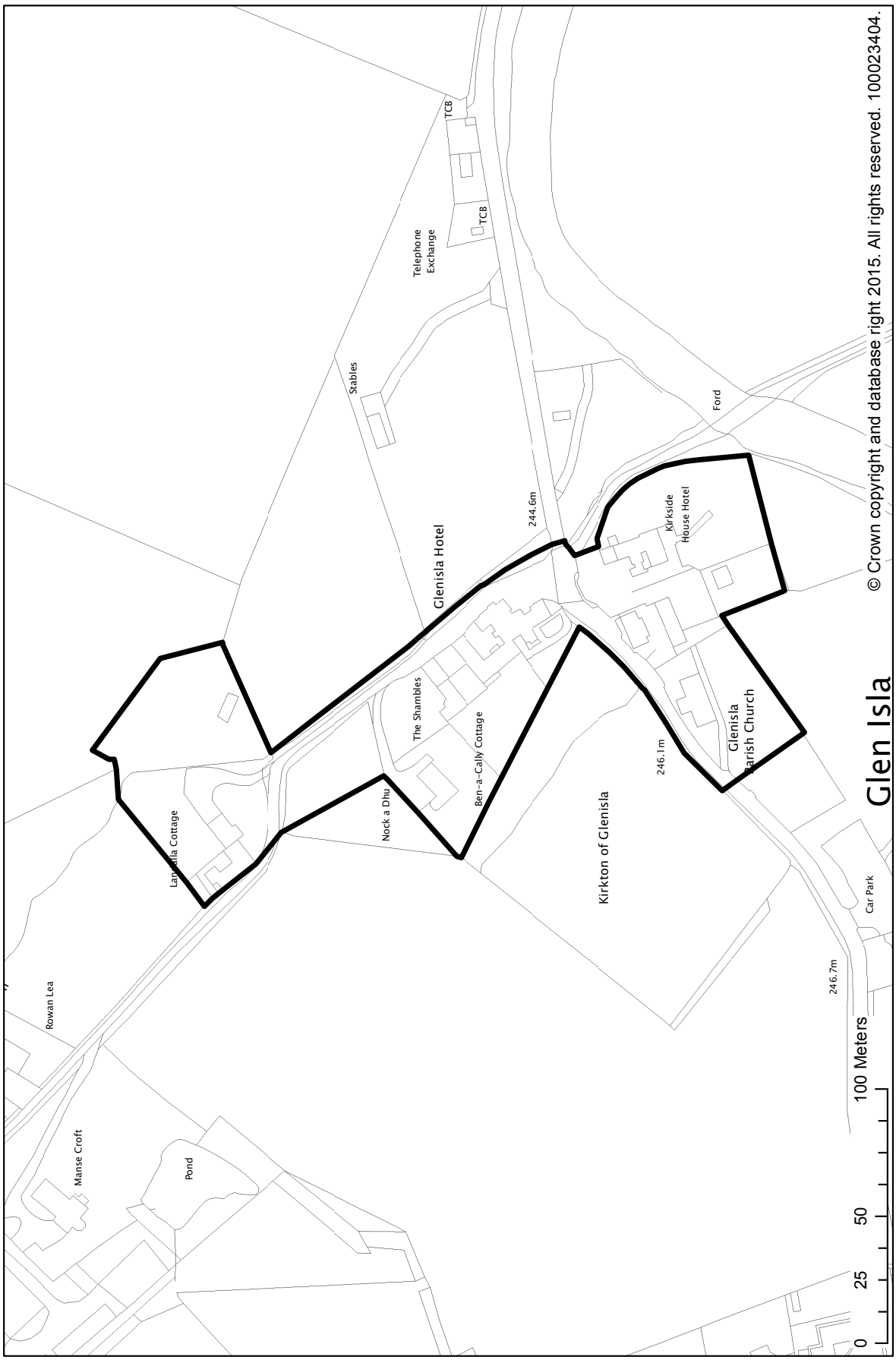
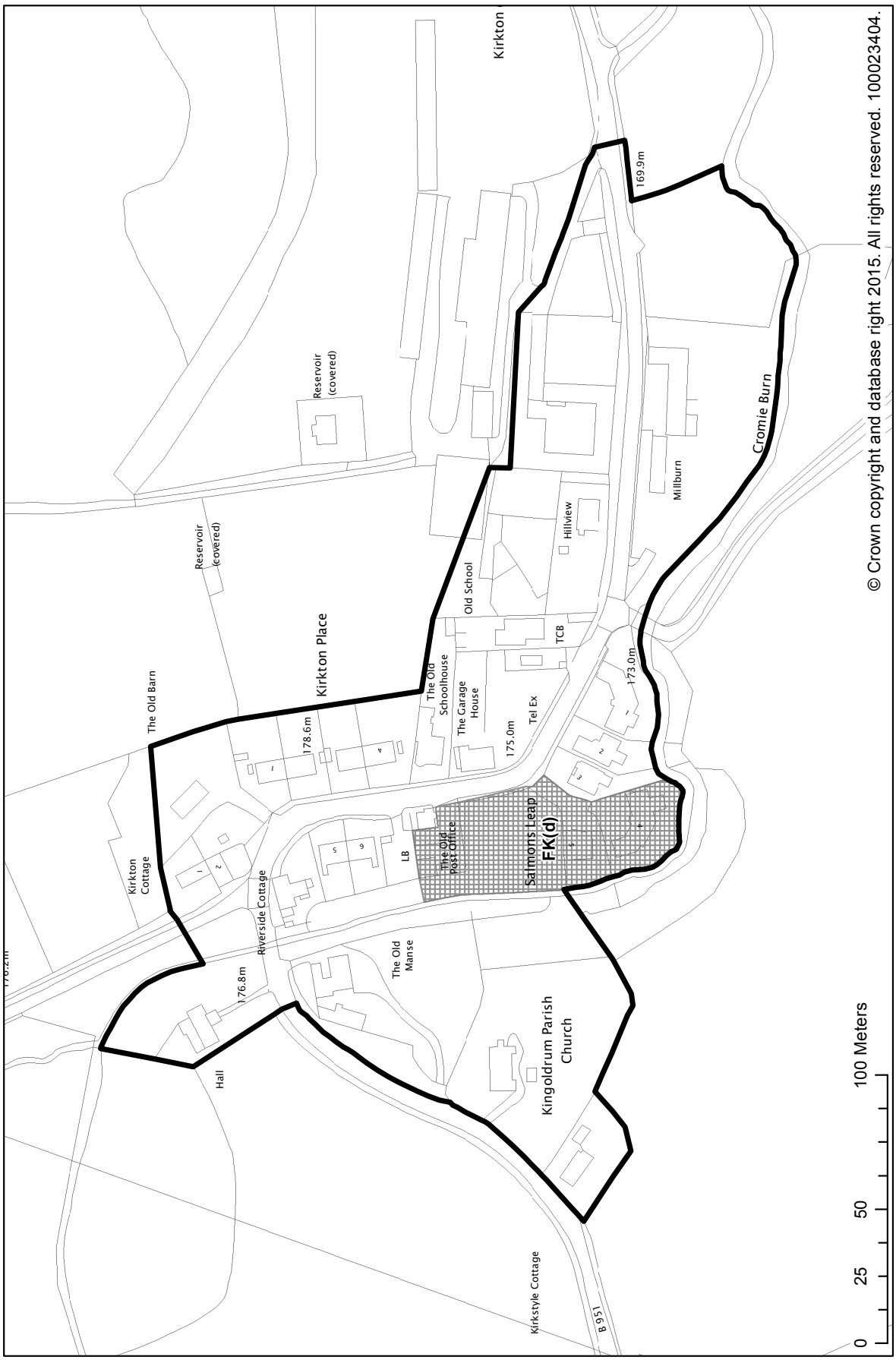
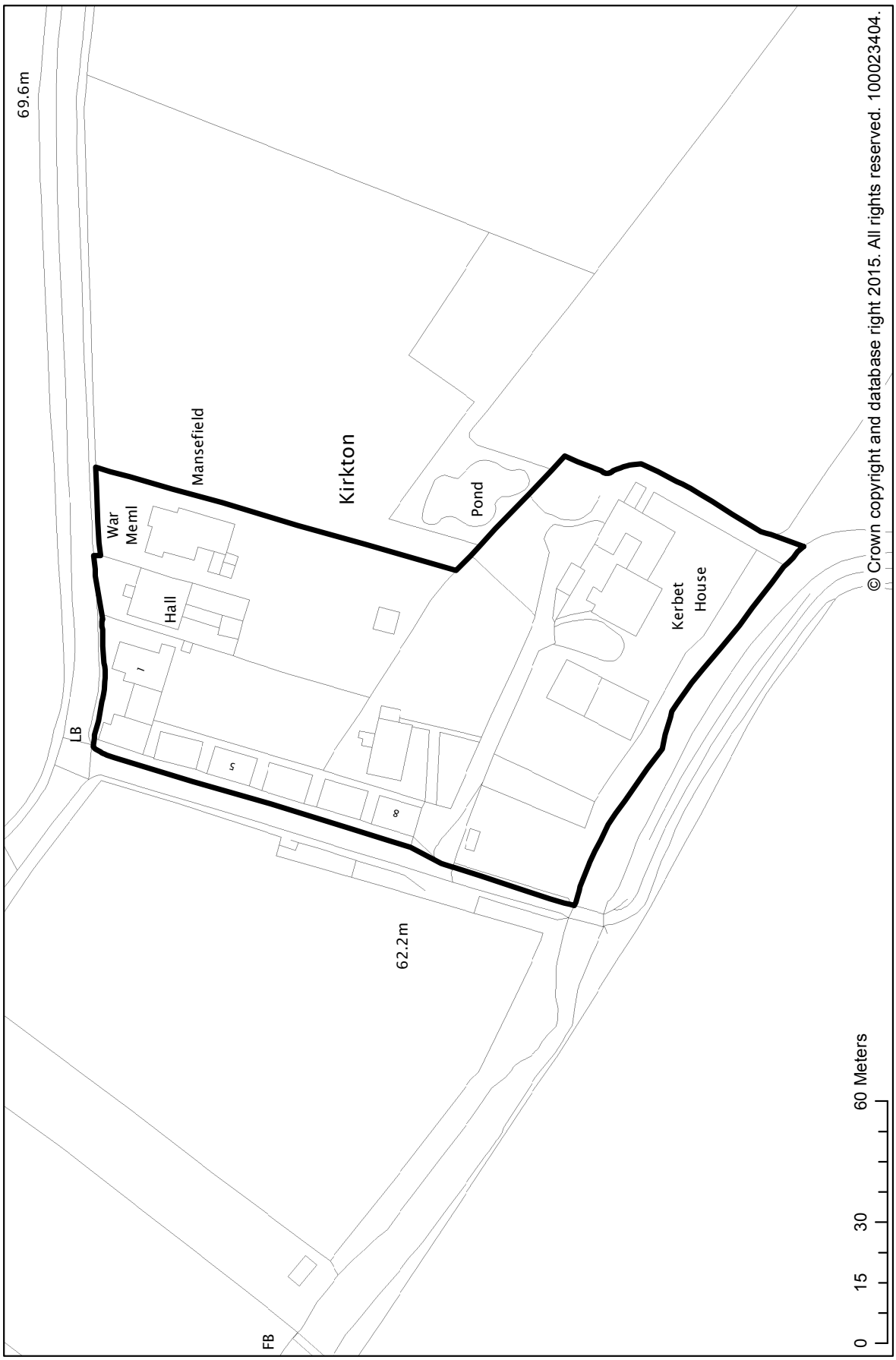
0
25
50
100 Meters

Kirkton of Glenisla



Kirkton of Kingoldrum




Kirkton of Kinnettles
69.6m
Mansefield
Kirkton
War Meml
Hall
Pond
Kerbet House
LB
FB
62.2m
0 15 30 60 Meters
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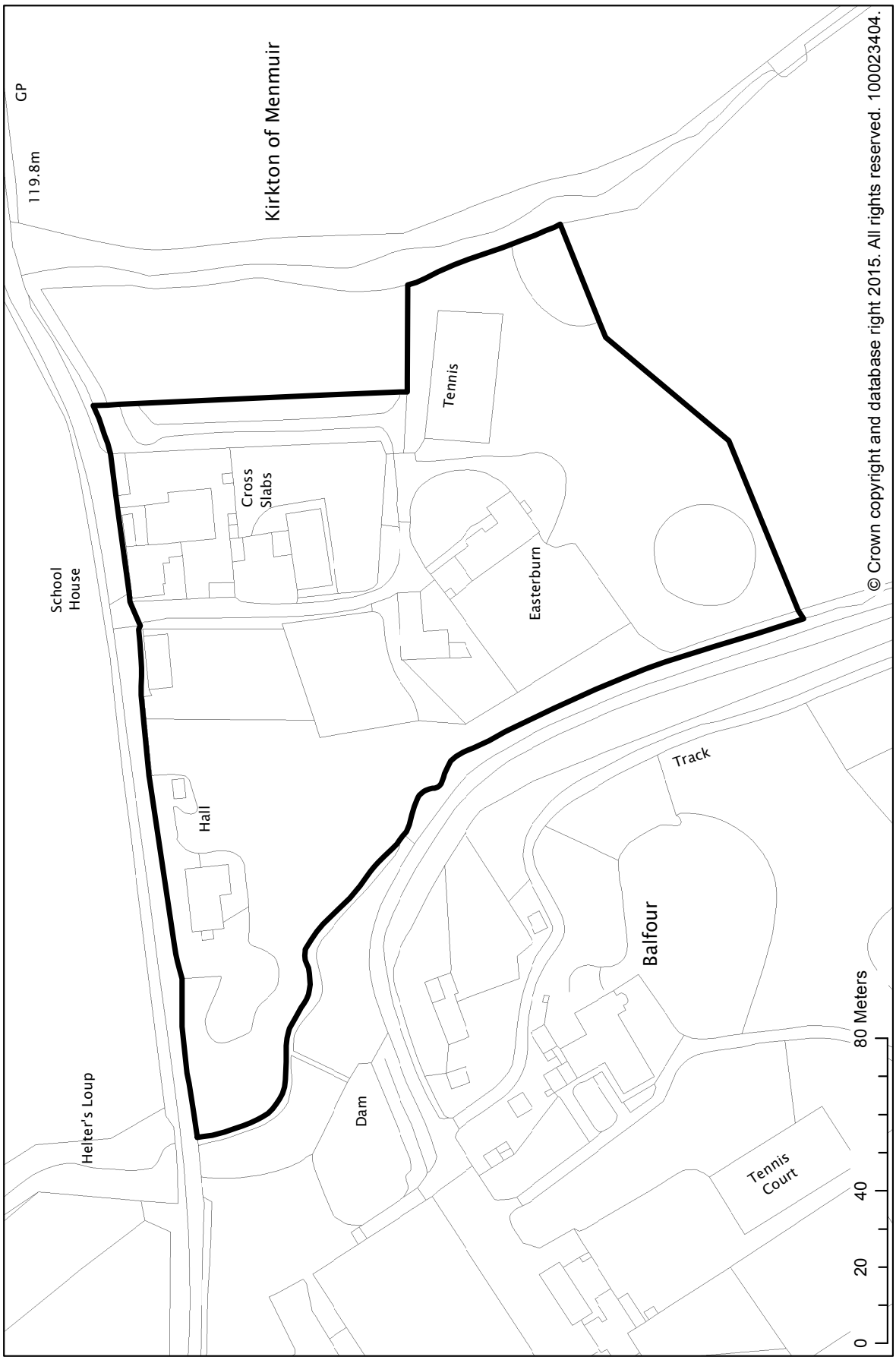
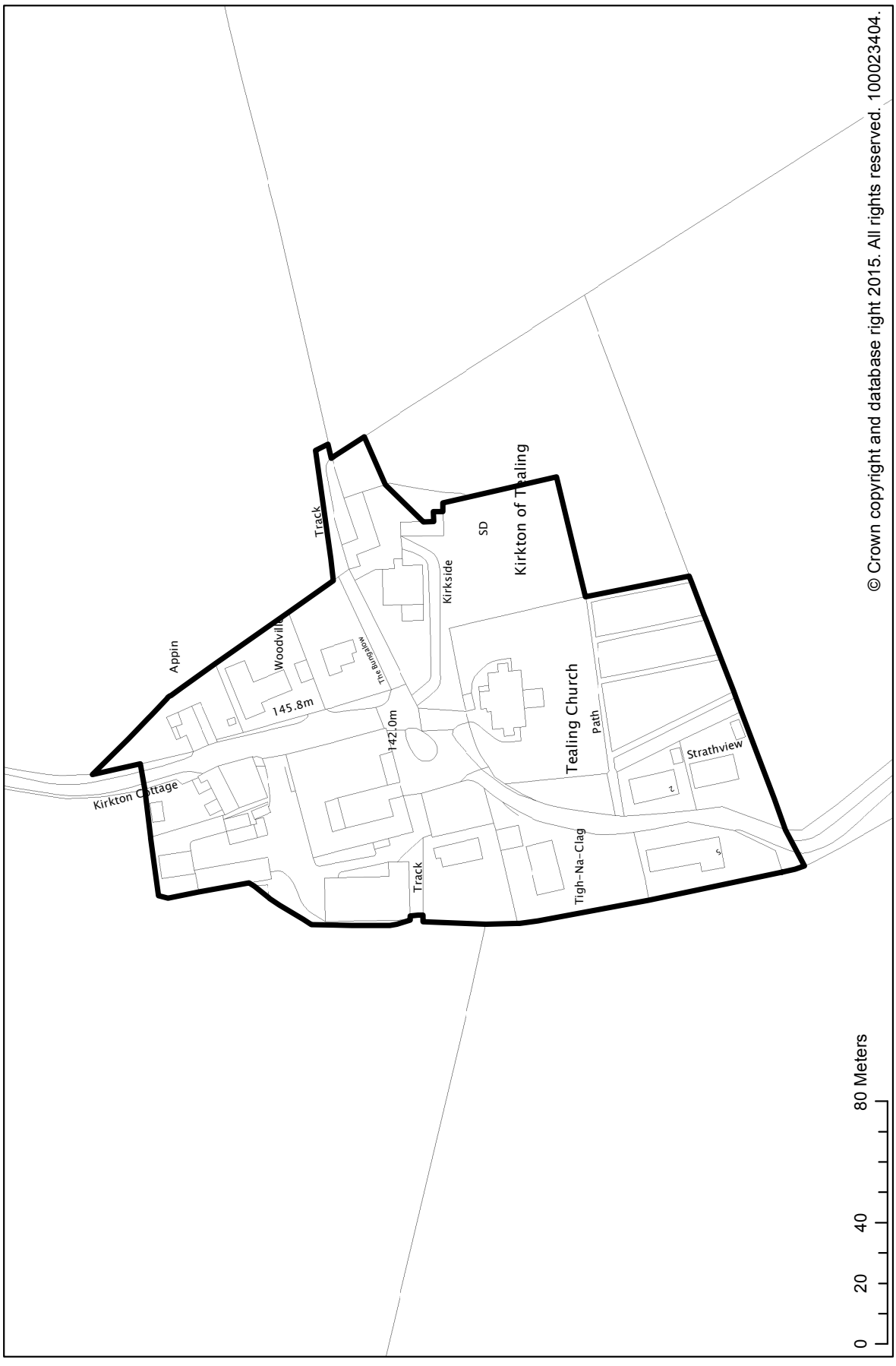


Kirkton of Menmuir



Kirkton of Tealing

Letham Grange

Letham Grange, a large country estate north of Arbroath, was developed over a number of years as a major recreational and residential area comprising an hotel and leisure complex, two golf courses and sites for 140 houses located in dispersed groups throughout the estate. This development has been completed with the exception of 2 units as identified within the Angus Housing Land Audit 2014.

DEVELOPMENT STRATEGY

The development strategy for Angus is set out in the introduction to the ALDP, for Letham Grange this means:

- supporting proposals which would provide for the long-term viability of the tourism and recreation facilities;
- protecting and enhancing existing residential amenity and environmental quality of the area;
- supporting proposals to reuse the Listed buildings and associated buildings; and
- additional housing development only being considered where it is required to cross-subsidise tourism and recreation development.

SPORT AND RECREATION

The golf courses contribute to the recreation and tourism resource of Angus. Proposals that support or enhance the recreational potential of Letham Grange will be supported where they are compatible with existing uses and do not adversely impact on the amenity and environment of the area.

LG1 : Letham Grange

Proposals which enhance or expand the tourism and recreation potential of the Letham Grange complex will be supported where:

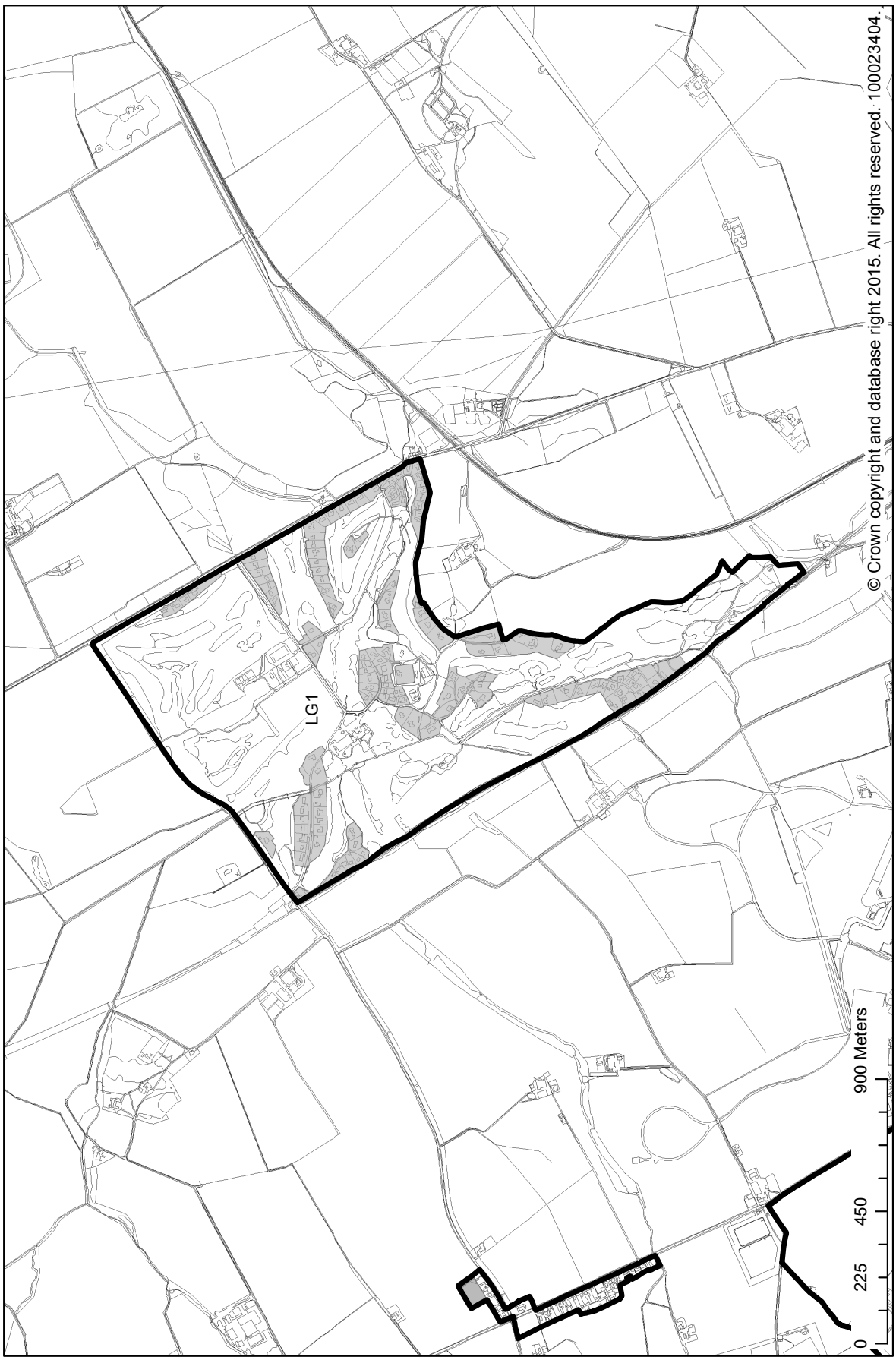
- **they are compatible with the existing land uses/activities and are not detrimental to the area's unique environment;**
- **they are compatible with the protection of the amenity of existing residential areas;**
- **they support the restoration of Listed Buildings and their setting;**
- **any reduction of the existing golf course provision is demonstrated to be necessary and that the remaining provision is viable; and**
- **links are made to the existing path/cycle network.**

Limited housing development outwith the existing residential areas will only be considered where it is necessary to cross-subsidise development of tourism and recreation facilities within the complex.

Development proposals must be accompanied by supporting information including a Drainage Impact Assessment, Sustainable Drainage and Surface Water Management Plan, Flood Risk Assessment, Conservation Plan for the Listed Buildings and Transport Assessment as appropriate.

A TPO applies to part of the site and Tree and Bat surveys may be required to protect and enhance the biodiversity of the site and its contribution to the green network.

