Estimation of Sea Salt in PM10 samples at Ferryden, Angus

DSS supply filters for PM10 collection at Ferryden Partisol
Filters are loaded into a magazine which automatically changes filters every 24 hours.
Filters are returned to the lab for gravimetric determination of PM10

PM10s consist of material from a number of sources, eg –

- Re-suspension from roads of road abrasion, salting and urban dust
- Construction dust
- Combustion
- Natural materials such as sae salt, soil and biological materials

Therefore there is recognition that a proportion of PM10 is not derived from traffic-related emissions.

To estimate the sea salt content of the particulate material collected, batches of 14 filters with known PM10 levels were treated with water to extract soluble material and analysed for Cl, NO2, NO3, F and SO4 by ion chromatography. Sodium was determined by flame AAS.

The calculation of the sea salt component of PM10 is based upon using Na as the sea salt marker and using the [component]: [Na] ionic ratio to calculate the fraction of the observed PM10 component that is comprised of sea salt. Care has to be taken that the ratio matches that in the neighbouring marine environment.
The ionic ratio of sea water constituents were used here –

- Cl:Na = 1.8
- SO4:Na = 0.28

The marine PM10 component is calculated from

Marine PM10 component = observed Na concentration * sea water ratio

Errors will arise if there are non-marine sources of sodium.

The results are shown in Table 1.

Average PM10 values (average of 14 filters in the batch) range from 5.6 to 23.8 ug/m3. Average was 13.5
Estimated sea salt content ranged from 14.9% to 39.8% of the total PM10 with an average of 27.7%

Table 1

FERRYDEN PM10 SPECIATION

Atomic wts	F	Cl	NO2	NO3	SO4	Na
	19.00	35.45	46.01	62.01	96.06	22.99

Ionic ratio of sea water constituents

Cl:Na	1.80
SO4:Na	0.28

										Marine component	
Samples	**Wt PM10**	**M3**	**F**	**Cl**	**NO2**	**NO3**	**SO4**	**Na**	**Avg PM10**	**ug**	**%**
30039936 - 49, ug	7806	327.7	12	123	4.5	232	61	560	23.8	1164.8	14.92185
moles * 1000000			0.631579	3.469676	0.097805	3.741332	0.63502	24.35842			
30041236 - 49, ug	3454	326.4	48	367	13	224	240	505	10.6	1050.4	30.41112
moles * 1000000			2.526316	10.35261	0.282547	3.612321	2.498438	21.96607			
30040821- 34, ug	6222	327.1	17	280	4.8	702	379	539	19.0	1121.1	18.01864
moles * 1000000			0.894737	7.898449	0.104325	11.32075	3.945451	23.44498			
30044427 - 40, ug	3449	322.1	27	142	16	118	140	254	10.7	528.3	15.31806
moles * 1000000			1.421053	4.005642	0.34775	1.902919	1.457422	11.04828			
30043651 - 64	1886	336	43	193	3.7	73	118	343	5.6	713.4	37.82821
moles * 1000000			2.263158	5.444288	0.080417	1.177229	1.228399	14.91953			
30042926 - 39	3581	322.4	39	277	13.4	326	605	585	11.1	1216.8	33.97934
moles * 1000000			2.052632	7.813822	0.291241	5.257217	6.298147	25.44585			
30040835 - 48	5381	324.1	35	537	15	626	593	773	16.6	1607.8	29.87995
moles * 1000000			1.842105	15.1481	0.326016	10.09515	6.173225	33.62331			
30042100 - 13	4093	322.4	47	323	17	476	405	549	12.7	1141.9	27.89934
moles * 1000000			2.473684	9.111425	0.369485	7.676181	4.216115	23.87995			
30042399 - 412	4516	326	42	364	20	403	609	630	13.9	1310.4	29.01683
moles * 1000000			2.210526	10.26798	0.434688	6.498952	6.339788	27.40322			
30042114 - 27	3385	321.5	59	559	9.6	274	407	648	10.5	1347.8	39.81802
moles * 1000000			3.105263	15.76869	0.20865	4.418642	4.236935	28.18617			