LG1 SEA Implications									
Biodiversity Flora and Fauna	**Population**	**Human Health**	**Soil**	**Water**	**Air**	**Climatic Factors**	**Cultural Heritage**	**Material Assets**	**Landscape**
+/?	-/+	-/+	+	0	-	+	+	0/+	-/+


Letham Grange
LG1
0
225
450
900 Meters
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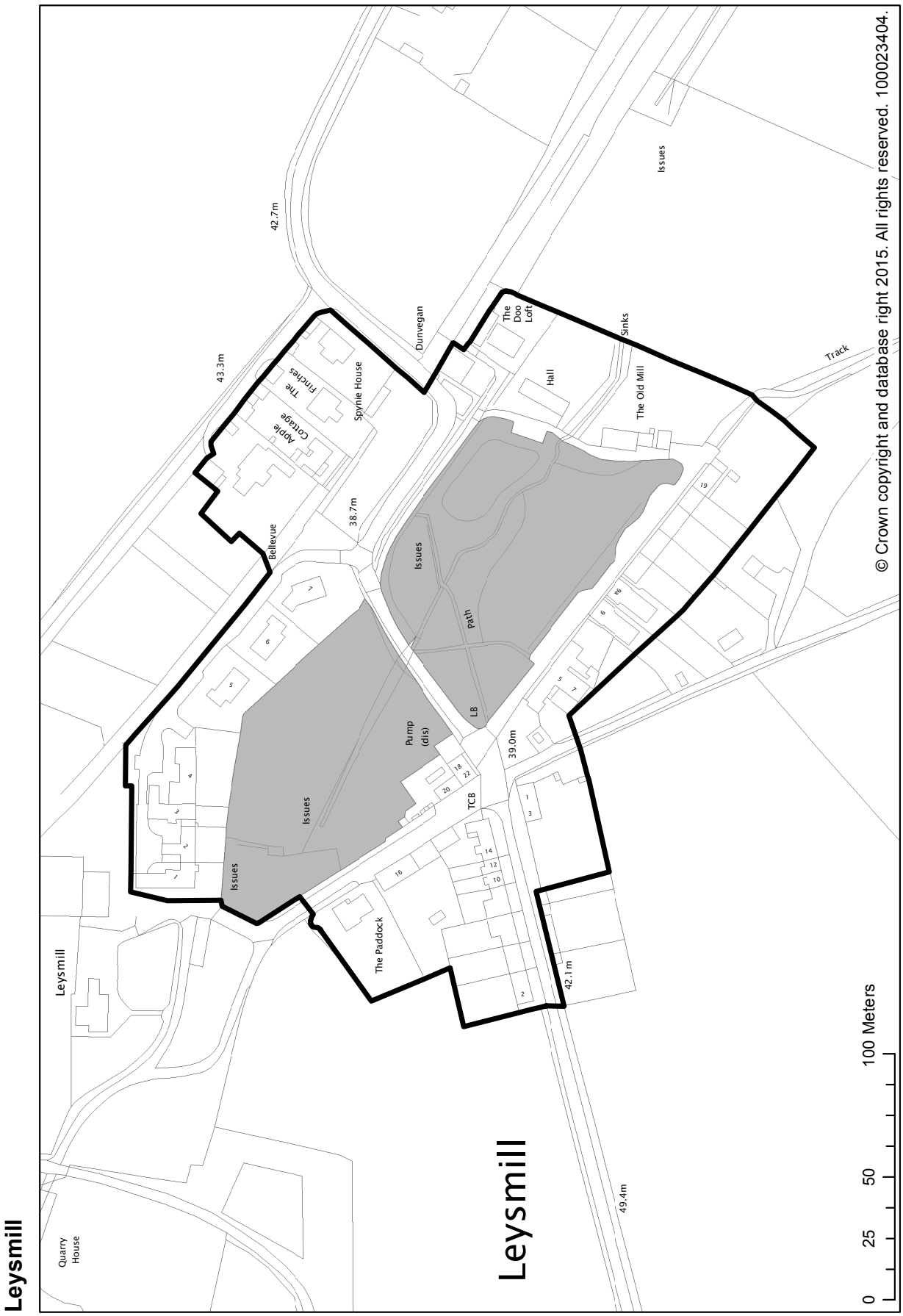
Leysmill
Leysmill
Quarry House
Leysmill
The Paddock
Issues
Issues
Issues
Pump (dis)
LB
Path
TCB
Bellevue
Apple Cottage
The Finches
Spynie House
Dunvegan
The Doo Loft
Hall
Sinks
The Old Mill
Track
Issues
42.7m
43.3m
38.7m
39.0m
42.1m
49.4m
0
25
50
100 Meters
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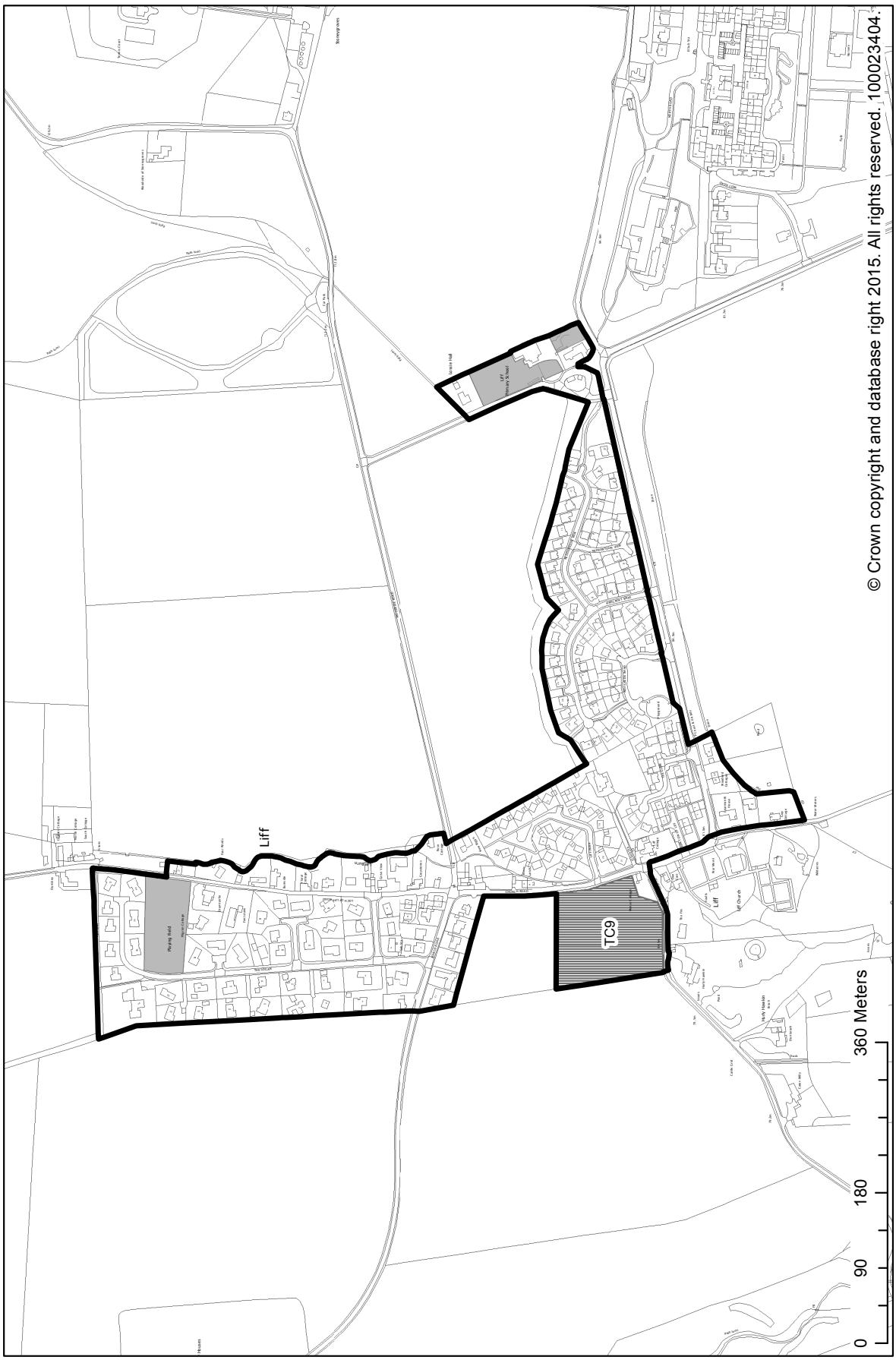
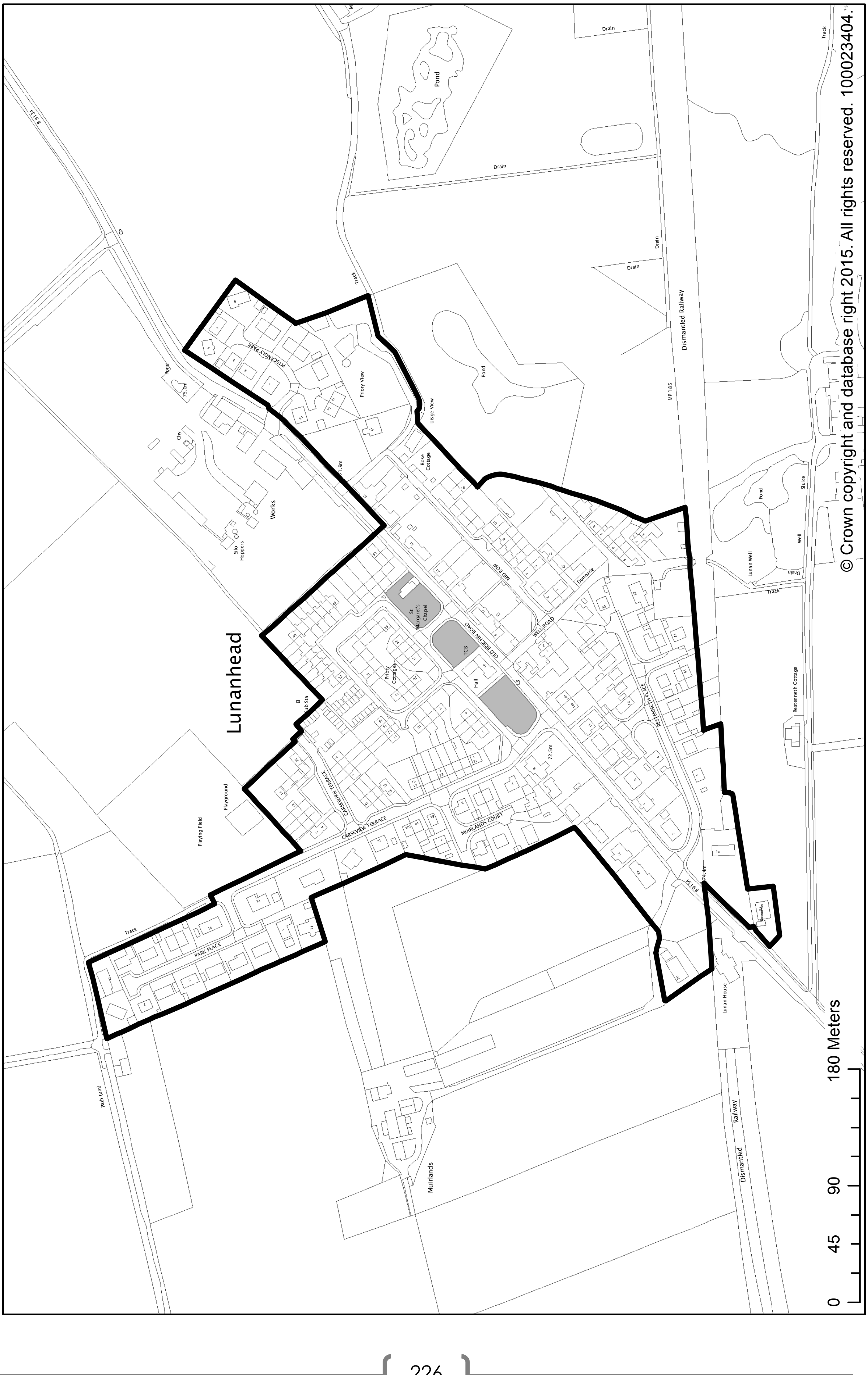
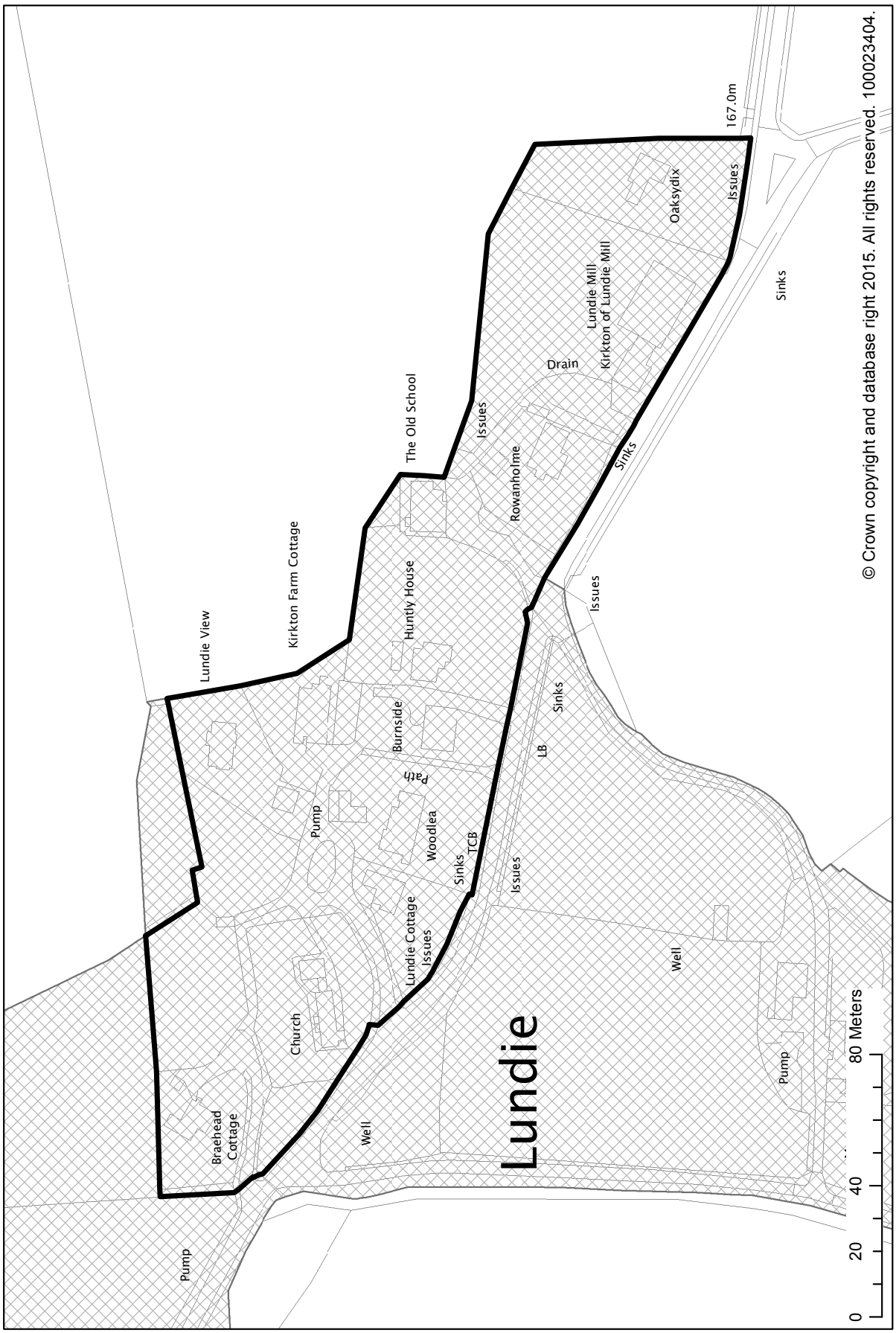

Liff
TC9
Liff
Village Hall
Liff Church
Playing Field
0
90
180
360 Meters
© Crown copyright and database right 2015. All rights reserved. 100023404.

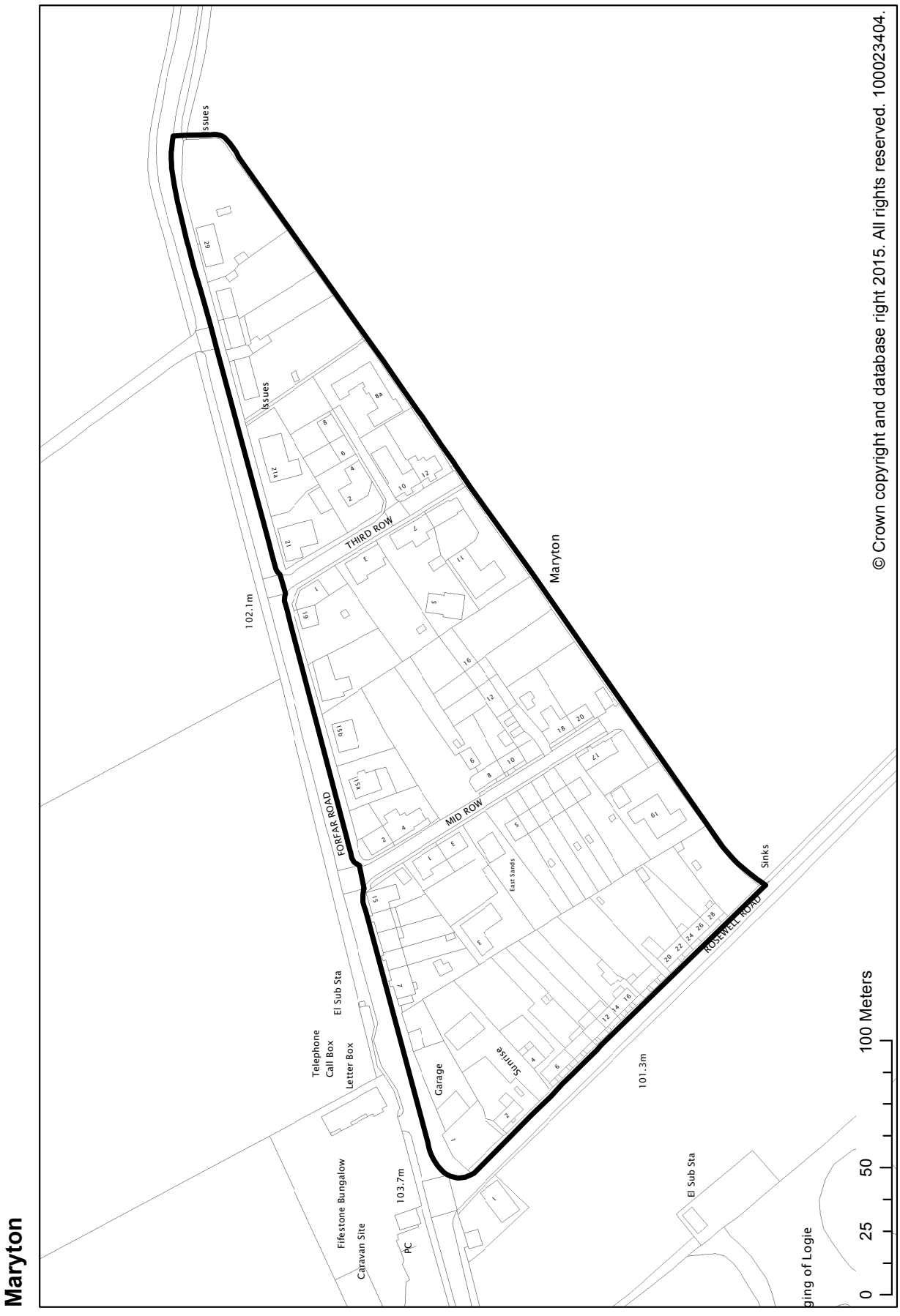
Liff

Lunanhead


Lunanhead
Dismantled Railway
Works
Playing Field
Playground
Muirlands
Pond
Drain
Track
0
45
90
180 Meters
© Crown copyright and database right 2015. All rights reserved. 100023404.

Lundie


Lundie
Lundie View
Kirkton Farm Cottage
The Old School
Huntly House
Burnside
Path
Pump
Woodlea
Sinks
TCB
Lundie Cottage
Issues
Church
Braehead Cottage
Well
Pump
Issues
Rowanholme
Drain
Lundie Mill
Kirkton of Lundie Mill
Oaksydix
Issues
167.0m
Sinks
Sinks
LB
Sinks
Issues
Issues
Well
Pump
0
20
40
80 Meters
© Crown copyright and database right 2015. All rights reserved. 100023404.


Maryton
Maryton
THIRD ROW
MID ROW
FORFAR ROAD
ROSEWELL ROAD
Sinks
East Sands
Sunrise
Garage
Telephone
Call Box
Letter Box
El Sub Sta
Fifestone Bungalow
Caravan Site
PC
102.1m
103.7m
101.3m
0
25
50
100 Meters
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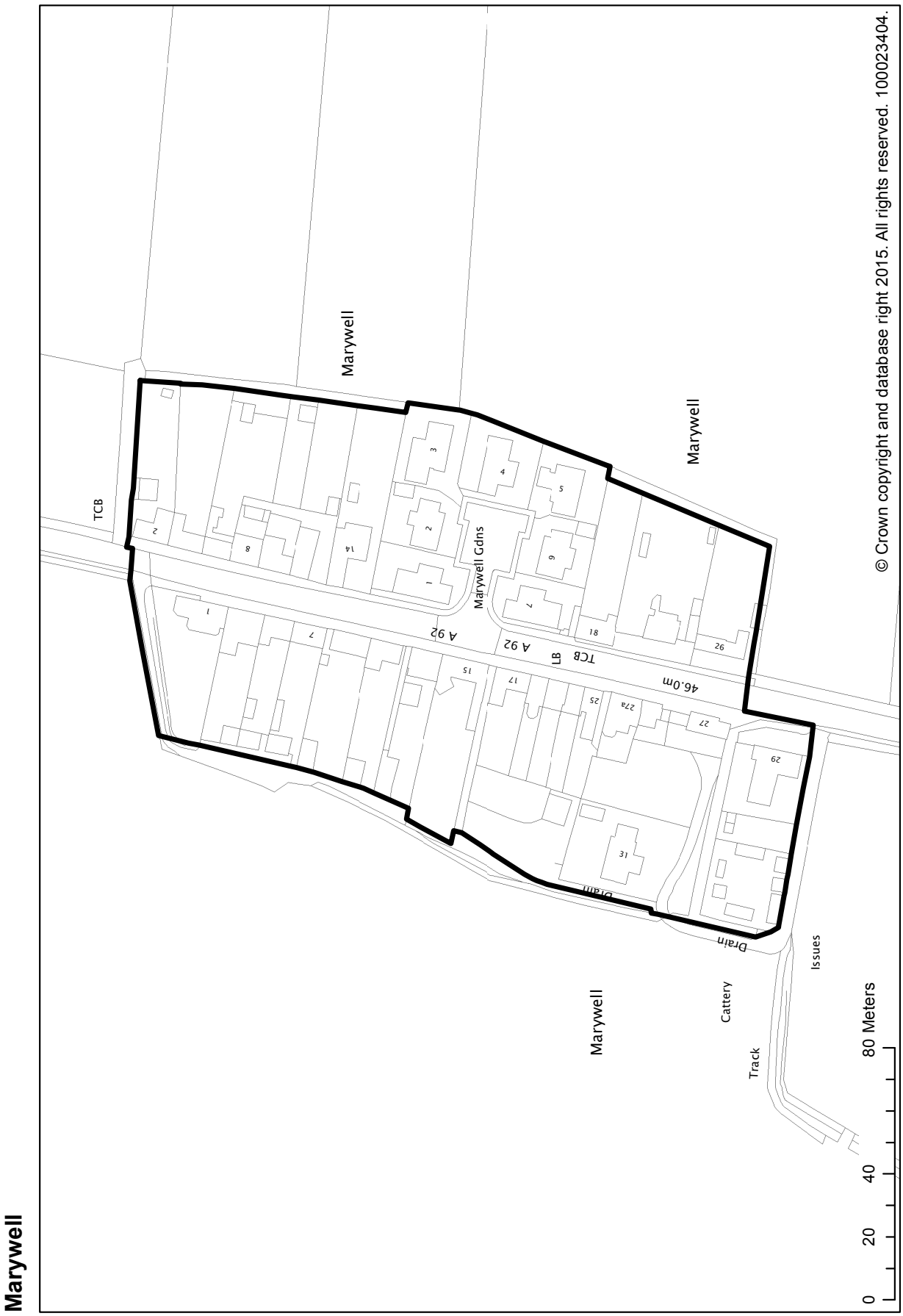
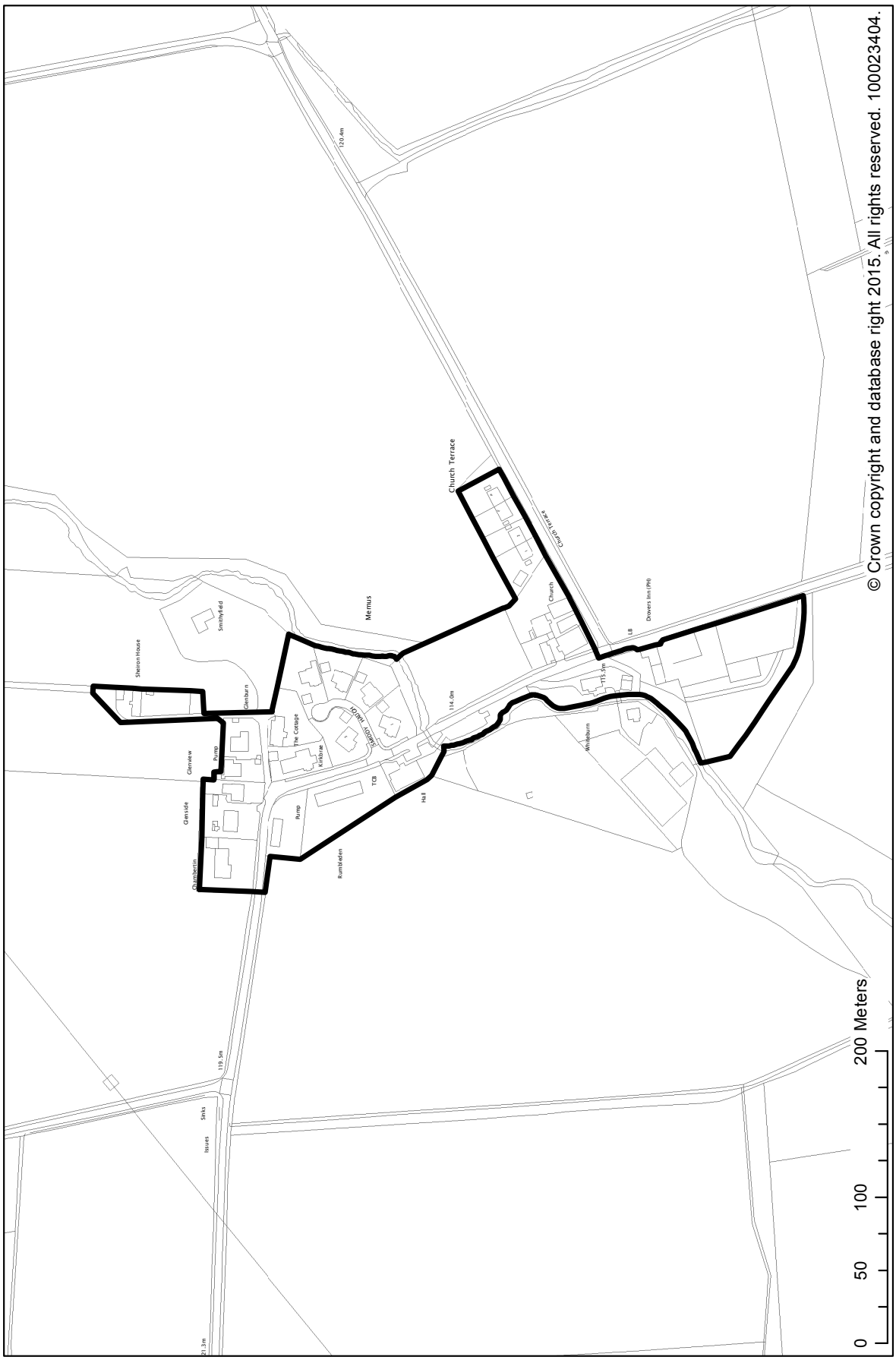
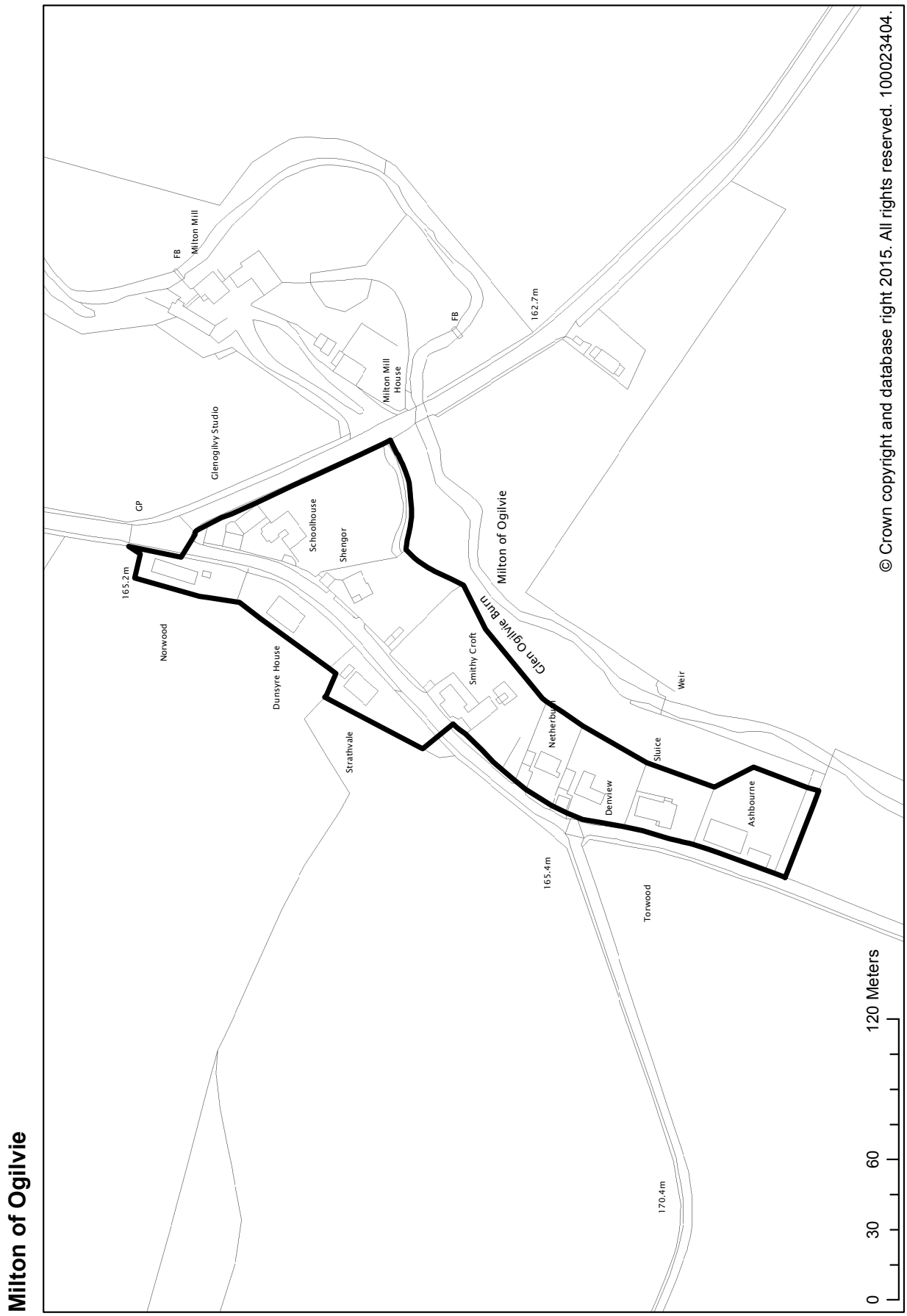
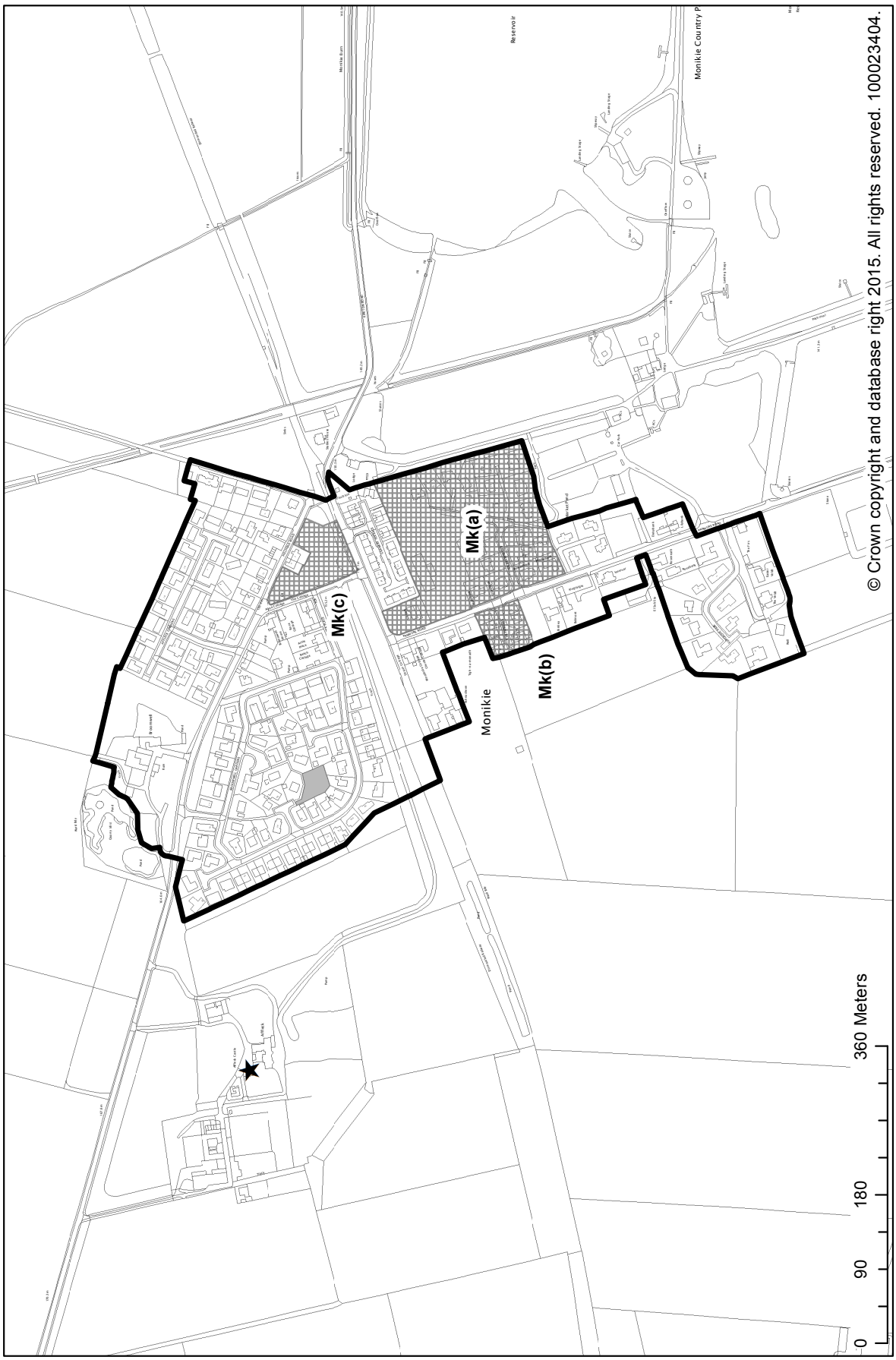

Marywell
Marywell
Marywell
Marywell Gdns
TCB
A 92
A 92
TCB LB
46.0m
Drain
Drain
Cattery
Track
Issues
0
20
40
80 Meters
© Crown copyright and database right 2015. All rights reserved. 100023404.

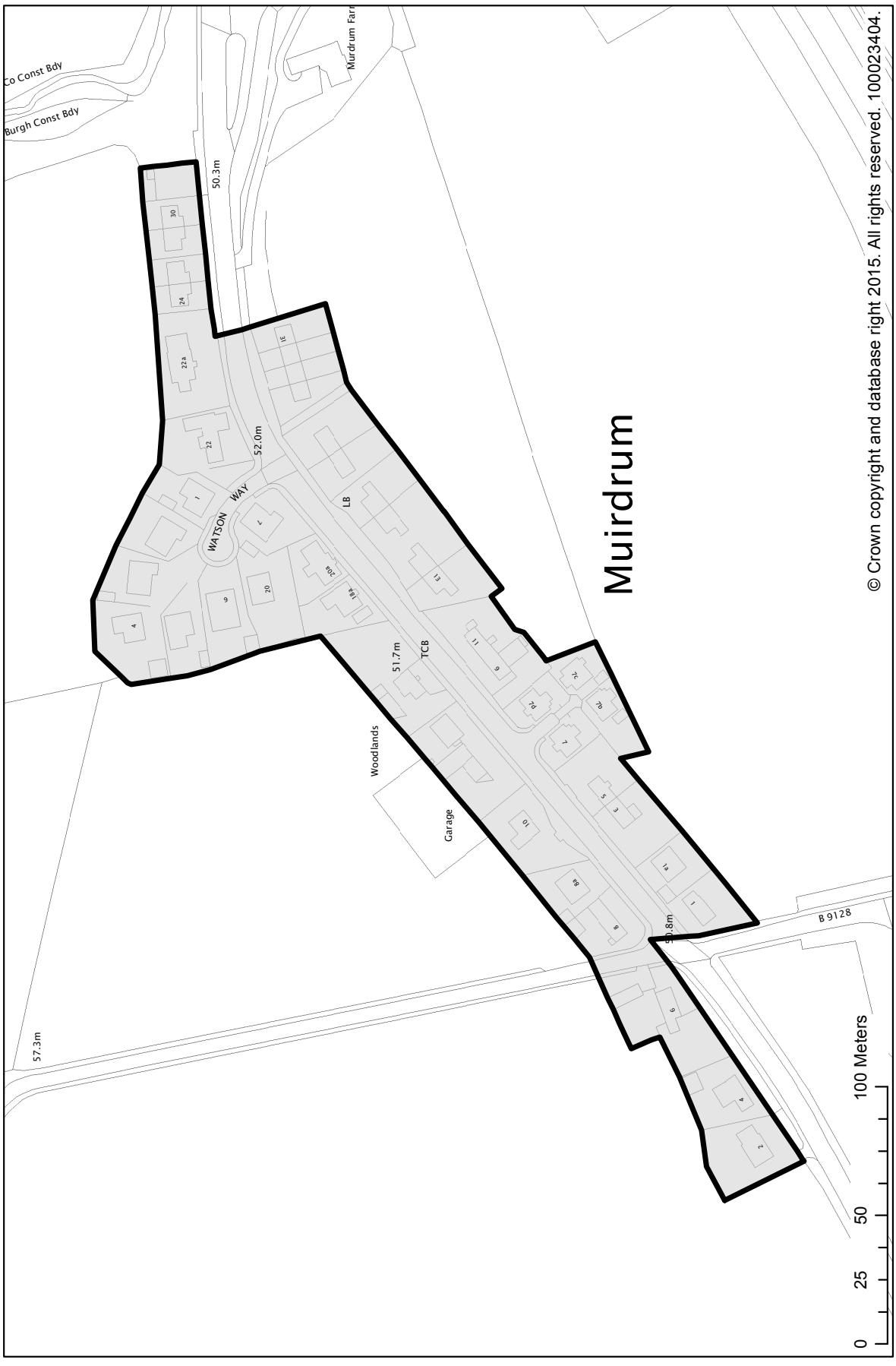
Marywell



Memus


Milton of Ogilvie
FB
Milton Mill
Glenogilvy Studio
CP
165.2m
Norwood
Dunsyre House
Strathvale
Schoolhouse
Shengor
Milton Mill House
FB
162.7m
Milton of Ogilvie
Glen Ogilvie Burn
Smithy Croft
Netherburn
Denview
Sluice
Weir
Ashbourne
165.4m
Torwood
170.4m
0
30
60
120 Meters
© Crown copyright and database right 2015. All rights reserved. 100023404.


Monikie
Mk(a)
Mk(b)
Mk(c)
Monikie
Reservoir
Monikie Country P
0
90
180
360 Meters
© Crown copyright and database right 2015. All rights reserved. 100023404.


Muirdrum
Co Const Bdy
Burgh Const Bdy
Murdrum Farm
50.3m
52.0m
WATSON WAY
LB
51.7m
TCB
Woodlands
Garage
57.3m
B 9128
0
25
50
100 Meters
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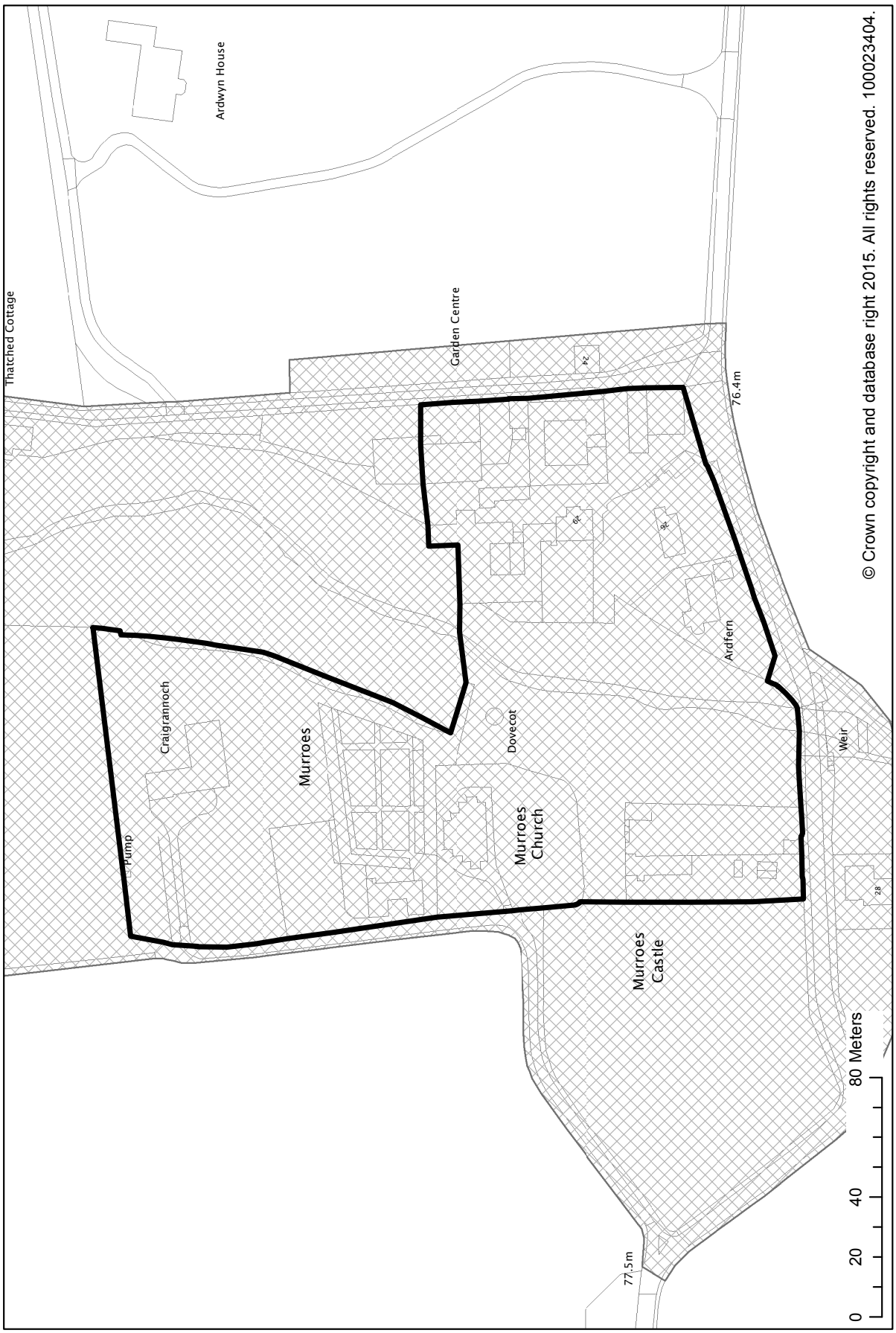
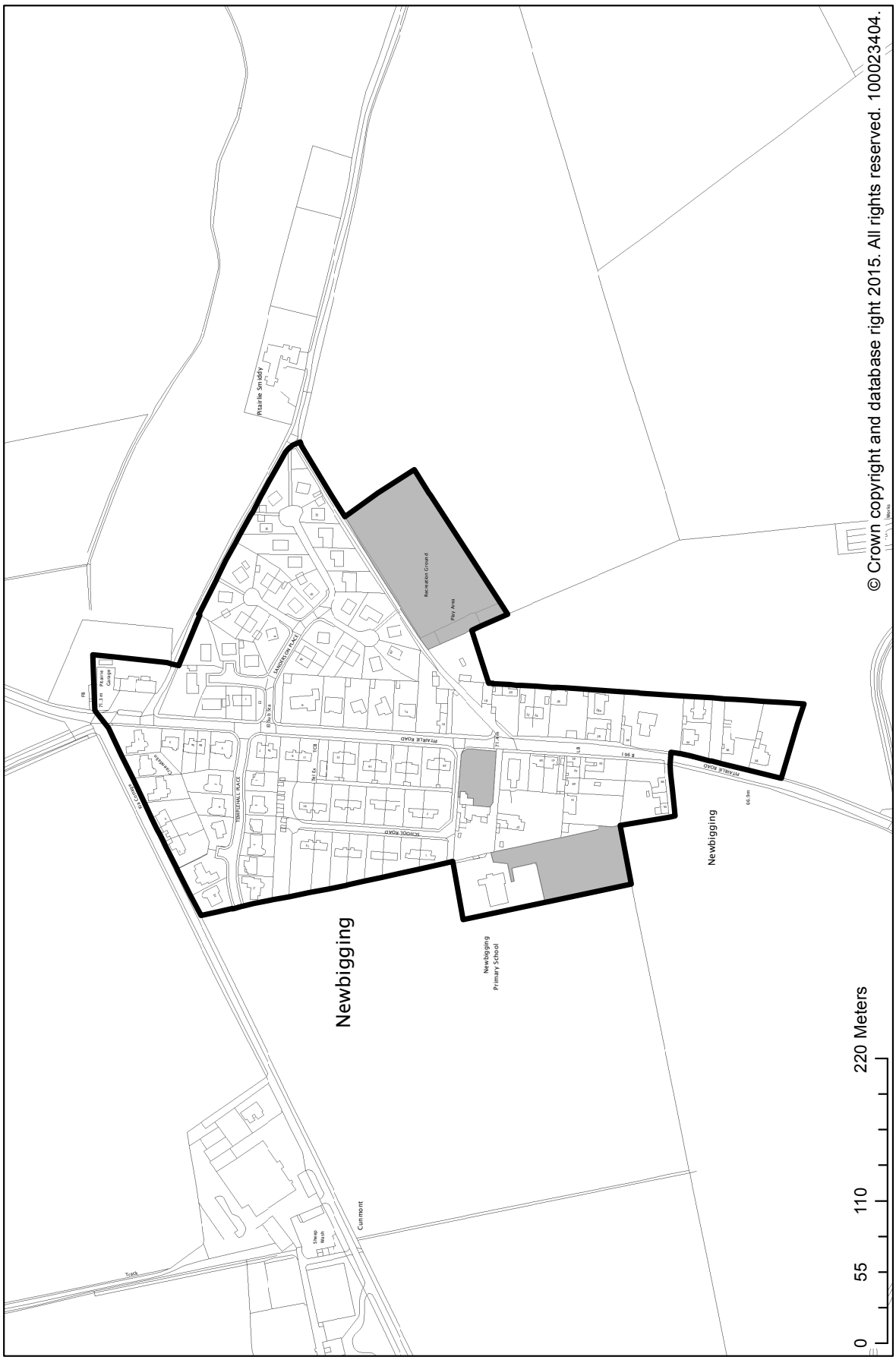
Muirdrum

Murroes




Newbigging (by Monifieth)
Newbigging
Newbigging
Primary School
Recreation Ground
Play Area
Pitairlie Smiddy
Cunmont
Newbigging
PITAIRLIE ROAD
SCHOOL ROAD
TEMPERANCE PLACE
LAMONTON PARK
B961
66.3m
0
55
110
220 Meters
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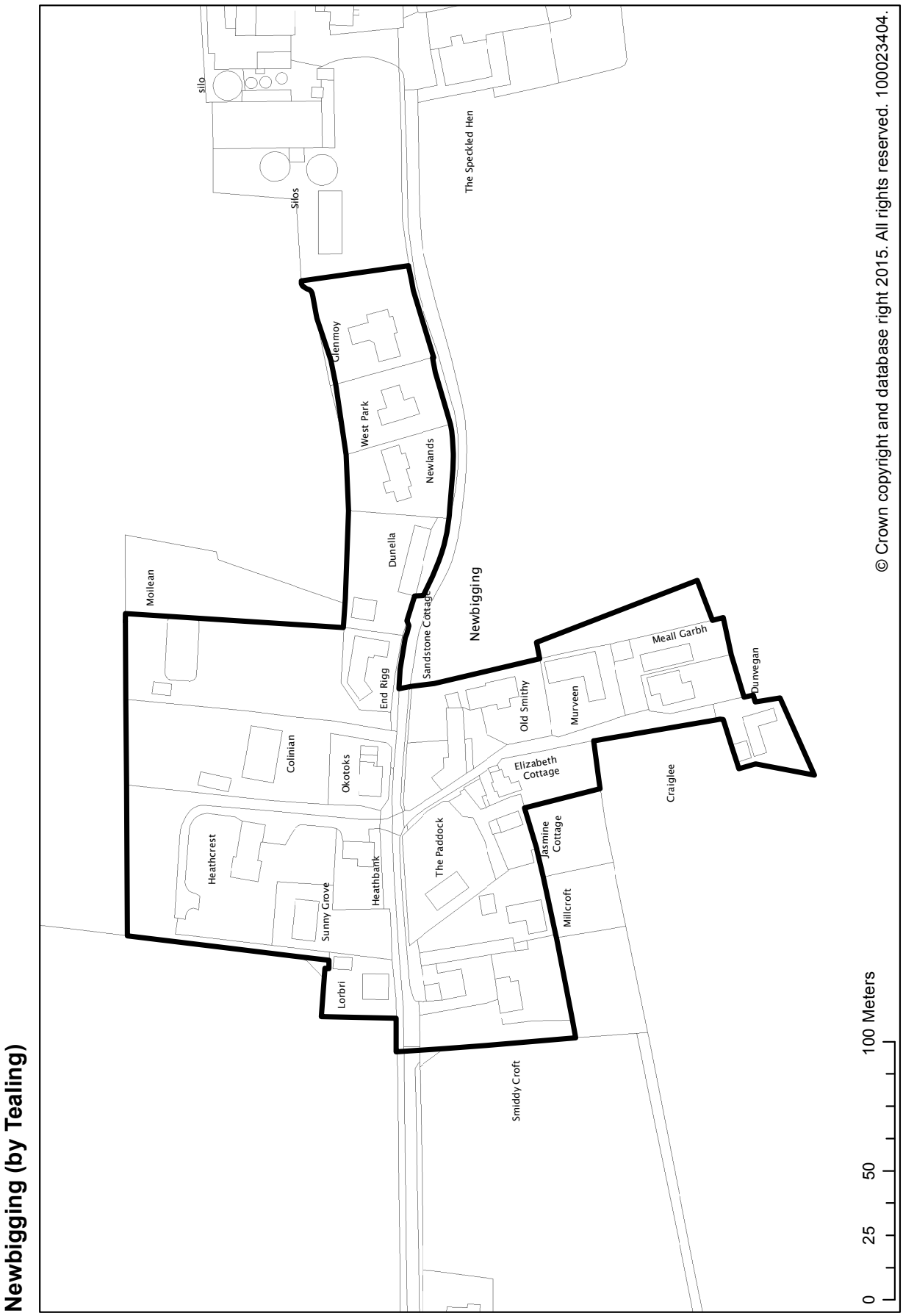
Newbigging (by Tealing)
silo
Silos
The Speckled Hen
Glenmoy
West Park
Newlands
Dunella
Moilean
Newbigging
Sandstone Cottage
End Rigg
Meall Garbh
Dunvegan
Old Smithy
Murveen
Colinian
Okotoks
Elizabeth Cottage
Craiglee
Heathcrest
Sunny Grove
Heathbank
The Paddock
Jasmine Cottage
Millcroft
Lorbri
Smiddy Croft
0
25
50
100 Meters
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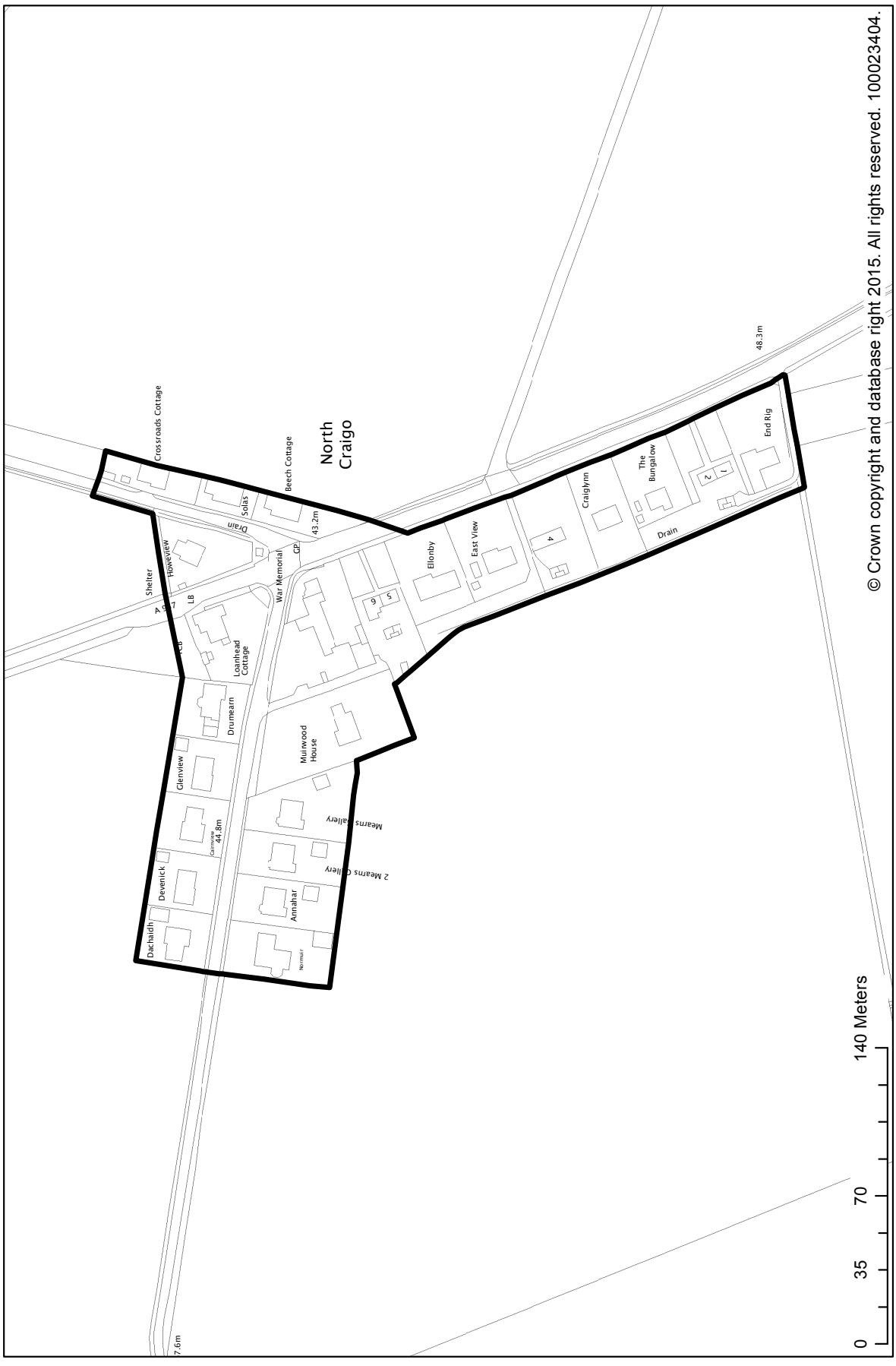
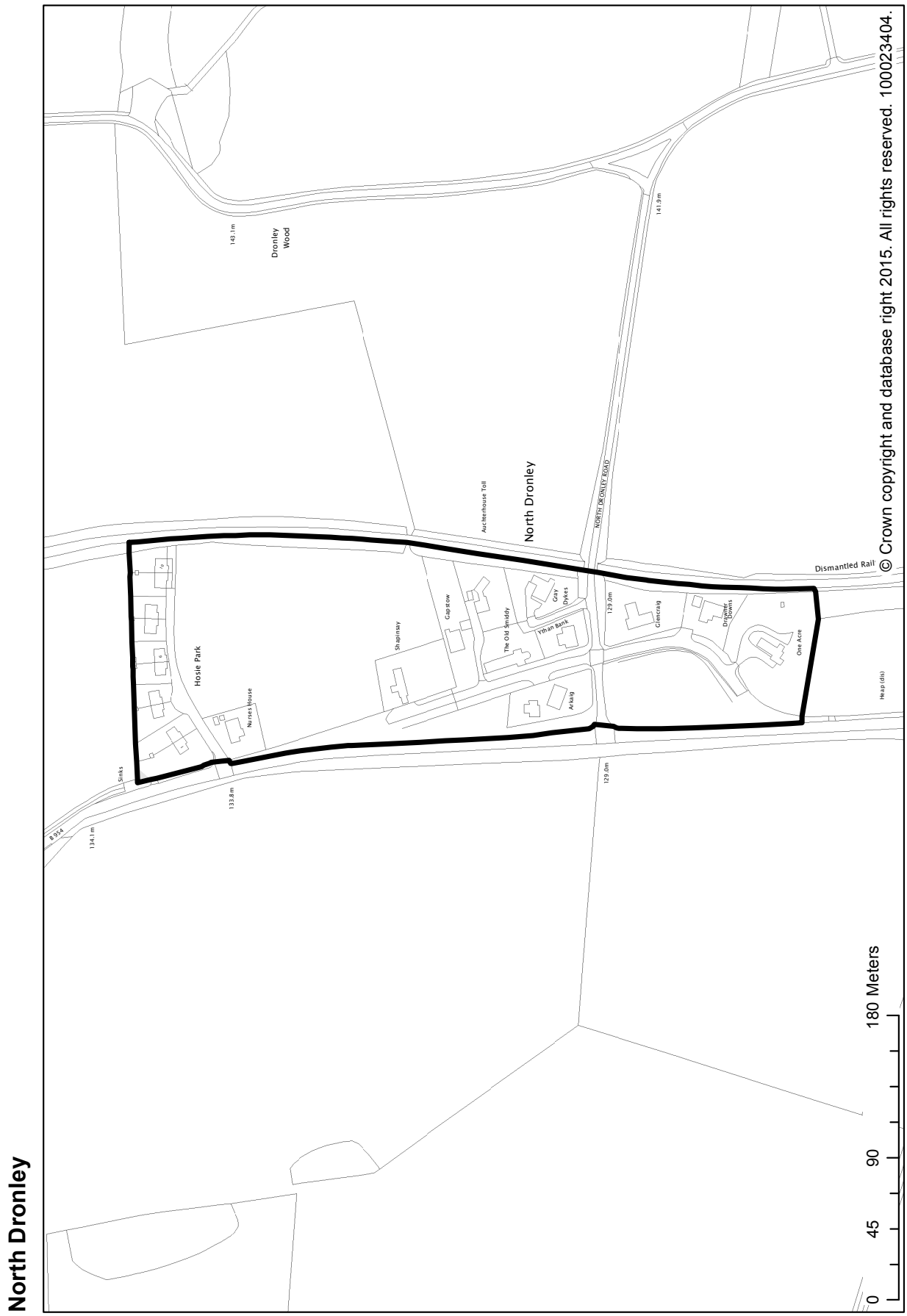
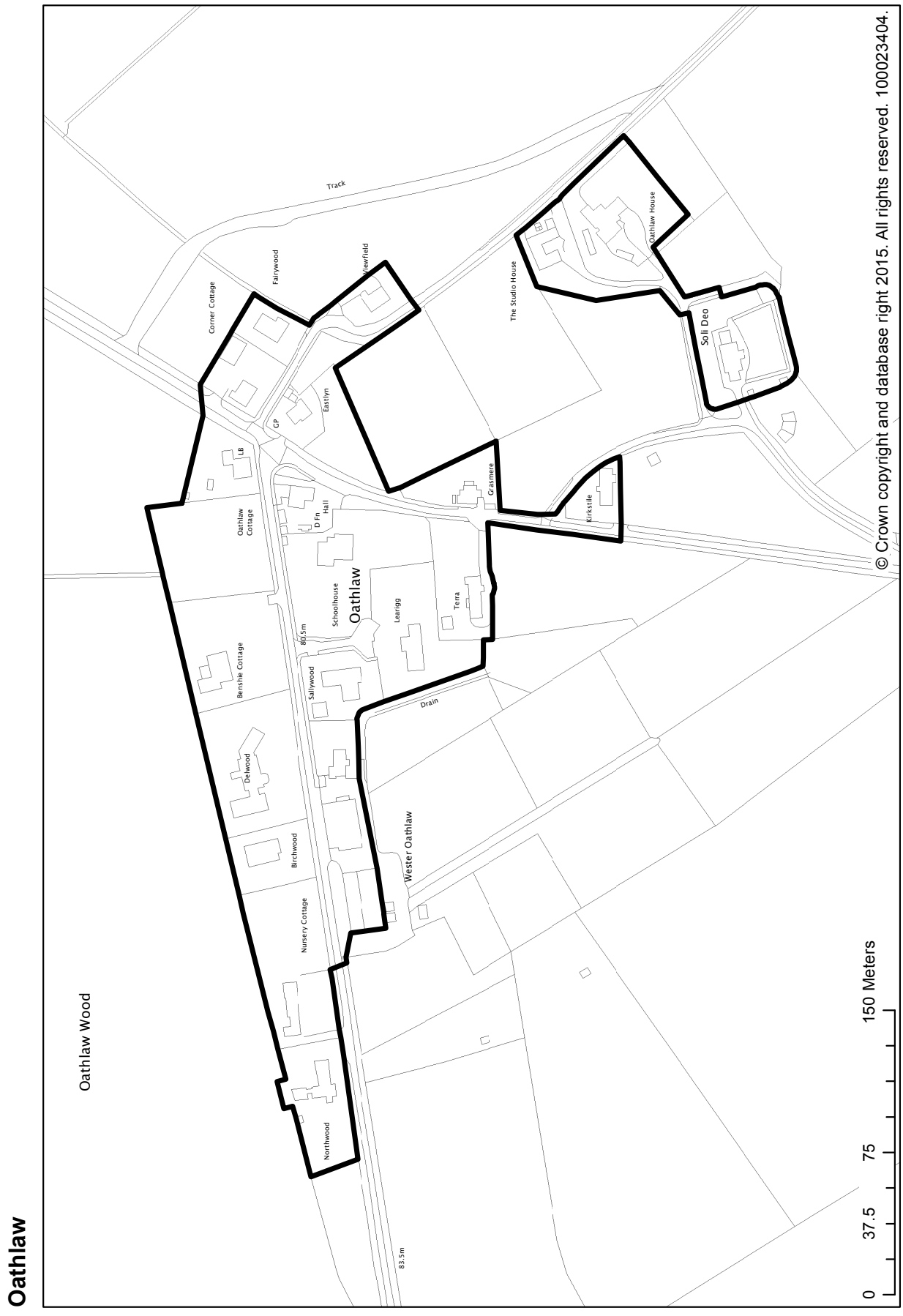
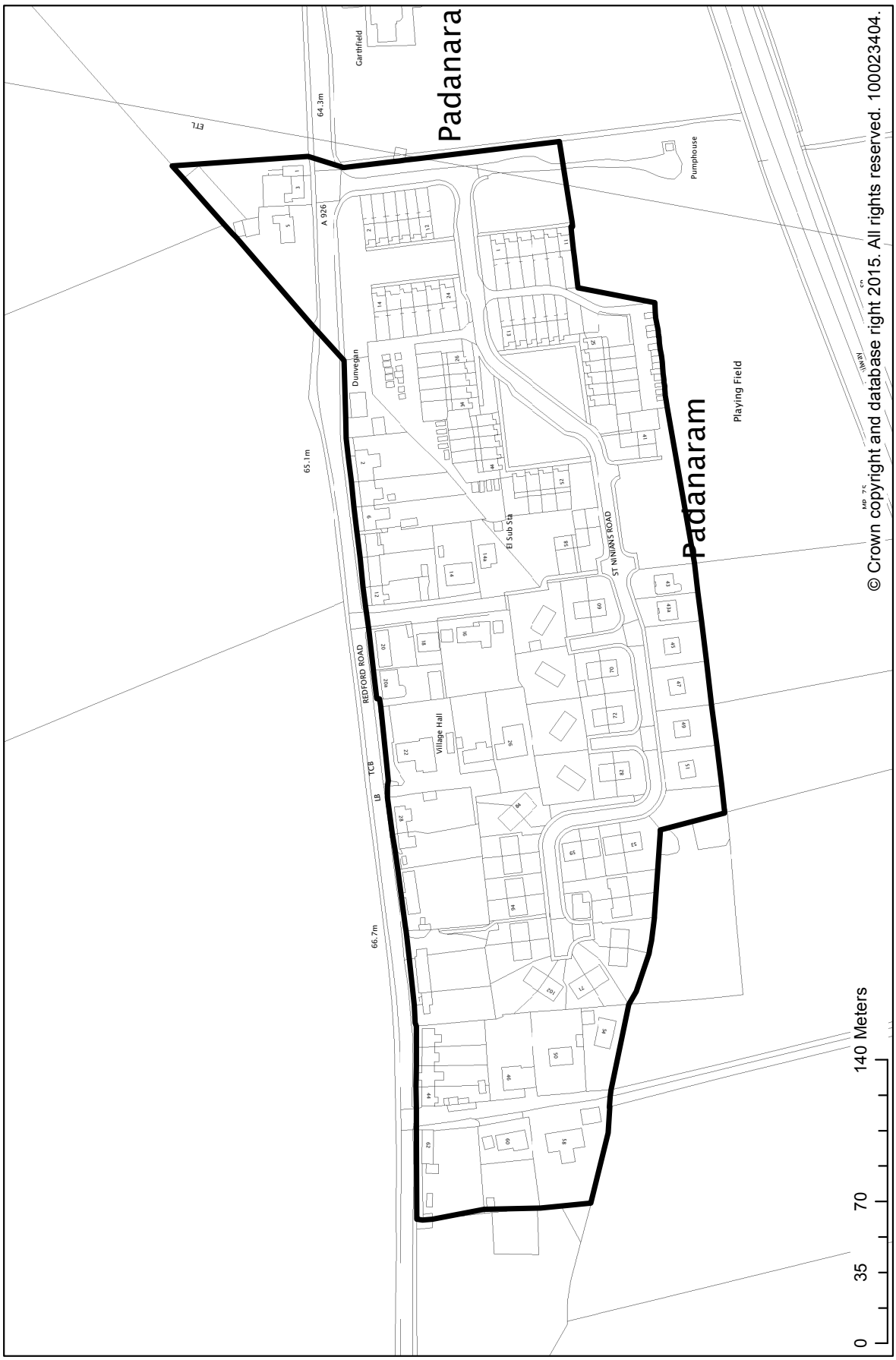


North Craigo




Oathlaw
Oathlaw Wood
Track
Corner Cottage
Fairywood
Viewfield
Eastlyn
CP
LB
Oathlaw Cottage
D Fn
Hall
Schoolhouse
Oathlaw
Learigg
Terra
80.5m
Benshie Cottage
Sallywood
Drain
Delwood
Birchwood
Nursery Cottage
Northwood
Wester Oathlaw
83.5m
Grasmere
Kirkstile
The Studio House
Oathlaw House
Soli Deo
© Crown copyright and database right 2015. All rights reserved. 100023404.
0
37.5
75
150 Meters


Padanara
Padanaram
Carthfield
Pumphouse
Dunvegan
Playing Field
El Sub Sta
ST NINIANS ROAD
REDFORD ROAD
Village Hall
A 926
64.3m
65.1m
66.7m
ETL
TCB
LB
0
35
70
140 Meters
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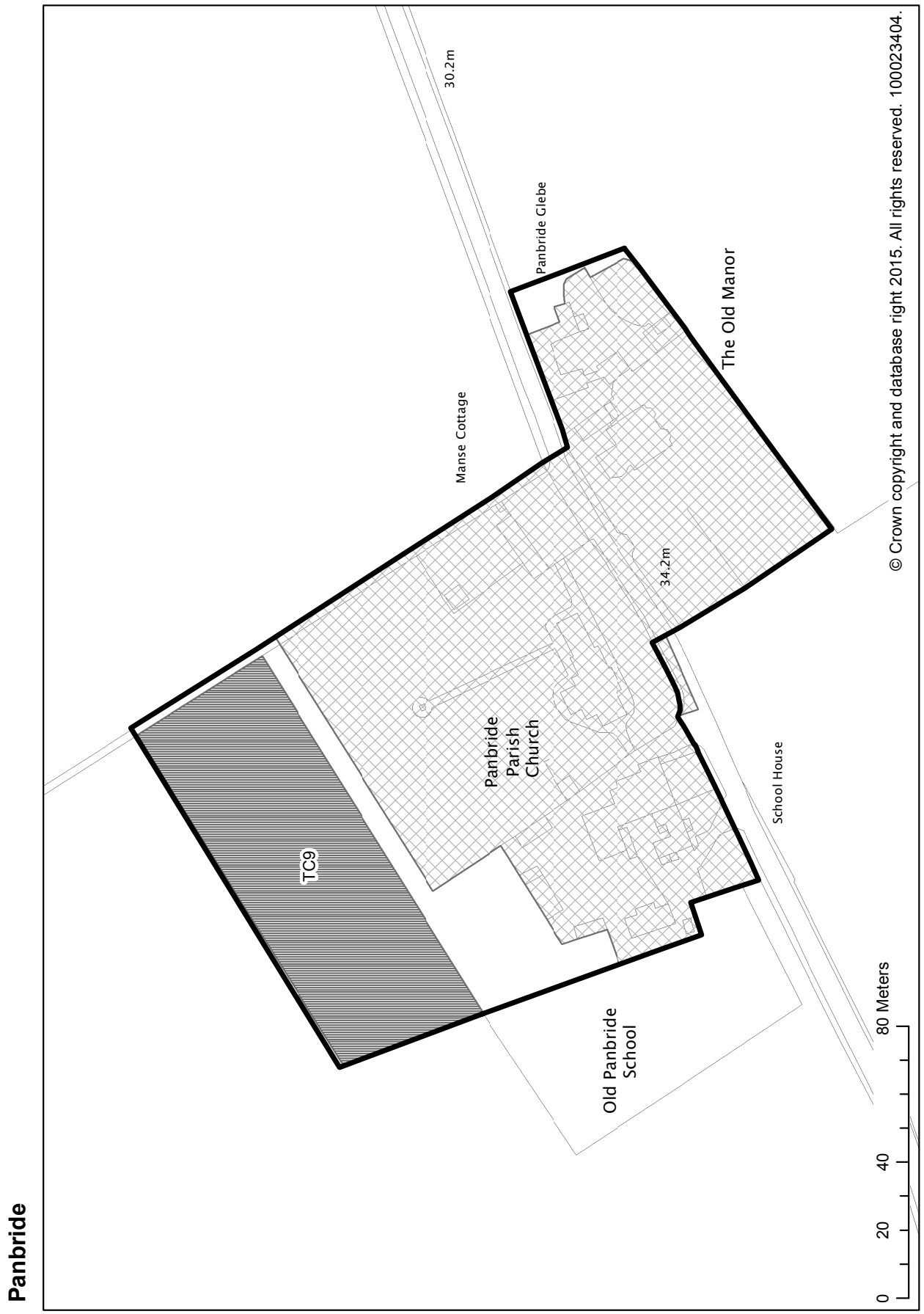
Padanaram


Panbride
30.2m
Panbride Glebe
The Old Manor
Manse Cottage
34.2m
Panbride Parish Church
School House
TC9
Old Panbride School
0
20
40
80 Meters
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Piperdam

Located to the west of Muirhead on the south side of the A923, Piperdam comprises golf courses, designed around a loch and woodland setting, associated driving range and other facilities including restaurant/centre, swimming pool/spa, loch fishings, chalets and timeshare properties. Planning permission was also granted for the development of a maximum of 123 houses in three phases. This development has been completed with the exception of 1 unit as identified within the Angus Housing Land Audit 2014.

DEVELOPMENT STRATEGY

The development strategy for Angus is set out in the introduction to the ALDP, for Piperdam this means:

- Supporting proposals which maintain or enhance the recreational and tourism potential of the golf course and associated facilities; and
- Additional residential development at Piperdam will not be supported.

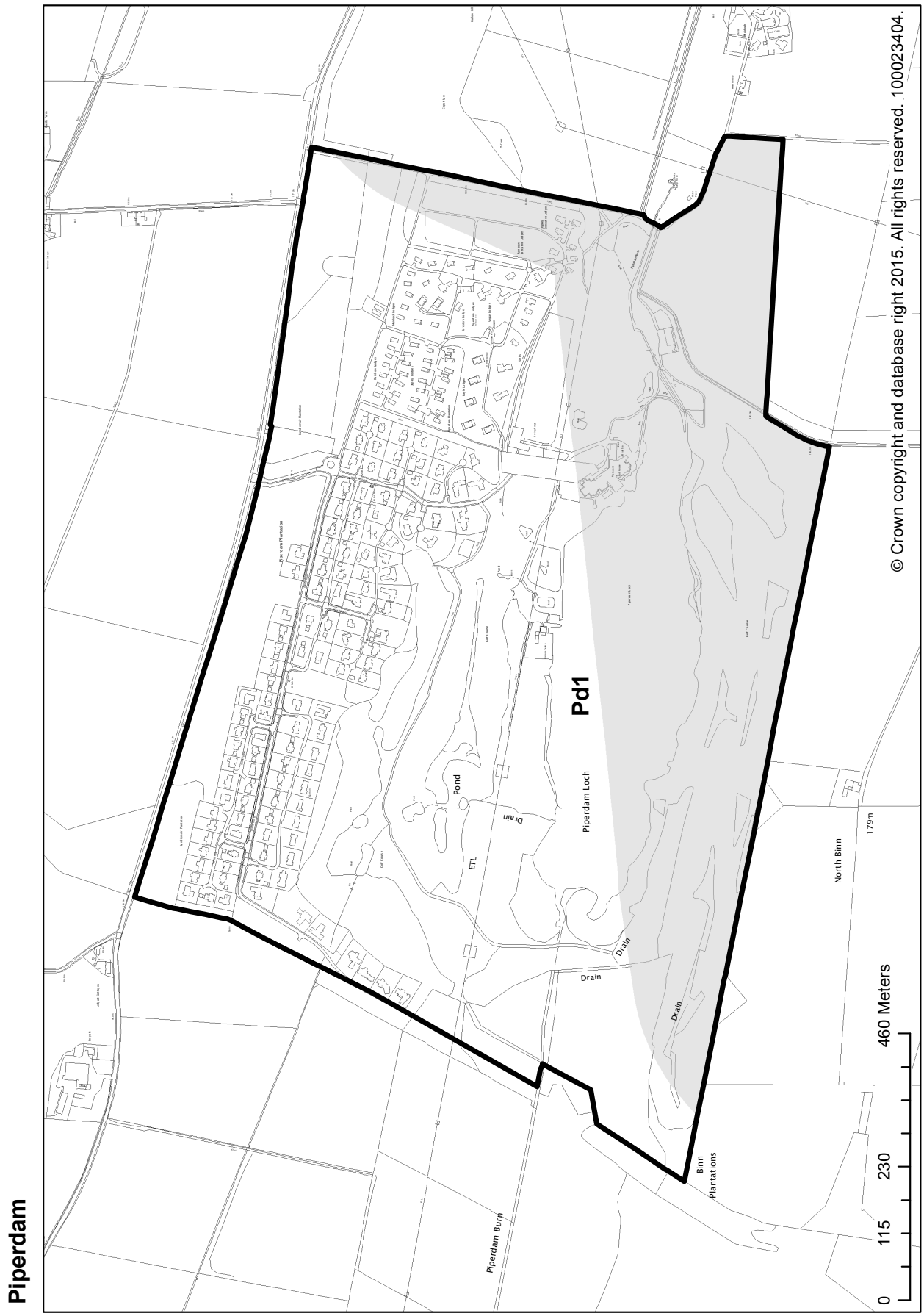
SPORT AND RECREATION

The existing recreational and tourism facilities at Piperdam, including golf courses, chalets, timeshare properties and other facilities, contribute to the recreation and tourism resources of Angus. Future proposals which consolidate and where appropriate expand the recreation and tourism potential of Piperdam will be supported where these are compatible with existing land uses and do not adversely impact on the amenity and environment of the area.

Pd1: Recreation Development

Proposals which extend the recreational and tourism potential of Piperdam, will be supported where they are compatible with the existing land uses/activities and are not detrimental to the area's setting and environment.

Pd1 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
?/0	0	+/?	+/?	?	+/?	?	0/+	+/?	+/?


Piperdam
Pd1
Piperdam Loch
Pond
Drain
ETL
Drain
Drain
Drain
North Binn
179m
Binn Plantations
Piperdam Burn
0
115
230
460 Meters
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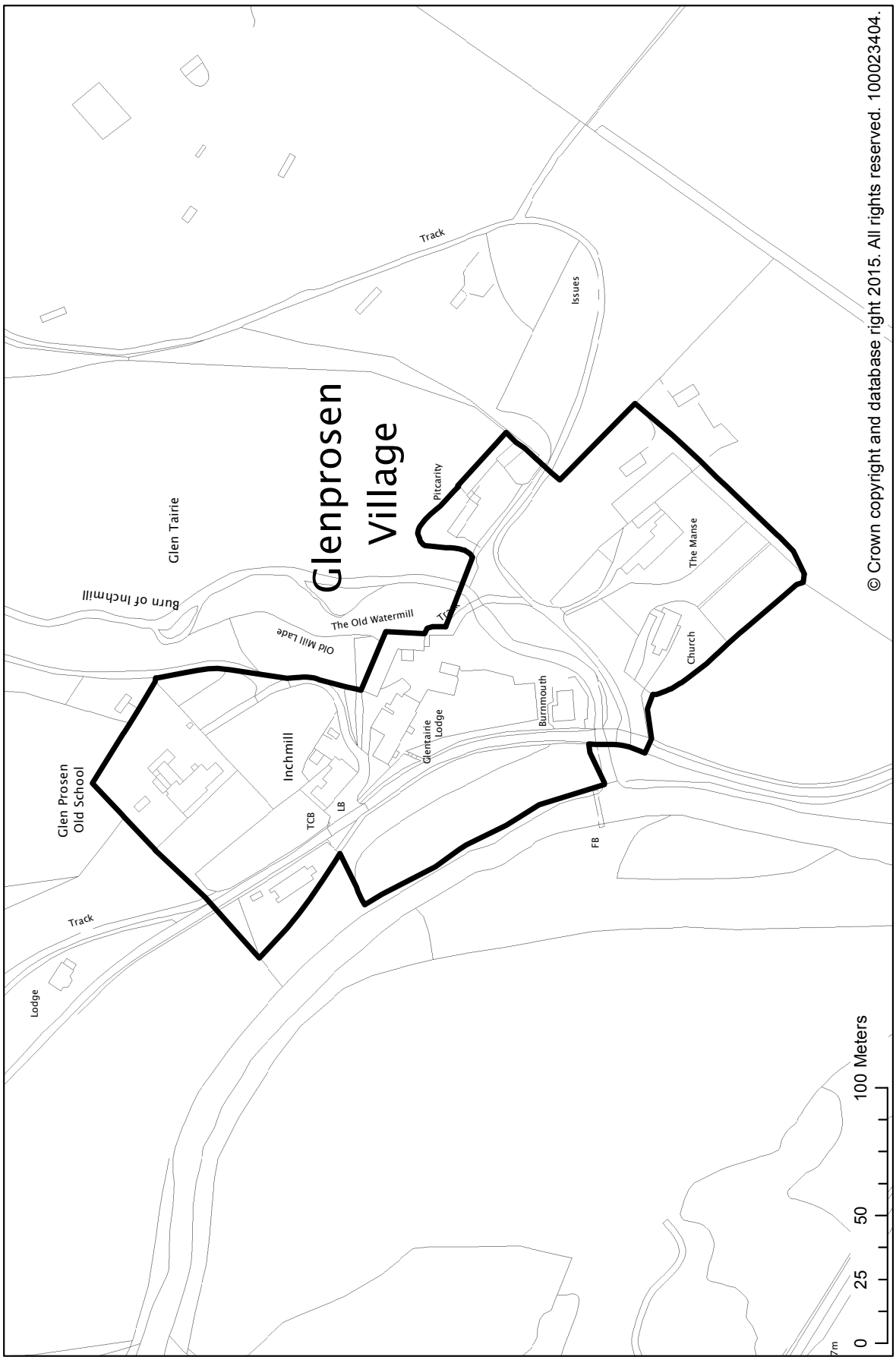
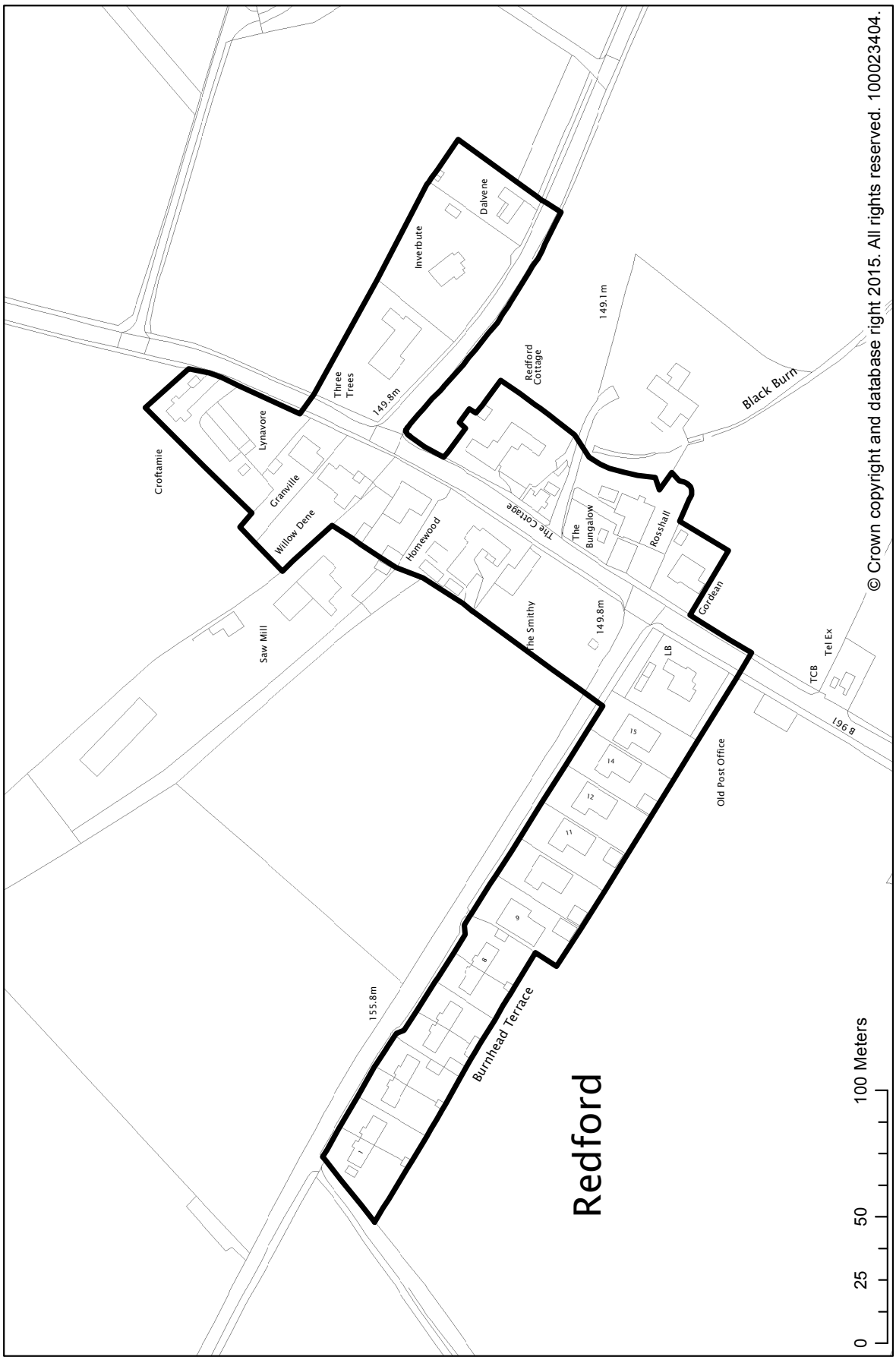
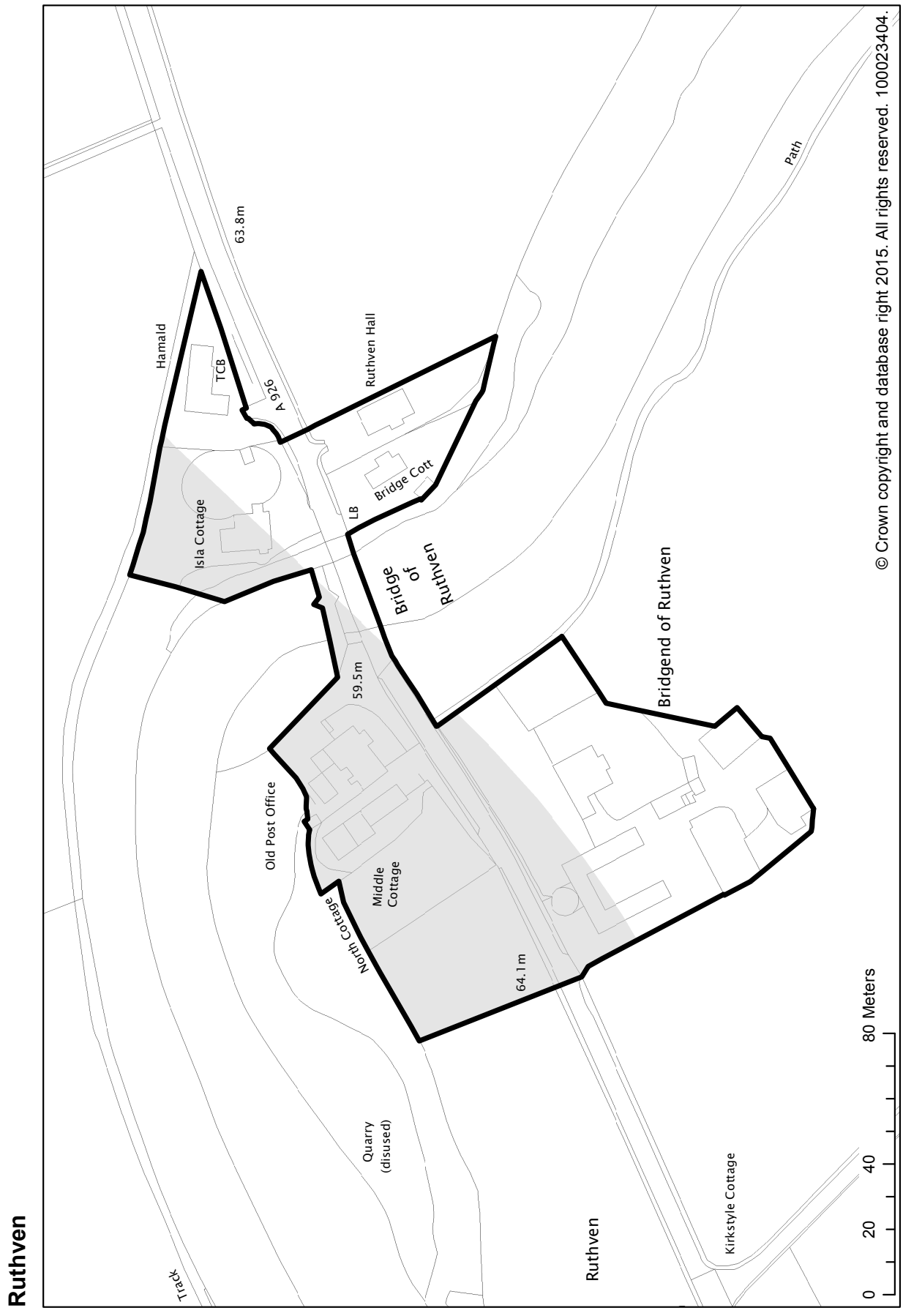
Prosen Village



Redford




Ruthven
Hamald
TCB
A926
63.8m
Ruthven Hall
Bridge Cott
LB
Isla Cottage
Bridge of Ruthven
Bridgend of Ruthven
Path
59.5m
Old Post Office
Middle Cottage
North Cottage
64.1m
Quarry (disused)
Track
Ruthven
Kirkstyle Cottage
0
20
40
80 Meters
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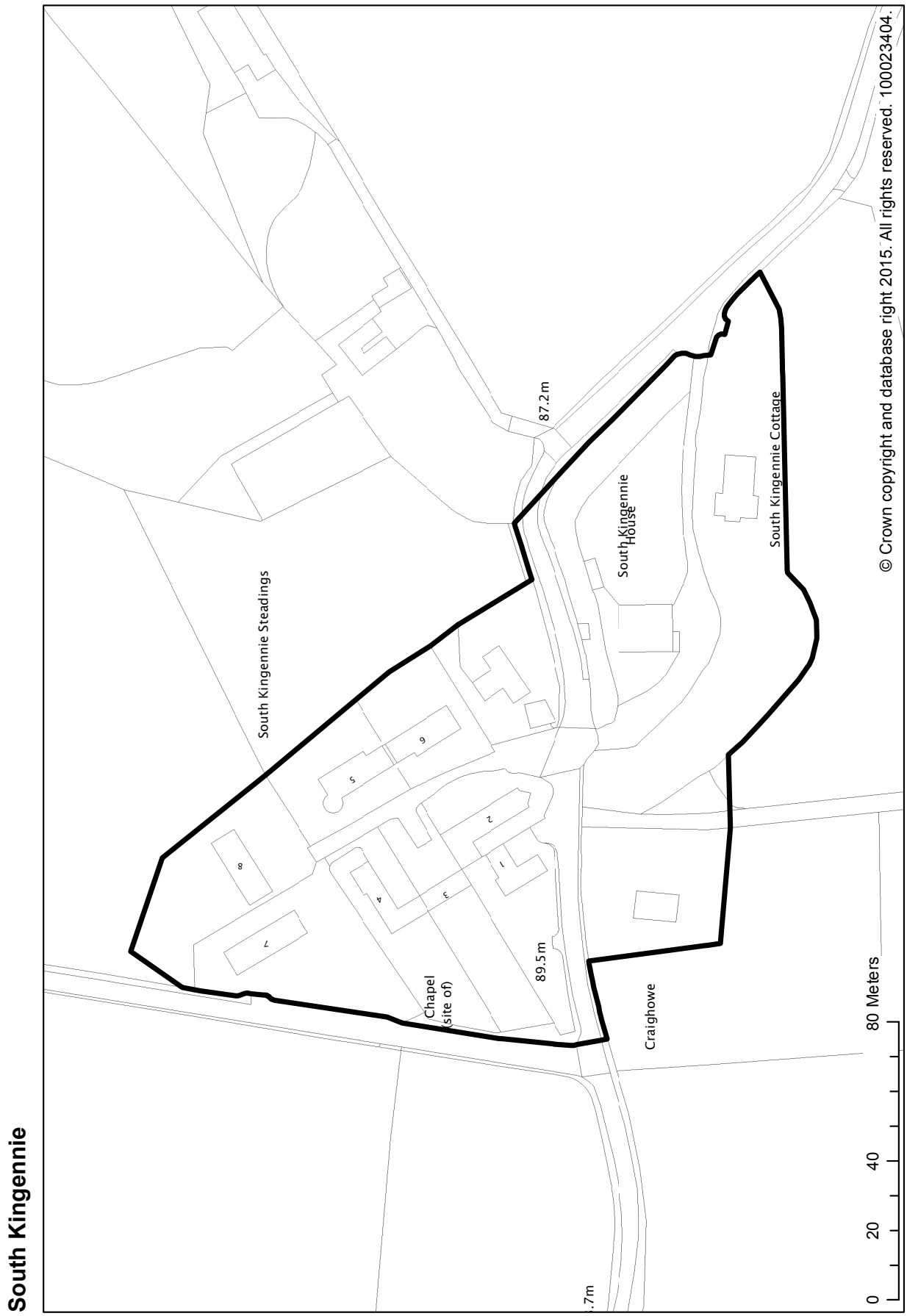
South Kingennie
South Kingennie Steadings
South Kingennie House
South Kingennie Cottage
Craighowe
Chapel (site of)
87.2m
89.5m
1
2
3
4
5
6
7
8
0
20
40
80 Meters
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Strathmartine Hospital

The Strathmartine Hospital Estate lies to the north west of Dundee and outwith the Dundee Core Area established by the TAYplan Strategic Development Plan. Although a small part of the estate currently remains in health care use the remainder of the site (17.5 ha) has been declared surplus to the requirements of the NHS Trust. The surplus buildings and landscaped grounds offer an opportunity for reuse and redevelopment for a range of uses, in the context of the development strategy and housing requirements for the South Angus Housing Market Area.

DEVELOPMENT STRATEGY

The development strategy for Angus is set out in the introduction to the ALDP, for Strathmartine Hospital this means:

- Supporting the redevelopment of vacant underused and brownfield sites and buildings for an appropriate mix of uses; and
- Proposals for the comprehensive redevelopment of this site will be required to address issues including, retention of the existing listed building, primary and secondary school capacity, timing and phasing of development, landscape setting and existing tree cover, and public safety and security related to existing redundant structures.

OPPORTUNITY SITES

The following site provides an opportunity for redevelopment. Where proposals involve new housing development they will require to contribute towards meeting the provision of Policy TC3: Affordable Housing.

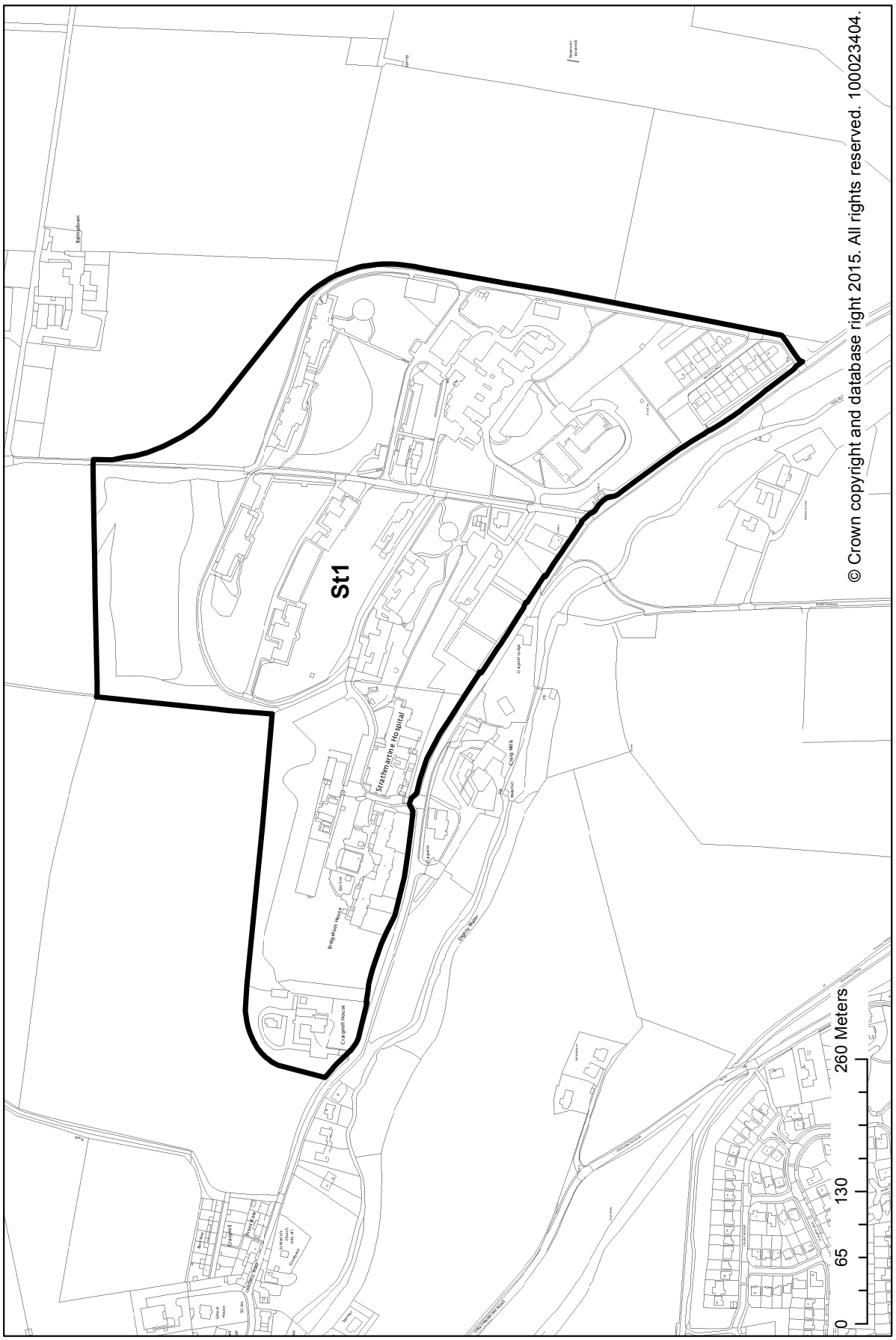
St1: Opportunity Site – Strathmartine Hospital Estate

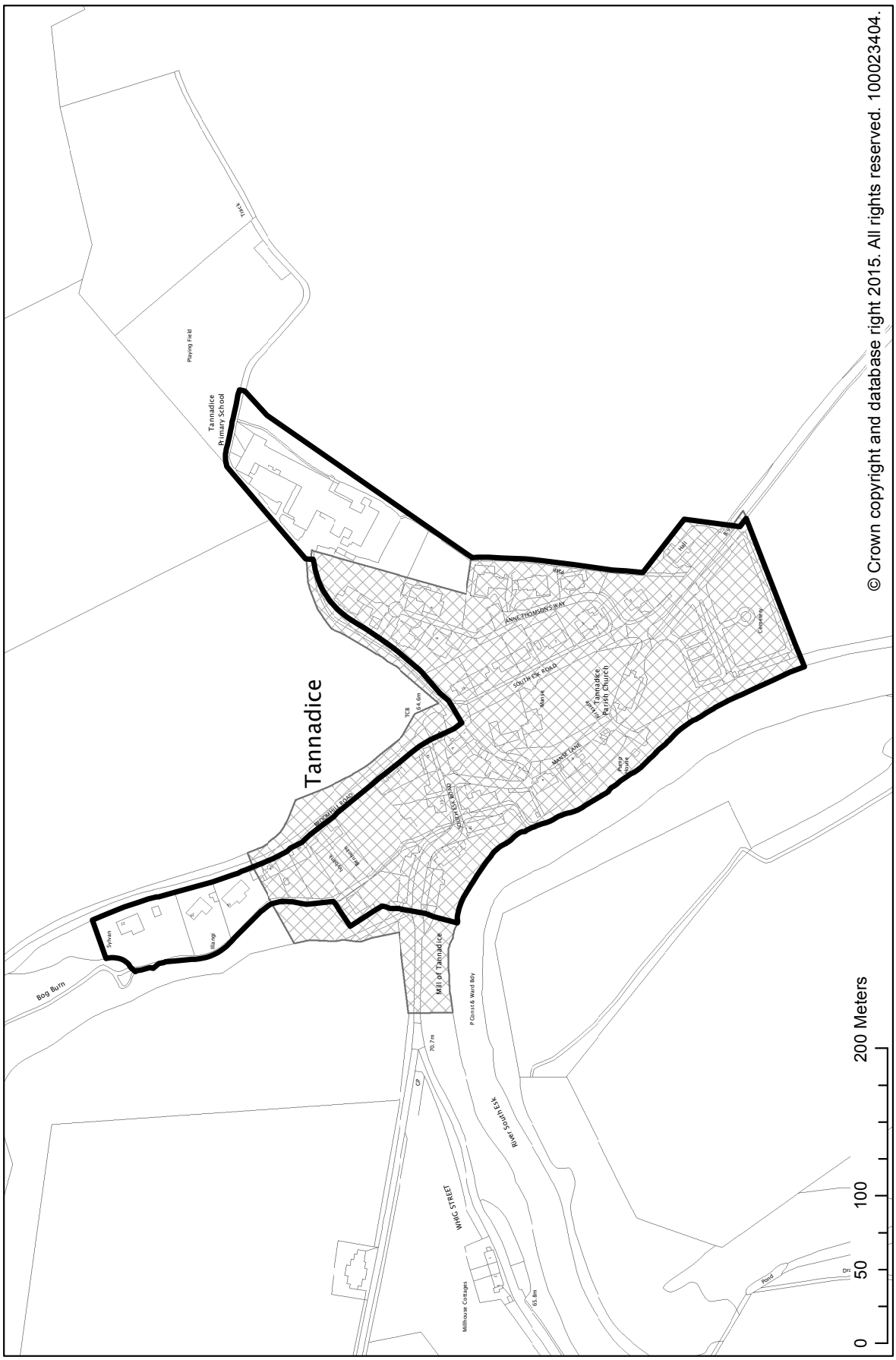
The Strathmartine Hospital Estate provides an opportunity for reuse and redevelopment for a range of uses, including housing. Proposals for the comprehensive redevelopment of this site should include:

- **retention of the existing listed building;**
- **a Flood Risk Assessment;**
- **the timing, phasing and location of development;**
- **public safety and security related to existing structures;**
- **the retention of existing tree cover and hedgerows, enhancement of the landscape setting and biodiversity of the site; and**
- **provision for public access to the landscaped grounds for informal recreational purposes.**

St1 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+/?	0/+	0/+	?/+	0/+	0/+	0/+	0/+	?/+	+

Strathmartine Hospital




Tannadice
Tannadice
Tannadice Primary School
Playing Field
Track
ANNE THOMSON'S WAY
SOUTH ESK ROAD
Tannadice Parish Church
Cemetery
Hall
MANSE LANE
Pump House
BROUGHTON ROAD
Bog Burn
Mill of Tannadice
River South Esk
WHIG STREET
Millhouse Cottages
Pond
0
50
100
200 Meters
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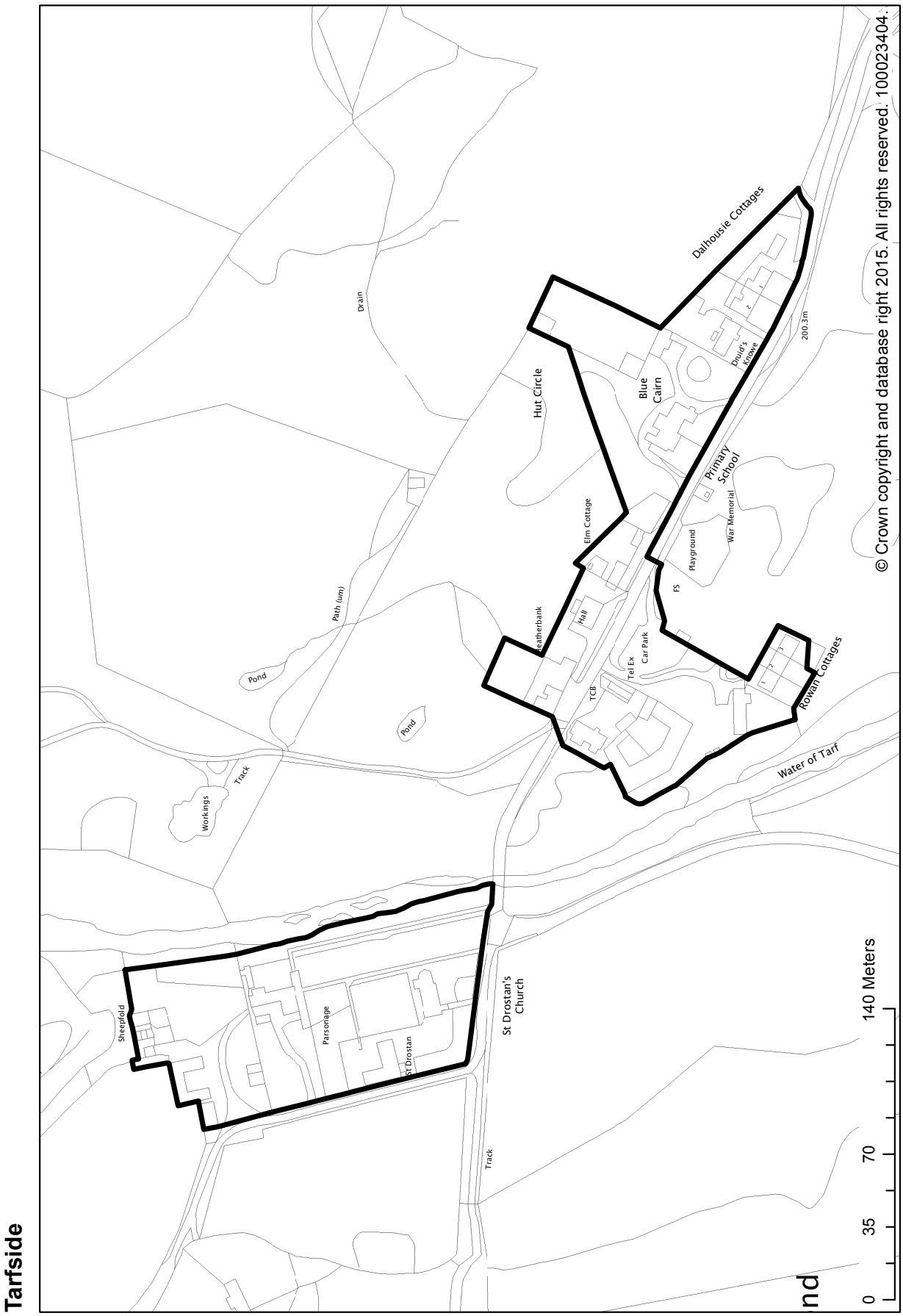
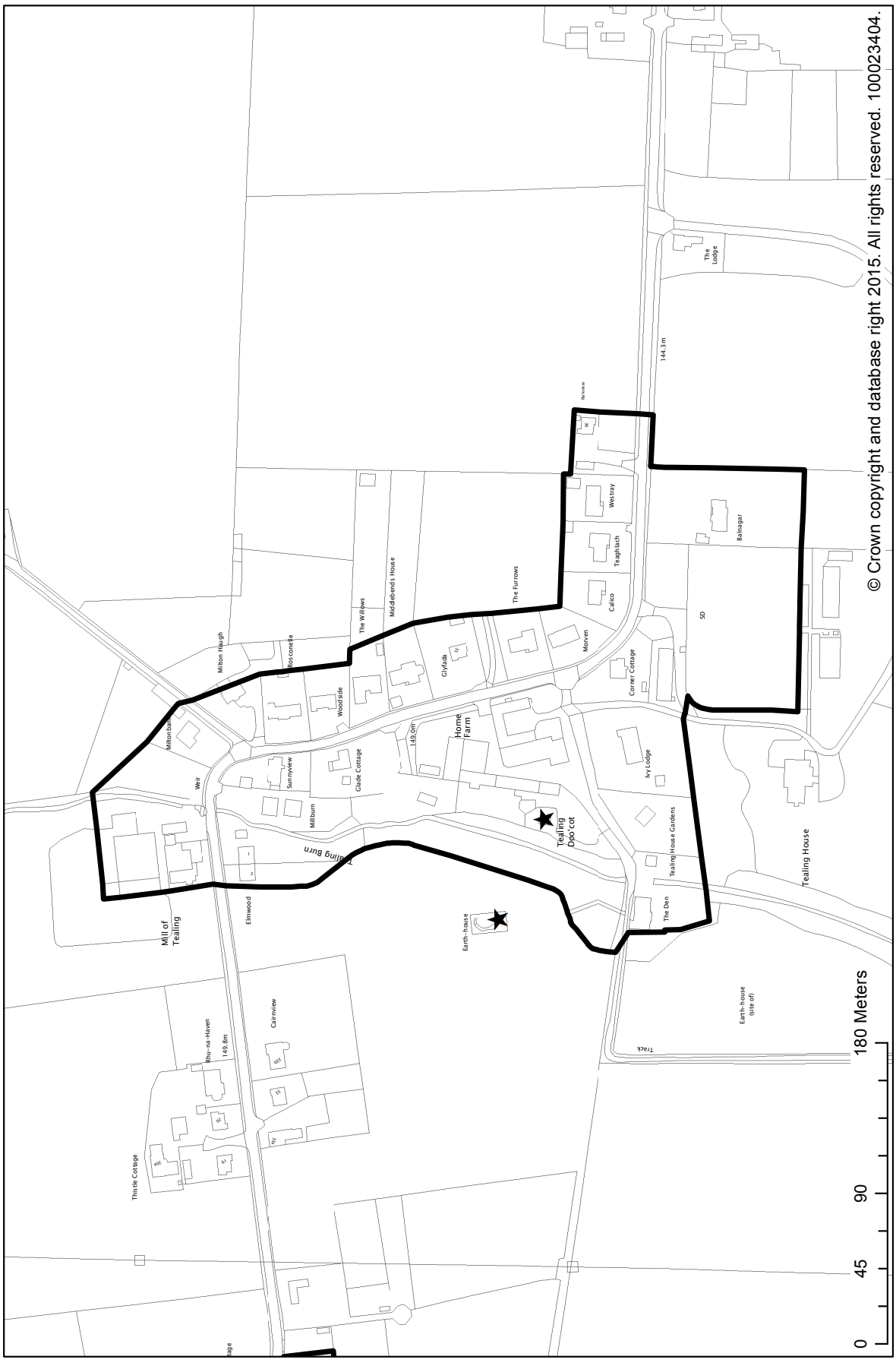
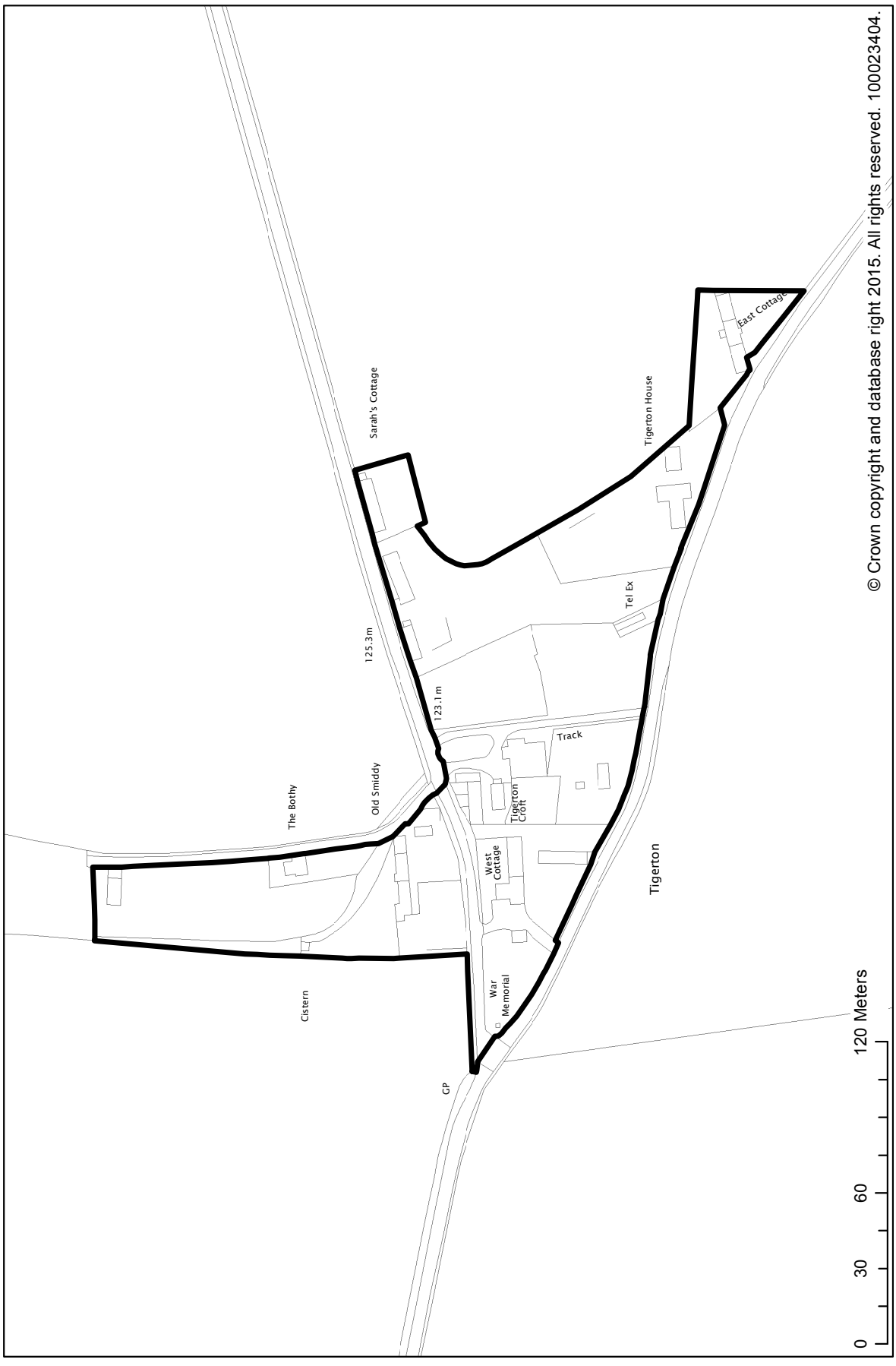

Tarfside
Dalhousie Cottages
Drain
Hut Circle
Blue Cairn
Druid's Knowe
200.3m
Primary School
War Memorial
Playground
FS
Elm Cottage
Heatherbank
Hall
Tel Ex
Car Park
TCB
Rowan Cottages
Path (um)
Pond
Pond
Track
Workings
Water of Tarf
Sheepfold
Parsonage
St Drostan
St Drostan's Church
Track
0
35
70
140 Meters
© Crown copyright and database right 2015. All rights reserved. 100023404.




Tigerton
Sarah's Cottage
Tigerton House
East Cottage
Tel Ex
125.3m
123.1m
Track
The Bothy
Old Smiddy
Tigerton Croft
West Cottage
Tigerton
War Memorial
Cistern
GP
0
30
60
120 Meters
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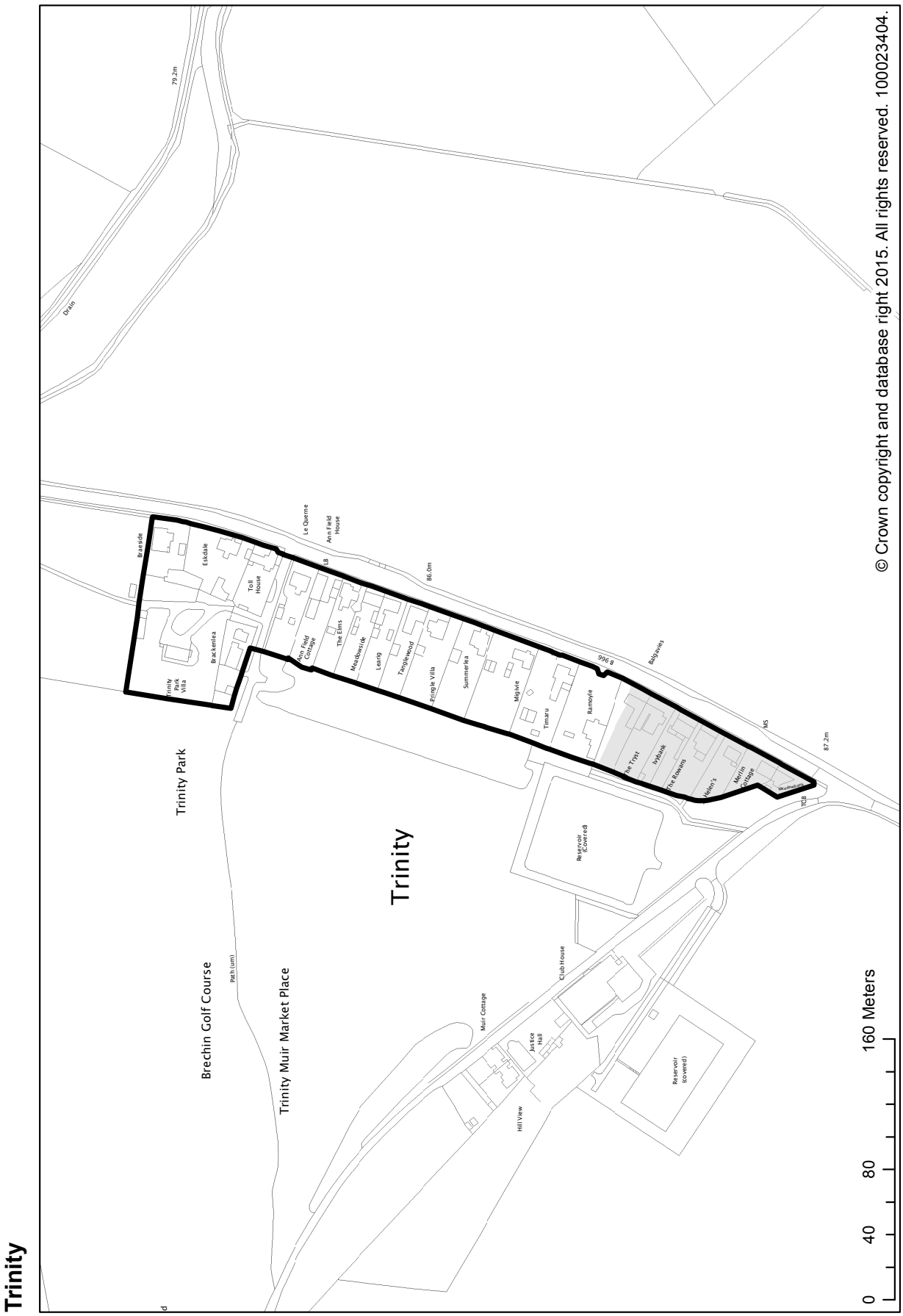
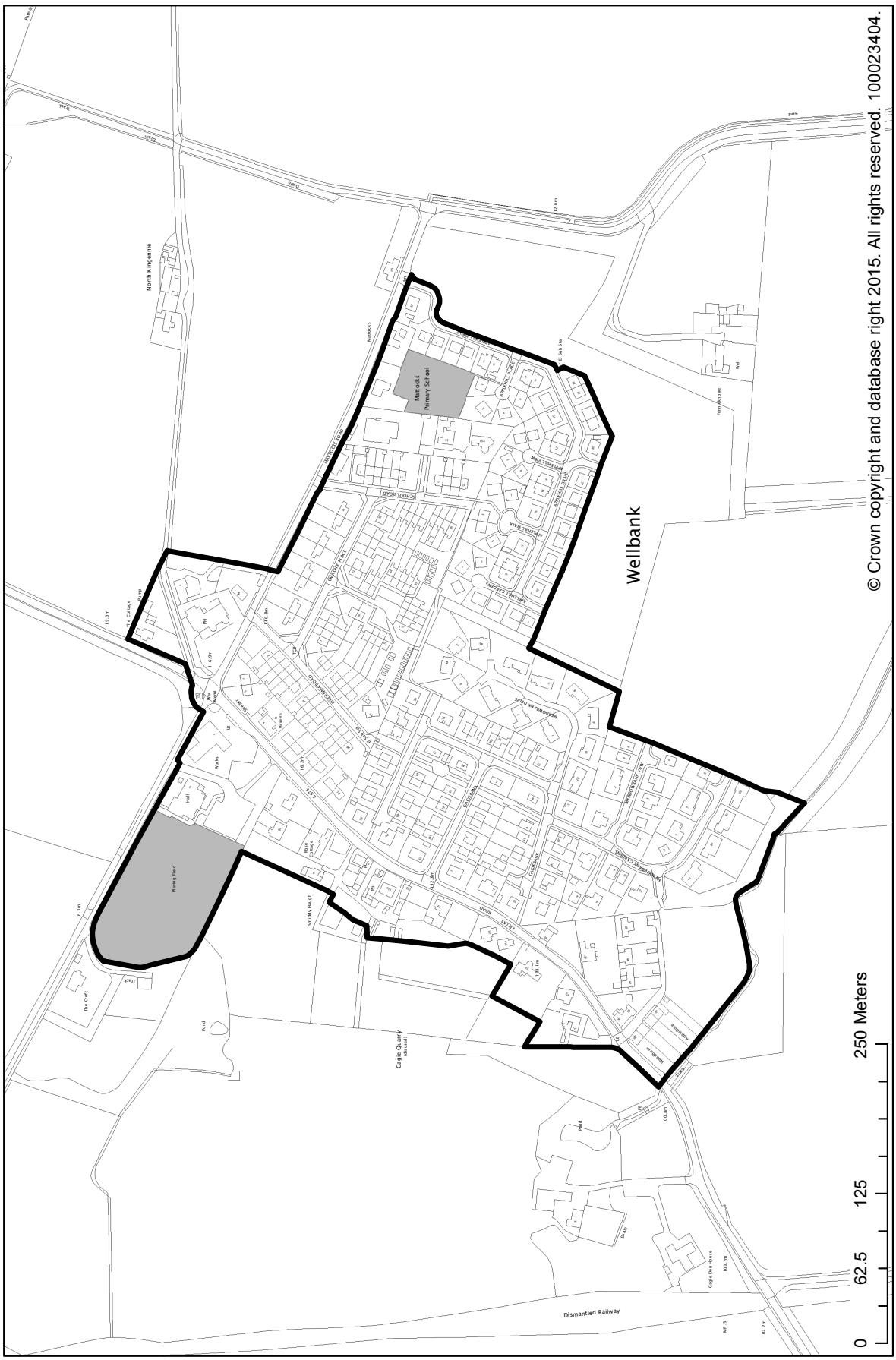
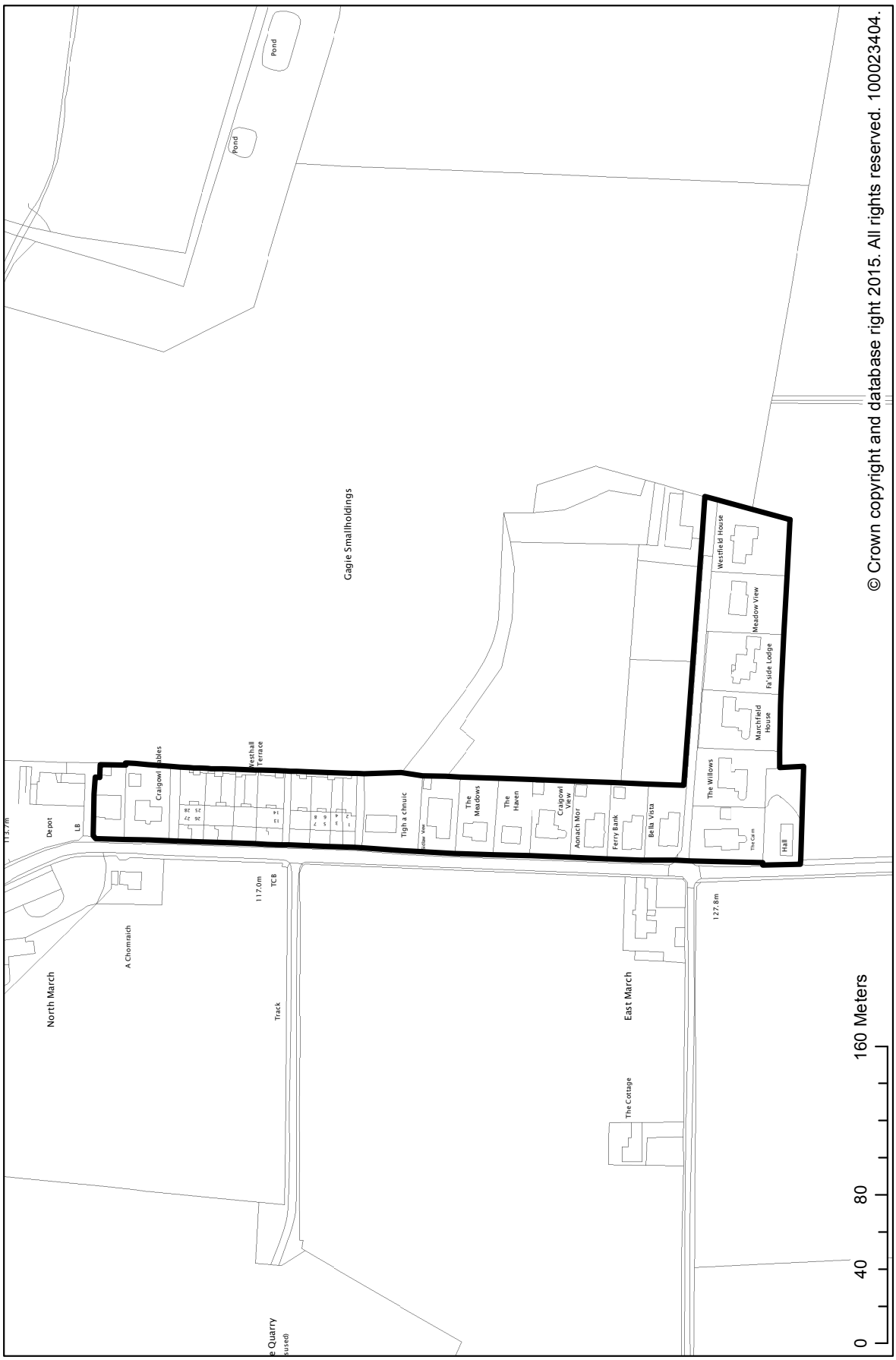
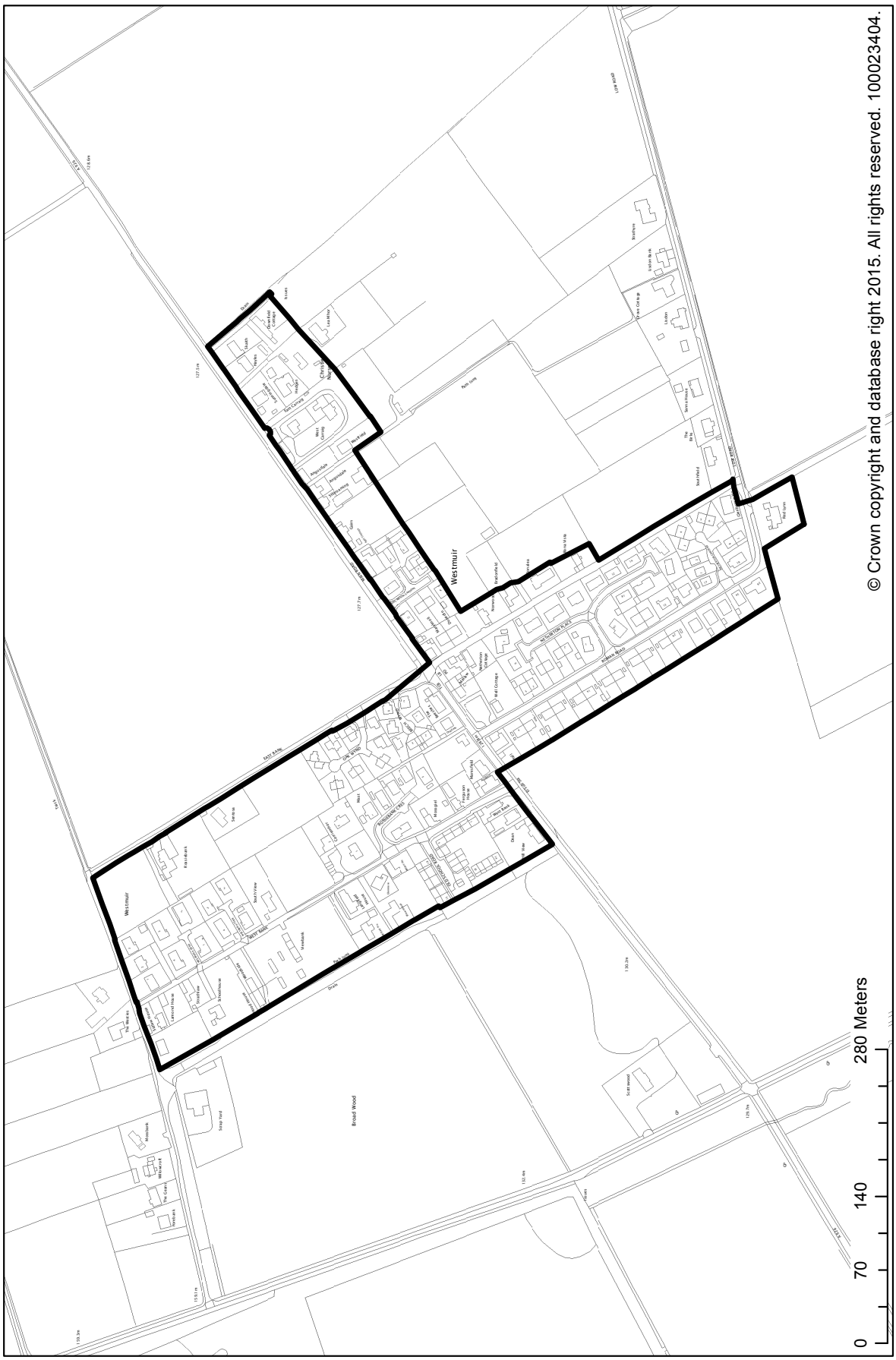


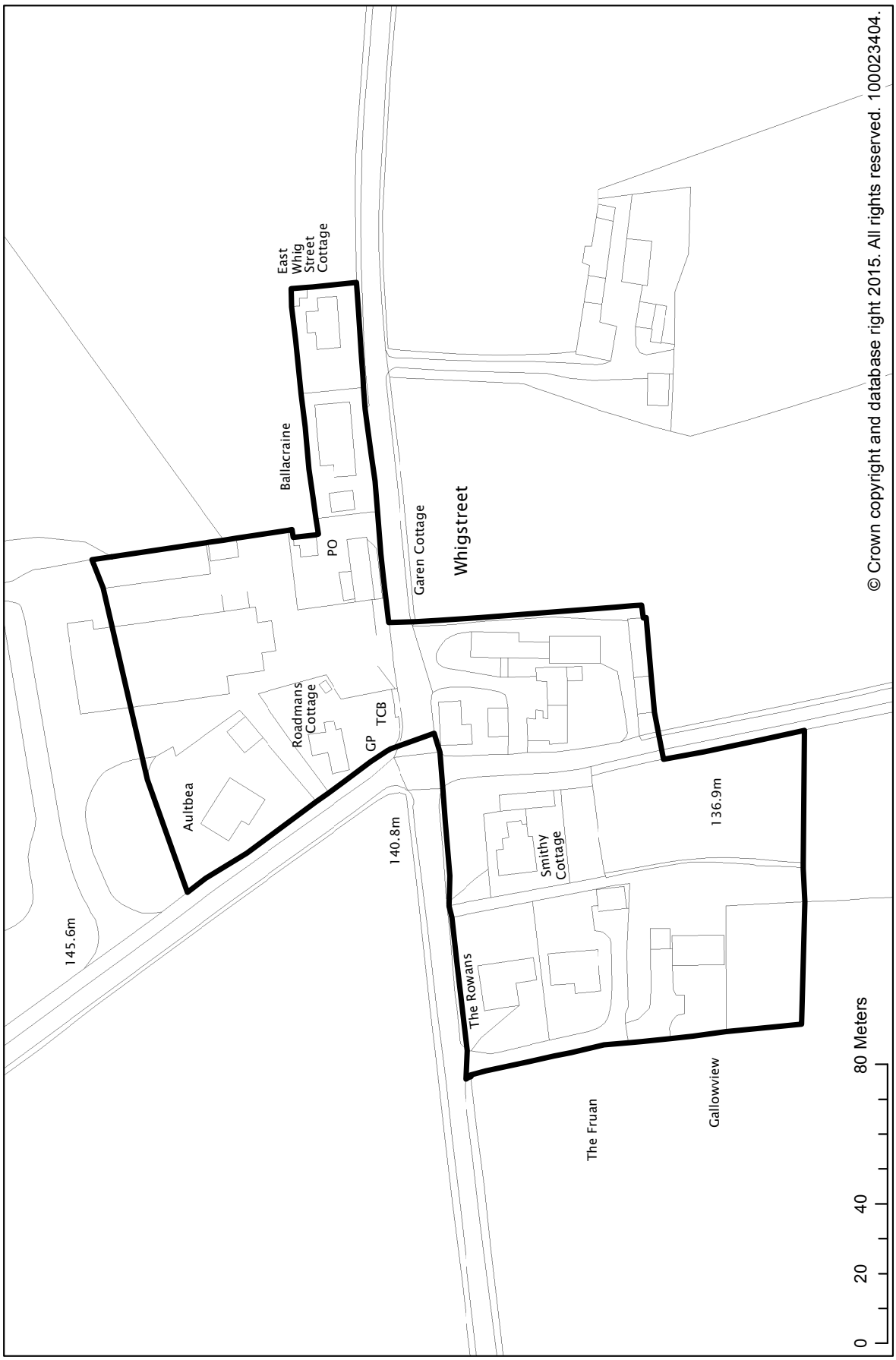
Wellbank




Westhall Terrace
Pond
Pond
Gagie Smallholdings
Westfield House
Meadow View
Fa'side Lodge
Marchfield House
The Willows
The Calm
Hall
Craigowl Cottages
Westhall Terrace
Depot
LB
Tigh a chnuic
The Meadows
The Haven
Craigowl View
Aonach Mor
Ferry Bank
Bella Vista
A Chomraich
North March
East March
Track
The Cottage
117.0m
TCB
127.8m
0
40
80
160 Meters
© Crown copyright and database right 2015. All rights reserved. 100023404.



Westmuir


Whigstreet
East Whig Street Cottage
Ballacraine
PO
Garen Cottage
Whigstreet
Roadmans Cottage
GP
TCB
Aultbea
140.8m
145.6m
Smithy Cottage
136.9m
The Rowans
The Fruan
Gallowview
0
20
40
80 Meters
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Woodville

Woodville, located north of Arbroath to the west of the A933, is an area where urban uses are encroaching into the countryside on the fringe of the town and incrementally changing its character from countryside to suburban. The area is characterised by loose groupings of individual houses, smallholdings, a hotel, two caravan sites and scattered commercial and industrial premises (some of which are agriculturally based).

DEVELOPMENT STRATEGY

The development strategy for Angus is set out in the introduction to the ALDP, for the Woodville area this means:

- restricting urban sprawl and resisting the increasing urbanisation of Woodville; and
- only considering development for essential worker housing or uses directly associated with agriculture or horticulture.

WOODVILLE DEVELOPMENT APPROACH

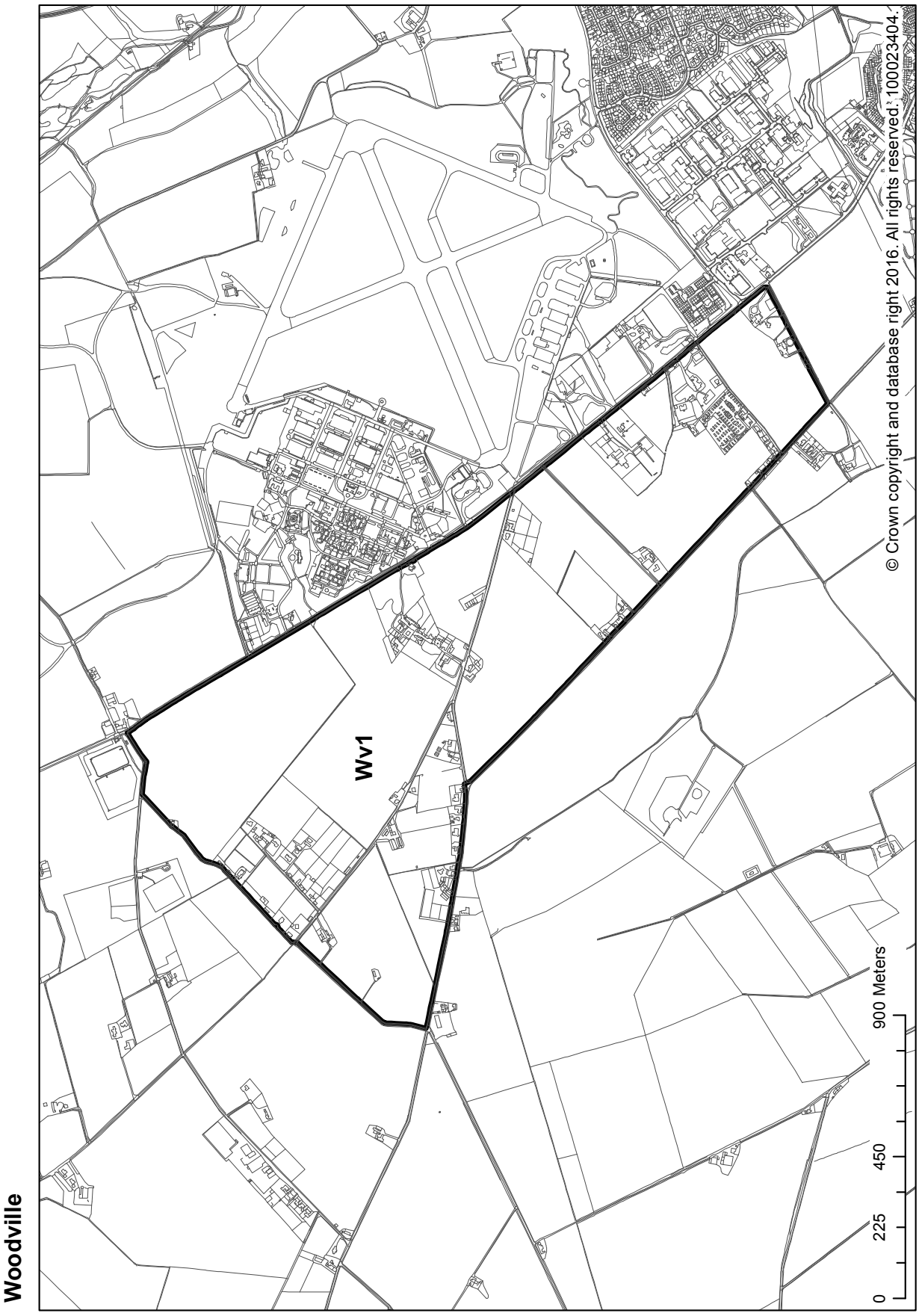
The Woodville area continues to experience pressure for the development of housing and other urban uses, and the Local Plan will resist development proposals which are to the detriment of its countryside character.

Wv1: Woodville Development Approach

Within the development boundary identified for the wider Woodville area, only proposals directly associated with agriculture or horticulture will be permitted. New housing will only be supported where it provides essential worker housing for established businesses.

Wv1 SEA Implications									
Biodiversity Flora and Fauna	Population	Human Health	Soil	Water	Air	Climatic Factors	Cultural Heritage	Material Assets	Landscape
+/?	0	+/?	0/+	?	0/+	?/-/+	0/+	?/+/-	0/+

SETTLEMENT STATEMENTS, VILLAGE DIRECTORY & DEVELOPMENT BOUNDARY MAPS



IMPLEMENTATION AND MONITORING

The ALDP sets out that the plan should be read in its entirety, as there may be policies in the Strategy, Policy Framework and Settlement Strategy that are relevant to any particular proposal. **Proposals will be expected to comply with all relevant policies within the plan**.

The following matrix has been provided to give some guidance for particular proposals as to which policies may be of relevance.

			Development Type						
	Section	Policy	Residential	Employment	Retail	Tourism	Leisure	Renewables	Waste
Strategy		DS1	✓	✓	✓	✓	✓	✓	✓
		DS2	✓	✓	✓	✓	✓	✓	✓
		DS3	✓	✓	✓	✓	✓	✓	✓
		DS4	✓	✓	✓	✓	✓	✓	✓
		DS5	?	?	?	?	?	?	?
Thriving and Connected	Housing	TC1	✓						
		TC2	✓						
		TC3	?						
		TC4						✓	
		TC5							
		TC6							
		TC7							
	Services	TC8	?	?	✓	?	?		
		TC9							
	Connectivity	TC10				?	?		
		TC11							
		TC12		?					
		TC13		?					
	Employment	TC14		✓					✓
		TC15		✓					
	Tourism	TC16	?	?	?	✓	✓		
	Town Centres	TC17		?	✓	✓	✓		
		TC18			✓				
		TC19		?	✓	✓	✓		
		TC20			✓				
Protected and Valued	Natural Environment	PV1	✓	✓	✓	✓	✓	?	?
		PV2	✓	✓	?	?	?	?	?
		PV3	✓	✓	✓	✓	✓	?	?
		PV4	?	?	?	?	?	✓	?
		PV5	?	?	?	?	?	?	?
		PV6	✓	✓	✓	✓	✓	✓	✓
		PV7	?	?	?	?	?	?	?
	Built Environment	PV8	?	?	?	?	?	?	?
	Heat and Energy Networks	PV9						✓	✓
		PV10	?	?	?	?	?	✓	✓
		PV11	✓	✓	✓	✓	✓	✓	✓
	Water Environment	PV12	?	?	?	?	?	?	?
		PV13	?	?	?	?	?	?	?
		PV14	✓	✓	✓	✓	✓	?	✓
		PV15	✓	✓	✓	✓	✓	?	✓
		PV16	?	?	?	?	?	?	?
	Resources	PV17	?	?	?	?	?	✓	✓
		PV18	✓	✓	✓	✓	✓		✓
		PV19							✓
		PV20	?	?	?	?	?	?	?
		PV21	✓	✓	✓	✓	✓	✓	✓

✓ - Policy applicable

? - Policy may be applicable

	Section	Policy	Development Type						
			Telecoms	Minerals	Householder	Gypsy / Traveller	Residential Caravans	Transport Facilities	Community Facilities
Strategy		DS1	✓	✓	✓	✓	✓	✓	✓
		DS2	✓	✓		✓	✓	✓	✓
		DS3	✓	✓	✓	✓	✓	✓	✓
		DS4	✓	✓	✓	✓	✓	✓	✓
		DS5	?	?		?	?	?	?
Thriving and Connected	Housing	TC1							
		TC2					?		
		TC3							
		TC4	✓		✓				
		TC5					?		
		TC6				✓			
		TC7					✓		
	Services	TC8							✓
		TC9							?
	Connectivity	TC10						✓	
		TC11						✓	
		TC12						✓	
		TC13	✓						
	Employment	TC14						?	
		TC15							
	Tourism	TC16							?
	Town Centres	TC17							?
		TC18							
		TC19							✓
		TC20							
Protected and Valued	Natural Environment	PV1	?	?		?	?	?	?
		PV2	?	?			?	?	?
		PV3	?	?		?	?	?	?
		PV4	?	?		?	?	?	?
		PV5	?	?	?	?	?	?	?
		PV6	✓	✓		✓	✓	✓	?
		PV7	?	?	?	?	?	?	?
	Built Environment	PV8	?	?	?	?	?	?	?
	Heat & Energy	PV9		?	?			?	
		PV10						?	?
		PV11		✓	✓	✓	✓	?	✓
	Water Environment	PV12	?	?	?	?	?	?	?
		PV13	?	?	?	?	?	?	?
		PV14	?	✓	?	?	?	?	?
		PV15	?	✓	✓	✓	✓	✓	?
		PV16	?	?		?	?	?	?
	Resources	PV17		?				?	
		PV18				✓	✓	✓	?
		PV19		✓				?	
		PV20	?	?	?	?	?	?	?
		PV21	✓	✓	?	✓	✓	✓	✓

✓ - Policy applicable

? - Policy may be applicable

It should be noted that the tables above provide a guide to the relevant policies. They are not intended to be comprehensive. Depending on the location, nature and scale of any proposed development, other policies of the ALDP may apply.

An action programme has been prepared in support of the ALDP. This document highlights the key actions required to implement the strategy, policies and proposals of the plan. The action programme highlights a range of partners who are to be involved in the various proposals and projects and timescales for carrying out each action.

The plan and action programme will be monitored and reviewed on a regular basis. An updated action programme will be published every 2 years and the ALDP itself will be reviewed every 5 years. This will involve the production of a Monitoring Statement at the outset, which will gauge the impact of the plan on the area and use population-wide indicators to consider how far the objectives and vision of the plan have been realised.

APPENDICES

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APPENDIX 1 - GLOSSARY

Action programme: A document setting out how the planning authority proposes to implement the development plan providing details of who is to do what within a particular timescale.

Active modes of transport / Active Travel: These are forms of transport that do not involve the use of motor vehicles or trains. Typically, we mean to speak of walking and cycling.

Affordable housing: Housing of a reasonable quality that is affordable to people on modest incomes.

Allocation: Land that has been identified through the development plan for a specific use, such as for housing or employment.

Angus Community Planning Partnership: A group made up of representatives from public agencies, forming a partnership that is responsible for community planning.

Angus Local Plan Review (ALPR): The local plan that was adopted by Angus Council in February 2009.

Angus Landscape Capacity Study (2003): This study was undertaken in 2002 and 2003 to inform the assessment of development options for the Angus Local Plan Review. It provides a suitable baseline description of the landscape resource, together with individual assessments of potential development options.

Angus Local Housing Strategy: A document that provides Angus Council's strategic direction to tackle housing need and demand, and to inform future investment in housing and related services across the local authority area.

Angus Woodland and Forestry Framework 2011: A framework for forestry activities for 5-10 years (from 2011). It covers all of Angus, excluding the Cairngorms National Park.

Biodiversity: The variability in living organisms and the ecological complexes of which they are part. This includes diversity within species, between species and of ecosystems (UN Convention on Biological Diversity, 1992).

Brownfield site: Land which has previously been developed. The term may cover vacant or derelict land, land occupied by redundant or unused building and development land within the development boundary where further intensification of use is considered acceptable.

Building Group: A group of at least 3 closely related existing dwellings or buildings capable of conversion for residential use. The building group will require to have a sense of containment.

Category 1 RSUs: These areas are generally non-remote areas with stable or increasing populations or where there are no services or facilities in need of support. In these areas new housing development outwith settlements should be restricted.

Category 2 RSUs: Primarily remote rural areas where limited new development outwith settlements may be appropriate in order to stem rural depopulation and / or support existing services.

Climate change: This refers to changes in the average weather (temperature, wind patterns, precipitation) experienced over a long period of time, typically 30 years.

Climate Change Adaptation: The adjustment in economic, social or natural systems in response to actual or expected climatic change, to limit harmful consequences and exploit beneficial opportunities.

Climate Change Mitigation: Reducing the amount of greenhouse gases in the atmosphere and reducing activities which emit greenhouse gases to help slow down or make less severe the impacts of future climate change.

Coast: Defined as Tayside Landscape Character Assessment classification 14a

coast with sand, 14b coast with cliffs and 15 lowland basin.

Commercial centre: The range of uses and physical structure of these centres distinguishes them from town centres. They have a more specific focus on retailing or on retailing and leisure uses. Examples of commercial centres include out-of-centre shopping centres, commercial leisure developments, mixed retail and leisure developments, retail parks and factory outlet centres.

Community Facilities: Facilities such as schools, healthcare, libraries, museums, halls and leisure that are important assets that play a key role in terms of sustainability and the health and wellbeing, social, educational, spiritual, recreational, leisure and cultural needs of the community.

Community Planning: This is the statutory process for the planning and delivery of public services, including making policy for the long term, and encouraging change and improvement.

Core paths: Core paths form the basic framework of paths, linking with other access provision. The core paths network as a whole should provide access opportunities for the full range of access takers, including walkers, cyclists and horseriders, of varying abilities.

Core Retail Area: The core of the central shopping are typified by its concentration of key multiple retailers and other prominent comparison outlets.

Countryside: The area outwith any defined development boundaries.

Cumulative impact: Impact in combination with other development. That includes existing developments of the kind proposed, those which have permission, and valid applications which have not been determined. The weight attached to undetermined applications should reflect their position in the application process.

Developed Coast: The area within development boundaries which lies wholly or partly within the defined coast and is subject to all other relevant local plan policies.

Development Boundary: Provide a definition between built up areas and the open countryside and may include peripheral areas of open space important to the settlement's setting and character. Defined to protect the landscape setting of towns and villages and prevent the uncontrolled spread of development.

Development Plan Scheme: A document that sets out the planning authority's programme for preparing and reviewing a local development plan or strategic development plan. It also includes a participation statement that states when, how and with whom consultation on the plan will take place. This document is reviewed annually.

Drainage Impact Assessment: This is an assessment of the potential impacts on the existing drainage network (drains and sewers) that may be expected from a proposed development. It is used to establish what mitigation would be required to acceptably accommodate the development.

Effective supply of housing land: This is housing land which is free or expected to be free of development constraints in the period under consideration (e.g. for the ALDP: 2016-2026) and would therefore be available for the construction of housing.

Environmental report: This is a document which identifies, describes and evaluates the likely significant effects on the environment of implementing a plan or programme. It is required as part of an impact assessment such as the strategic environmental assessment which has been undertaken on the ALDP.

Essential worker: A full time worker required by the operational needs of a farm or rural business to live in close proximity to their place of work for reasons of security or animal welfare or similar.

Flood risk: The combination of the probability of a flood and of the potential adverse consequences, associated with a flood, for human health, the environment, cultural heritage and economic activity.

Gap site: the space between the curtilages of two houses, or between the curtilage of one house and a metalled road (i.e. a stone surface with a hard, crushed rock or stone surface as a minimum) or between the curtilage of one house and an existing substantial building such as a church, a shop or a community facility. The site should have established boundaries on three sides.

Greenfield site: These are sites which have never previously been developed, or that were derelict but have now been fully-restored and brought back into active or beneficial use for agriculture, forestry, environmental purposes or outdoor recreation.

Green infrastructure: Includes the "green" and "blue" (water environment) features of the natural and built environments that can provide benefits without being connected. Green features include parks, woodlands, trees, play spaces, allotments, community growing spaces, outdoor sports facilities, churchyards and cemeteries, swales, hedges, verges and gardens. Blue features include rivers, lochs, wetlands, canals, other water courses, ponds, coastal and marine areas including beaches, porous paving and sustainable urban drainage systems.

Green network: Connected areas of green infrastructure and open space that together form an integrated and multi-functional network.

Housing demand: Households who are able to buy or rent the quality/type of housing which meets their needs and desires.

Housing land: This is land which is or can be made available for the development of new homes. Housing land may either be effective or constrained, but will only contribute towards meeting the housing requirements if it has been judged to be effective.

Housing Land Audit: This is a document that provides a factual statement of housing land supply for a particular area, such as the Angus Council area. In Angus, only sites with a capacity of five or more new homes are included. It is prepared and updated annually and is used to monitor the availability of effective housing land against the requirements of the development plan.

Housing market area: Geographical areas which are relatively self-contained in terms of housing demand, i.e. a large percentage of people moving house or settling in the area will have sought a dwelling only in that area.

Housing need: Households lacking their own housing or living in inadequate or unsuitable accommodation, who are unlikely to be able to meet their own needs in the housing market without some assistance.

Housing Need and Demand Assessment (HNDA): This is an assessment of the need and demand for housing within particular housing market areas, which provides the evidence base for defining housing supply targets and allocating land for housing.

Housing land requirement: The number of new homes to be built over the plan period, increased by a margin of 10 to 20% to ensure a generous supply of land for housing. This can be met from a number of sources including sites form the established supply which are effective or expected to become effective in the plan period, sites with planning permission, proposed new

land allocations and a possibly a proportion from windfall development.

Housing supply targets: A policy view of the number of homes that will be delivered in each housing market area over the period of the local development plan and local housing strategy, taking into account wider economic, social, environmental factors, issues of capacity, resource and deliverability, and other important requirements.

Infrastructure: In broad terms, this covers the facilities that are required to allow development to take place. Typically, we mean to speak of roads, sewers, waste water treatment works, schools, open space, bus stations and bus stops, park and ride facilities, and/or waste management centres. Community infrastructure might also include libraries, community halls and even shops.

Local convenience shop: retailing drinks, tobacco, newspapers, magazines, food and confectionary which are purchased regularly for relative immediate consumption and measure 500 m^2 gross floorspace or less and are located outwith defined town centre boundaries as identified within the Proposals Maps.

Local Development Plan (LDP): A document prepared by a planning authority, which provides a spatial strategy for the future development of land at the local level, including details of policies and proposals for the future use of land. It is prepared for a particular geographical area and must be consistent with the strategic development plan that also covers that area.

Main issues report (MIR): A document prepared by a planning authority, which must set out general proposals for development in a particular area, and in particular on where development should and should not occur. It must also set out reasonable alternative sets of proposals.

National planning policy: National planning policy is set out through documents prepared by the Scottish Government, including the National Planning Framework 3, Scottish Planning Policy, Designing Places, Designing Streets and a range of guidance on implementation that is contained within documents known as Planning Circulars. Taken together, these documents will help to inform the content of the ALDP.

Open Space: Space within and on the edge of settlements comprising green infrastructure and / or civic areas such as squares, market places and other paved or hard landscaped areas with a civic function. Detailed typologies of open space are included in PAN65.

Opportunity site: These are brownfield sites that may be or may become available for redevelopment for appropriate uses (e.g. housing or employment). Given uncertainties related to the timing of release of such sites and the range of potentially suitable uses, they are not counted towards meeting development plan requirements until planning permission has been granted.

Out of centre: A location that is clearly separate from a town centre but within the urban area, including programmed extensions to the urban area in approved or adopted development plans.

Out of town: An out of centre development on a site or on land not clearly within the current urban boundary.

Outdoor sports facilities: Uses where sportscotland is a statutory consultee under the Town and Country Planning (Development Management Procedure) (Scotland) Regulations 2013, which establishes 'outdoor sports facilities' as land used as:

(a) an outdoor playing field extending to not less than 0.2 hectares used for any sport played on a pitch;
(b) an outdoor athletics track;

(c) a golf course;
(d) an outdoor tennis court, other than those within a private dwelling, hotel or other tourist accommodation; and
(e) an outdoor bowling green.

Prime quality agricultural land: This is agricultural land identified as being of Class 1, 2 or 3.1 in the land capability classification for agriculture as developed by the Macaulay Land Use Research Institute

Principal settlements: These are the settlements that have been defined by the TAYplan Strategic Development Plan as the places where most of the region's people, jobs, services and facilities are already located, offering the best ability to access these by a range of transport modes.

Public Interest: Development that would have benefits for the wider community, or is justifiable in the national interest. Proposals that are solely of commercial benefit to the proposer would not comply.

Retail impact assessment: An assessment undertaken for an application for retail use on the impact of the proposal on the vitality and viability of existing centres within the catchment area of the proposed development. The assessment includes the likely cumulative effect of recent permissions, developments under construction and completed developments.

Reasonable market price: A price considered to reflect location and current market conditions.

Reasonable period: The period considered reasonable for marketing purposes will be determined by location and use and current market conditions. This will vary in each circumstance, but as a default should be considered to be around 6 months.

Roadside Services: These are facilities provided primarily to meet the reasonable needs of travellers. The scale of provision should be consistent with these needs and can include the following: facilities accessible to disabled people; free short-term parking for both commercial and private vehicles; fuel; free toilets; picnic areas with tables; telephones; catering; retail (provision limited to a single unit of up to 200 sqm net floorspace to meet the reasonable needs of travellers only); tourist information; cash dispenser and overnight accommodation.

Rural area: The area outwith the development boundaries of the seven towns in Angus.

Rural service centre: These are some of the largest villages in Angus, which have a range of important services and facilities (such as primary schools, doctors' surgeries, shops, public transport stops) and are capable of accommodating additional development over the Angus LDP period.

Rural Services: Services in the rural area that provide a valuable local community function such as local convenience shops, hotels, public houses, restaurants and petrol stations.

Rural Settlement Units (RSUs): Geographical areas loosely based on primary school catchment areas.

Scheduled Ancient Monument: This is a monument of national importance for the sake of conserving cultural heritage, as designated by Scottish Ministers.

Sequential approach: In relation to town centre uses, the first preference should be for town centre sites, followed by edge-of-centre sites, and only then out of centre sites in locations that are or can be made easily accessible by a choice of means of transport.

Shoreline Management Plan: This is a document that acts to co-ordinate the approach taken within Angus towards managing coastal erosion and the

problems that are associated with it. The original Shoreline Management Plan outlines the risks to people and the environment from coastal erosion and flooding and identifies preferred policies to manage these risks.

Single Outcome Agreement: This is an agreement between the Scottish Government and Community Planning Partnerships, which sets out how each will work towards improving outcomes for local people in a way that reflects local circumstances and priorities.

Small site: This is housing land that will accommodate less than five new homes.

Strategic development plan (SDP): This is a document prepared by a strategic development planning authority, which sets out a vision for a designated area and a broad spatial strategy that provides proposals for the development of land in that area.

Strategic environmental assessment (SEA): This is an assessment of the likely significant environmental effects of implementing a plan or programme, including any reasonable alternatives. The assessment process also involves the production of an environmental report, which provides details of its findings.

Strategic Development Areas: These are large areas of land that have been identified for employment, housing or mixed-use development and will contribute individually to delivering the TAYplan Strategic Development Plan. They are identified in Policy 4 of the TAYplan.

Strategic Transport Network: Includes trunk roads and rail networks. Its primary purpose is to provide the safe and efficient movement of strategic long-distance traffic between major centres, although in rural areas it also performs important local functions.

Supplementary Guidance: This is a document that provides the details in respect of policies or proposals set out in a strategic or a local development plan. Such guidance may be adopted as part of the development plan and may be prepared subsequent to the adoption of a strategic or a local development plan.

Sustainable Development: Development that meets the needs of the present without compromising the ability of future generations to meet their own needs. The Brundtland Definition. Our Common Future, the World Commission on Environment and Development, 1987

The TAYplan Strategic Development Plan: This is the strategic development plan that covers the Angus Council area (excluding the Cairngorms National Park). It sets out policies and proposals for the development and use of land for the period 2012-2032.

Tourist accommodation: includes hotels, guest houses, new build bed and breakfast accommodation, caravan and camping sites, wigwams, yurts, huts, bunkhouses and self-catering cottages, chalets and cabins

Tourist related facilities: specific places or points of visitor interest, including natural, built and cultural heritage features which attract people to the area, increase the length of people's stay and increase visitor spending

Town centre: This term covers the central areas of the Angus towns, which provide a broad range of facilities and services and which fulfil a function as a focus for both the community and public transport. The precise boundaries of this area are determined by the development plan. The term excludes retail parks, neighbourhood centres and small parades of shops of purely local significance.

Town centre Impact assessment: An assessment undertaken for an application for a town centres use on the impact of the proposal on the vibrancy, vitality and viability of existing centres within the

catchment area of the proposed development. The assessment includes the likely cumulative effect of recent permissions, developments under construction and completed developments.

Town centre uses: Uses which attract significant number of people, including retail and commercial leisure, offices, community and cultural facilities.

Travel Plan: a scheme introduced by employers to reduce the level of travel demand and implement mode sharing.

Undeveloped Coast: Defined coast outwith settlement boundaries and subject to all other relevant local plan policies, includes areas subject to significant constraint and unspoiled coast as defined in SPP (2014).

Urban capacity study: This is a study that assesses the opportunities for further housing development within existing development boundaries, focusing on previously developed land and the conversion of existing buildings.

Use Class: defined within the Town and Country Planning (Use Classes) (Scotland) Order 1997.

Vibrancy, vitality and viability (retail): Vitality is a measure of how lively and busy a town centre is. Viability is a measure of a centre's capacity to attract ongoing investment for maintenance, improvement and adaptation to changing needs. Together these measures give an indication of the health of a town centre.

Water environment: all rivers, lochs, estuaries, groundwaters, wetlands and coastal waters (out to 3 nautical miles).

Water quality: Water Quality takes account of all impacts (physical, polluting and otherwise) as well as the fish, plant and other life that inhabits it, this is defined in terms of "ecological status" for surface water bodies (ranging from High, Good, Moderate, Poor to Bad) and "status" for groundwaters (either Good or Poor).

Windfall site: Sites which become available for development unexpectedly during the life of the development plan and so are not identified individually in the plan.

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APPENDIX 2 – TRANSPORT ASSESSMENT

GUIDANCE ON DEVELOPMENTS REQUIRING A TRANSPORT ASSESSMENT

A Transport Assessment will require to be submitted for all development proposals which fall at or above the size thresholds set out below.

USE	SCALE
Retail	1,000 sq.m Gross Floor Area
Cinemas and Conference Facilities	1,000 sq.m Gross Floor Area
Leisure Facilities	1,000 sq.m Gross Floor Area
Business/Office	2,500 sq.m Gross Floor Area
Industry	5,000 sq.m Gross Floor Area
Distribution and Warehousing	10,000 sq.m Gross Floor Area
Hospitals/Health Care Facilities	2,500 sq.m Gross Floor Area
Education Facilities	2,500 sq.m Gross Floor Area
Stadia	1,500 seats
Housing	100 dwellings

Please note that the above list is not exhaustive. Angus Council may also in appropriate circumstances request a Transport Assessment for development which does not exceed the above thresholds

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APPENDIX 3 – HOUSING LAND SUPPLY

			Sites Previously Identified by Angus Local Plan Review				Allocated Sites			
	Sites with Planning Permission or Under Construction (Housing Land Audit, April 2014)	No. of Units	First Phase (2016-2021)	No. of Units	Second Phase (2021-2026)	No. of Units	First Phase (2016-2021)	No. of Units	Second Phase (2021-2026)	No. of Units
EAST ANGUS HMA										
Arbroath	A(a) Montrose Road	280					A1 :Crudie Acres, East Muirlands Road	100	A1: Crudie Acres, East Muirlands Road	130
	A(b) Springfield Terrace, Abbeybank House	9							A2: Crudie Farm, Arbirlot Road West	120
	A(c) Cliffburn	1								
	A(d) Ernest Street / Palmer Street	75								
	A(e) Caimie Loan, The Cairnie	20								
	A(f) Viewfield Hotel	21								
	A (g) Alexandra Place, Arbroath Lads Club	6								
	A(h) Roy's Auto, 32-38 Dishlandtown St	13								
	A(i) 15-29 Noran Avenue	7								
	A(j) Bank Street, Inverpark Hotel	12								
	A(k) Wardmill Road / Andrew Welsh Way	51								
	A(l) Baltic Mill, Dens Road *	39								
Sub total		**534**		**0**		**0**		**100**		**250**
Landward										
Friockheim			Fk1 : South of Gardyne Street	50	Fk1 : South of Gardyne Street	30				
Inverkeilor	Ik(a) Lunan Avenue/ Kirkton Farm *	9								
	Ik(b) Railway Field 1 & 2	30								
	Ik(c) North Mains of Ethie	5								
	Ik(d) Boghead Farm Steading	9								
Letham Grange	LG(a) Letham Grange	2								
Other	ARB(a) Kirkbank, Auchmithie	16								
	ARB(b) Greystone, Carmyllie	5								
	ARB(c) Cotton of Colliston	1								
	ARB(d) Denside Farm	7								
	ARB(e) Kinnells Mill Farm Steading	8								
Sub total		**92**		**50**		**30**		**0**		**0**
East Angus HMA Total		**626**		**50**		**30**		**100**		**250**

3030

APPENDIX 3 – HOUSING LAND SUPPLY

			Sites Previously Identified by Angus Local Plan Review				Allocated Sites			
	Sites with Planning Permission or Under Construction (Housing Land Audit, April 2014)	No. of Units	First Phase (2016-2021)	No. of Units	Second Phase (2021-2026)	No. of Units	First Phase (2016-2021)	No. of Units	Second Phase (2021-2026)	No. of Units
NORTH ANGUS HMA										
Brechin	B(a) Bearehill / Rosehill	22	B1 : Dubton Farm	125	B1 : Dubton Farm	125				
	B(b) St Andrew Street, Townhead Nursery	3								
	B(c) 59 Clerk Street	9								
	B(d) Park Road	8								
Sub total		**42**		**125**		**125**		**0**		**0**
Montrose	M(a) Brechin Road (Phase 1)	15	M1: Brechin Road	150	M1: Brechin Road	150	M2: Rosemount Road, Hillside	65		
	M(b) Hill Place	10					M3 : Sunnyside Hospital, Hillside	140	M3 : Sunnyside Hospital, Hillside	125
	M(c) Croft Road	2								
	M(d) Wishart Gardens	6								
	M(e) Lower Hall Street	7								
	M(f) Bridge Street	5								
	M(g) Waldron Road, Former Drexel Workshop	29								
	M(h) Broomfield Road	5								
Sub total		**79**		**150**		**150**		**205**		**125**
Landward										
Edzell	E(a) East Mains Farm	13					E1: East of Duriehill Road	50		
Other	BM(a) Muirton of Ballochy	1								
	BM(b) Glenskinno Farm	6								
	BM(c) Mains of Farnell	5								
Sub total		**25**		**0**		**0**		**50**		**0**
North Angus HMA Total		**146**		**275**		**275**		**255**		**125**

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APPENDIX 3 – HOUSING LAND SUPPLY

			Sites Previously Identified by Angus Local Plan Review				Allocated Sites			
	Sites with Planning Permission or Under Construction (Housing Land Audit, April 2014)	No. of Units	First Phase (2016-2021)	No. of Units	Second Phase (2021-2026)	No. of Units	First Phase (2016-2021)	No. of Units	Second Phase (2021-2026)	No. of Units
SOUTH ANGUS HMA										
Carnoustie and Barry	C(a) Victoria Street, Former Maltings	62					C1: Land at Pitskelly	150	C1: Land at Pitskelly	100
	C(b) 2 Burnside Street	7								
	C(c) 108 High Street	7								
	C(d) Balmachie Road	5								
	C(e) West Path, Camus House	16								
	C(f) Unit 1, 2 North Brown Street	8								
	C(g) Former Manse, Barry	4								
Sub total		**109**		**0**		**0**		**150**		**100**
Monifieth	Mf(a) Milton Mill	50					Mf1: Ashludie Hospital	130		
	Mf(b) Former Nursery, Victoria Street	5					Mf2: Land West of Victoria Street	200	Mf2: Land West of Victoria Street	150
Sub total		**55**		**0**		**0**		**330**		**150**
Landward										
Newtyle							N1 : Land North of Coupar Angus Road	20		
							N2: Land North of Eassie Road	30		
Wellbank	Wb(a) Kingennie Fishings 2	5								
	Wb(b) Shank of Omachie	160								
Monkie	Mk(a) Granary Site (part)	13								
	Mk(b) The Fiddlers, Panmure Road	1								
	Mk(c) Hillhead Road	5								
Other	SA(a) Piperdam	1								
	SA(b) Dronley Road, Jungle Kids, Birkhill	3								
	SA(c) Baldovan House, Strathmartine	6								
Sub total		**194**		**0**		**0**		**50**		**0**
South Angus HMA Total		**358**		**0**		**0**		**530**		**250**

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APPENDIX 3 – HOUSING LAND SUPPLY

			Sites Previously Identified by Angus Local Plan Review				Allocated Sites			
	Sites with Planning Permission or Under Construction (Housing Land Audit, April 2014)	No. of Units	First Phase (2016-2021)	No. of Units	Second Phase (2021-2026)	No. of Units	First Phase (2016-2021)	No. of Units	Second Phase (2021-2026)	No. of Units
WEST ANGUS HMA										
Forfar	F(a)Turfbeg Farm	3	F2 : Gowanbank	60			F3 : Turfbeg	175	F3 : Turfbeg	125
	F(b) New Road	16							F4: Westfield	300
	F(c) Wester Restenneth	136								
	F(d) Dundee Road	120								
	F(e) Slatefield Rise (Phase 2)	7								
	F(f) Queen Street Pavilion	14								
	F(g) Roberts Street	22								
Sub total		**318**		**60**		**0**		**175**		**425**
Kirriemuir	K(a) Westfield/Lindsay Street/Sunnyside	38					K1: Land South of Beechwood Place	50	K1: Land South of Beechwood Place	50
	K(b) Sunnyside	35								
	K(c) Hillhead	1								
	K(d) Platten, Brechin Road	1								
	K(e) 19 Glengate Hall	9								
	K(f) Pathhead Nursery, Forfar Road	1								
	K(g) Former Workshop & Yard, Cortachy	33								
Sub total		**118**		**0**		**0**		**50**		**50**
Landward										
Letham	L(a) 16 Guthrie Street	2	L2: Jubilee Park	30			L3 : Land Between Blairs Rd & Dundee	20		
	L(b) East Hemming Street	15								
Kingsmuir	Ki(a) Kingston Place *	23								
Glamis	G(a) Dundee Road	16								
Other	FK(a) Damside, Netherton	3								
	FK(b) Jubilee Arms Hotel Motel, Dykehead	9								
	FK(c) Seggieden Farm, Inverarity	3								
	FK(d) Kingoldrum Garage 2	8								
	FK(e) Over Ascreavie Farm	4								
	FK(f) Eassie Farm	5								
	FK(g) Balnabreich Steading	6								
	FK(h) Bellahill Farm	10								
Sub total		**104**		**30**		**0**		**20**		**0**
West Angus HMA Total		**540**		**90**		**0**		**245**		**475**
Angus Total		**1670**		**415**		**305**		**1130**		**1100**

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APPENDIX 4 – DESIGNATED SITES

Sites Designated for their Natural Heritage Value

Designation	Site Name (ALDP area only)	
Ramsar	Firth of Tay and Eden Estuary Loch of Kinnordy Loch of Lintrathen Montrose Basin	
SPA	Cairngorms Massif Firth of Tay and Eden Estuary Loch of Kinnordy Loch of Lintrathen Montrose Basin	
SAC	Barry Links Firth of Tay and Eden Estuary River South Esk River Tay	
SSSI	Auchterhouse Hill Balloch Moss Balshando Bog Barry Links Blackmire Hill mire Carrot Hill Meadow Craigs Of Lundie and Ardgath Loch Crossbog Pinewood Den of Airlie Den of Fowlis Den of Ogil Dilty Moss Dryleys Brick Pit Dun's Dish Easthaven Elliot Links Forest Muir Gagie Marsh Gannochy Gorge	Little Ballo Loch of Kinnordy Loch of Lintrathen Lochindores Long Loch Of Lundie Monifieth Bay Montrose Basin North Esk and West Water Paleochannels Red Craig Rescobie and Balgavies loch Restenneth Moss Rickle Craig to Scurdie Ness Rossie Moor Round Loch Of Lundie St Cyrus and Kinnaber Links Turin Hill Whitehouse Den Whiting Ness-Ethie Haven
LNR	Montrose Basin	
Inventory of Historic Garden and Designed Landscape	Airlie Castle Ascreavie Brechin Castle Cortachy Castle Craig House Dunninald Glamis Castle	Edzell Castle Guthrie Castle House of Dun House of Pitmuies Kinnaird Castle The Burn (part) The Guynd

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APPENDIX 5 – LETHAM UNADOPTED ROADS POLICY

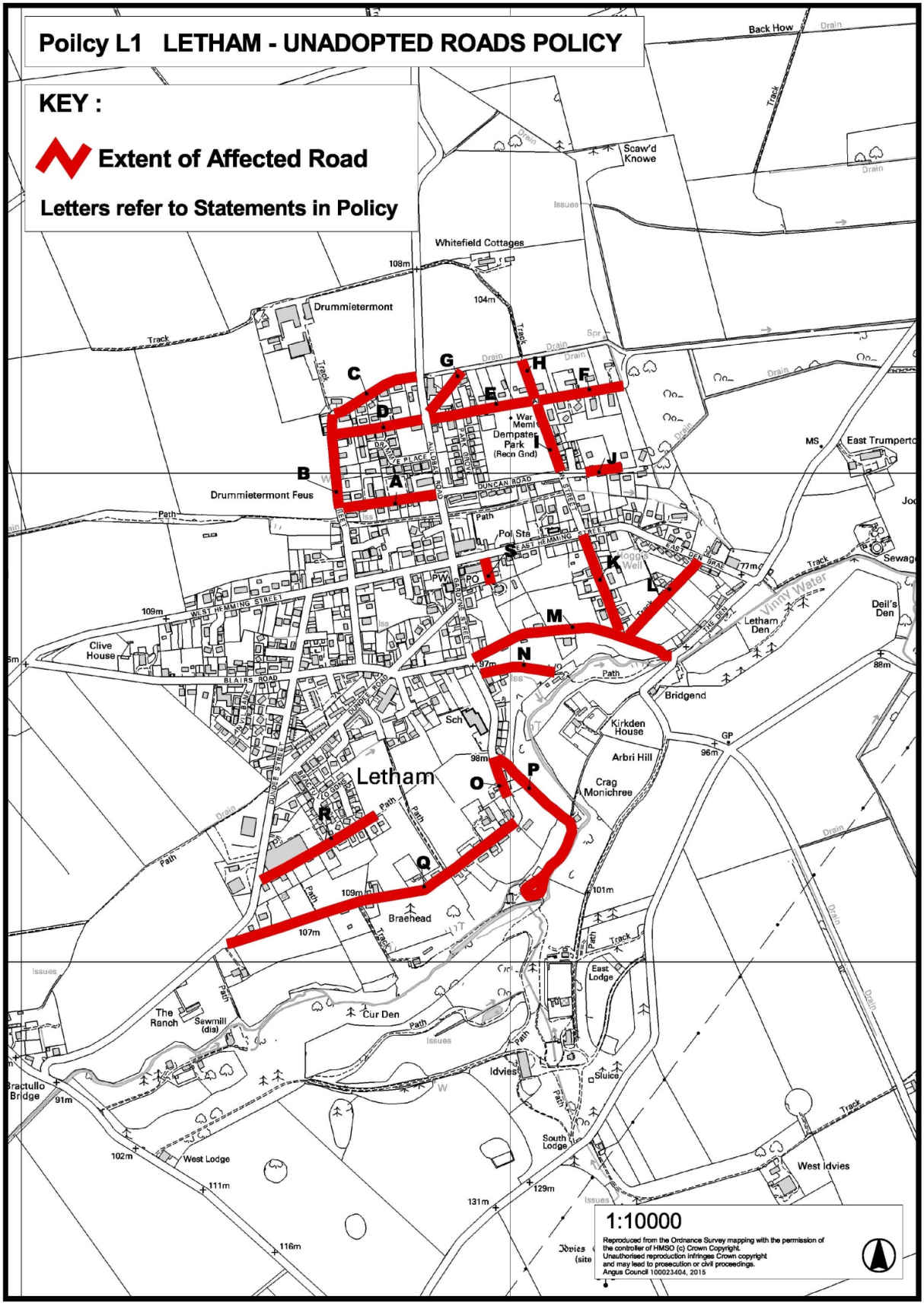
L1: LETHAM – UNADOPTED ROADS POLICY

The number of unmade and unadopted roads in Letham constrains development in the village. The roads in Letham have been inspected by Angus Council's Roads Service and the following comments set out the description of the current unadopted road, the potential for development on or adjacent to the unadopted road (subject to development proposals meeting other policies within the Local Development Plan) and the roads policy position regarding the possibility of development being accessed from the unadopted road network. In general, roads would be required to be brought up to full adoptable standard before development of adjacent land would be possible.

Road	Description	Potential for Development	Policy
A) Burnside Road	Nominal width 3m. No footways but fair to good condition with system of street lighting. Sub-standard visibility at junctions with Auldbar Road and Guthrie Street.	Potential demand for development at bowling club and village hall.	Redevelopment proposals may be acceptable but no new development will be permitted.
B) Guthrie Street (west)	Nominal width 2.75m. No footways but system of street lighting in place. Carriageway in a poor, deteriorating condition with west edge badly broken and potholing evident.	Significant potential for development in field on west side.	No new development permitted unless brought up to adoptable standard.
C) Guthrie Street (north)	Nominal width 4m narrowing to 2.9m towards east end. No footways or street lighting. Fair to poor condition but deteriorating with some infill to existing potholes. Sub-standard visibility at junction with Auldbar Road.	Significant potential for development in field on north side.	No new development permitted unless brought up to adoptable standard.
D) Drimmie Road	Nominal width 2.8m. No footways or street lighting but fair to good condition. Isolated potholes have been infilled and patching of carriageway carried out to a good standard.	Single plot development at either end.	No new development permitted.
E) Park Road (west)	Width varies. Footway on south side over half length. System of street lighting in place. Fair to good condition. However, severe potholing adjacent to Park Grove and edge break-up on south side. Visibility at junction with Auldbar Road acceptable.	Possible backland to north side and recreation park on south side.	No new development permitted.
F) Park Road (east)	No through road. Nominal width 3.0m. Good condition with wide, flat verges and system of street lighting.	Possible backland on north side and field to south side via narrow,	No new development permitted.

	Single small pothole infilled.	unmade track.	
G) Auldbar Road (track)	No through road. Nominal width 4.75m. Unmade track with no street lighting.	Single plots on either side.	Limited new development permitted.
H) North Watson Street (north)	No through road. Unmade, unlit, narrow track with no street lighting or footways.	Possible backland on both sides and field to north.	No new development permitted.
I) North Watson Street (central)	Nominal width 4.0m. No footways but system of street lighting in place. Carriageway in a poor, deteriorating state with some potholing. Very poor condition at its junction with Duncan Road.	Recreation park on west side.	No new development permitted.
J) Duncan Road (east extension)	No through road. Nominal width 3.75m. No footways but system of street lighting in place. Very poor condition with extensive potholing.	Possible backland on both sides and at end.	No new development permitted unless brought up to adoptable standard.
K) Watson Street	Width varies from 6.75m at north end down to 3.75m at south end. Footway at north end, west side over short length. System of street lighting in place. Carriageway generally kerbed with wide, flat verges and in good condition.	Possible backland in field on east side and limited potential for individual infill.	Development permitted where supported by other policies of plan.
L) Greenhills	No through road. Nominal width 4.0m reducing to 3.0m at south-west end. No footways or street lighting. Good condition at East Den Brae end but deteriorates into unmade track beyond Fairies Knowe.	Extensive potential in fields on both sides.	No new development permitted unless brought up to adoptable standard.
M) East Blairs Road	Nominal width 3.0m. No footways and limited street lighting. Generally in fair to poor condition but some areas very poor with edge break-up and potholing. Steep gradient approaching The Den. Sub-standard visibility at junction with Gardyne Street.	Potential in fields on south side.	No new development permitted unless brought up to adoptable standard, including sightlines.
N) Lane at Braehead Road	No through road. Nominal width 2.0m. No footways or street lighting. Part surfaced track in poor condition with extensive edge damage and potholing. Turns into unmade track beyond existing housing with steep gradient	Extensive area in fields to both sides.	No new development permitted unless brought up to adoptable standard, including sightlines.

	towards den. Sub-standard visibility at junction with Braehead Road.		
O) Braehead Road (east)	Nominal width 6.5m. No footways but lit. Very poor condition with edge damage and central rutting/potholing.	Extensive potential in field on west side.	No new development permitted unless brought up to adoptable standard.
P) Vinney Den	No through road. Surfaced at junction with Braehead Road but unmade narrow track over its majority. No footways or street lighting. Steep gradient towards den.	Limited due to ground levels.	No new development permitted.
Q) Braehead Road (west)	Nominal width 4.0m at east end narrowing to 3.0m at west end. No footways and only partly lit. Poor condition over majority of its length with large number of areas of rutting and potholing. Very poor condition at its junction with Dundee Street. Visibility at junction with Dundee Street acceptable.	Extensive potential in fields on both sides.	No new development permitted unless brought up to adoptable standard.
R) Woodside Road	No through road with two distinct sections. Nominal widths, 7.0m adjacent to factory and 3.75m beyond. No footways but lit. Good condition over first section but deteriorates into poor, unmade track beyond factory with extensive potholing. Sub-standard visibility on south side of junction with Dundee Street.	Extensive potential in fields at north-east end of road. Potential single plot infill on south side.	No new development permitted from Woodside Road. New development permitted via Jubilee Park and Bractullo Gardens.
S) Lane at The Square	No through road. Nominal width 4.0m. No footways or street lighting. Unmade track in poor condition. Serves 4 houses and workshop.	Limited potential for backland development.	No new development permitted unless brought up to adoptable standard.


Poilcy L1 LETHAM - UNADOPTED ROADS POLICY
KEY :
Extent of Affected Road
Letters refer to Statements in Policy
A
B
C
D
E
F
G
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I
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L
M
N
O
P
Q
R
S
Letham
Drummietermont
Drummietermont Feus
Whitefield Cottages
Scaw'd Knowe
Back How
Dempster Park (Recn Gnd)
War Meml
Pol Sta
PO
PW
Sch
Clive House
Kirkden House
Arbri Hill
Crag Monichree
Bridgend
Braehead
Cur Den
Idvies
East Lodge
South Lodge
West Lodge
West Idvies
The Ranch
Sewmill (dis)
Bractullo Bridge
Letham Den
Deil's Den
Vinny Water
Sluice
DUNCAN ROAD
WEST HEMMING STREET
EAST HEMMING STREET
BLAIRS ROAD
DUNDEE ROAD
1:10000
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APPENDIX 6 – SCHEDULE OF LAND OWNERSHIP

Schedule of Land Ownership

The following table outlines land in the ownership of Angus Council, as required by Section 15(3) of the Planning etc. (Scotland) Act 2006, which is affected by policies and proposals for development in the Proposed Angus Local Development Plan.

Description of Land Owned by Planning Authority	Reference to Policies or Proposals in the Angus Local Development Plan which relate to the occurrence of development of the land
Wardmill / Dens Road, Arbroath	A3
Elliot Industrial Estate, Arbroath	A10
Arbroath Seafront (incl. Arbroath Harbour)	A11, A12
Western Cemetery, Arbroath	A13
Brothock Water	A15
Noran Avenue 15-29	A(i)
Brechin Cemetery	B7
Land at Cookston, Brechin	B8
West Path, Camus House, Carnoustie	C(e)
Shanwell Road Sports Ground,	C9
Former Chapelpark School, Forfar	F6
Former Music Centre, Prior Road, Forfar	F7
Forfar Swimming Pool	F8
Orchardbank Business Park, Forfar	TC10, F9
Newmonthill Cemetery, Forfar	F11
Forfar Loch	F13
Kirriemuir Cemetery	K3
Rosemount Road, Hillside	M2
Former Swimming Pool, Montrose	M5
Sleepyhillock Cemetery	M10
Former Primary School, Eastgate, Friockheim	Fk2
Jubilee Park, Letham	L2

Village Inset Map Key

	SUBJECT POLICIES
Development boundary	DS1
Pipeline Consultation Zones	PV21
Existing Housing Site (Appendix 3)	
Land Reserved for Cemetery use	TC9
Conservation Areas	PV8
Scheduled Ancient Monument (property in care)	PV8
Open space protection	PV2