



Contractor



Forth Crossing Bridge Constructors

HOCHTIEF Solutions
 American Bridge International
 DRAGADOS
 Morrison Construction

Project

FORTH REPLACEMENT CROSSING

Document title

**AIR QUALITY MONITORING REPORT
 FEBRUARY 2014**

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1. INTRODUCTION

- 1.1.** Air quality monitoring is being undertaken by FCBC during the construction of the Forth Replacement Crossing and the associated road network. This report details the air quality monitoring that is currently being undertaken across the site and presents the monitoring results for February 2014.
- 1.2.** Air quality monitoring during this period has been undertaken in accordance with the Code of Construction Practice (CoCP) and the Dust and Air Pollution Management Plan (DAPMP) contained within the Environmental Management Plan (EMP).

2. MONITORING EQUIPMENT AND LOCATIONS

2.1. Air quality is being monitored on site using both automatic light scatter dust meters and Frisbee gauge dust deposition monitoring. Thirteen Frisbee gauges are set up at sensitive locations across the site to measure dust deposition rates (Figure 1). Seven automatic light scatter meters have also been installed at various sensitive locations to measure real time particulate matter (PM₁₀) concentrations and the Total Suspended Particle (TSP) concentrations (Figure 2). These meters are calibrated annually. Table 1 lists the air quality monitoring equipment present at each monitoring location. The installation of the air quality monitoring equipment was not simultaneous across the site, thus installation dates are also given in Table 1.

2.2. Light scatter type monitoring equipment have been selected as a site monitoring tool to create a live network which assesses the levels of fugitive particulate matter, principally airborne dust. These monitors require less space, maintenance and power than other real time monitors such as a Tapered Element Oscillating Microbalance (TEOM) which is used and designed to measure particulate levels to exceedingly high standards, including measuring long-term compliance to statutory limits. Light scatter meters are more practicable to deploy. However, the meters do generally record levels higher than those measured by the TEOM. The meters can also be affected by atmospheric moisture content which further increases reported levels. Accordingly, any elevations of statutory limits should be treated as precautionary exceedances. The monitors are reliable for on-site monitoring and the establishment of action thresholds to ensure unforeseen activities generating significant dust are identified and suitably controlled. Light scatter meters are becoming the construction and waste industries norm for particulate dust monitoring.

2.3. In association with air quality monitoring across the site, weather conditions (temperature and relative humidity) are also continually measured by the light scatter meters at Inchgarvie Lodge and Clufflat Brae. Weather stations, located at the sound level meters at Echline and Linn Mill which are adjacent to the light

scatter meters at these monitoring locations, also continually record weather data, including temperature, relative humidity, wind speed and wind direction.

2.4. In addition to the fixed monitoring equipment used at sensitive locations across the site, a daily dust log for both the North and South sites has been kept by the FCBC Environmental Department. This daily dust inspection is used to identify any dust occurring as a result of construction works and any actions required. This log also records the weather conditions at the time of the inspection.

2.5. Frequent environmental site inspections are also undertaken by members of the FCBC Environmental Department. These inspections include a dust check to assess the following:

- dust levels on site;
- suppression/dampening down; and
- transportation of materials.

In relation to these inspections, the FCBC Environmental Department register any environmental issues using a QMT (Quality Management Tool). These include those relating to air quality meaning that they can be noted and closed out appropriately.



Figure 1: Example of an Installed Frisbee Gauge Meter



Figure 2: Example of an installed Automatic Light Scatter Dust Meter

Table 1: Air Quality Monitoring Locations

Ref:	Monitoring Location	Monitoring Equipment	Installation Date	Construction Activities in February
M1	Whinny Hill	Frisbee	21/03/12	<ul style="list-style-type: none"> • Surfacing, excavation, grouting and top soil batters • Crushing works
		Automatic light scatter meter	16/02/12	
M7	Butlaw Fisheries	Frisbee	05/10/11	<ul style="list-style-type: none"> • Marine works • Society Road TARMAC coring • Assembling and fixing rebar and formwork works at Piers S5&6
M8	Barracks West	Frisbee	31/08/11	<ul style="list-style-type: none"> • Marine works • Society Road TARMAC coring • Assembling and fixing rebar, concrete pouring and formwork works at Piers S5&6
M9	Barracks East	Frisbee	31/08/11	
M10	Inchgarvie Lodge	Frisbee	22/08/11	<ul style="list-style-type: none"> • Launch install plates to props, king post works and structural steel works • Concreting, fixing rebar and installation of tie beam at Pier S7 • Society Road TARMAC coring
		Automatic light scatter meter	17/10/11	
M11	Linn Mill	Frisbee	22/08/11	<ul style="list-style-type: none"> • Launch – install plates to props, king post works and structural steel works • Assembling and fixing rebar and formwork works at Piers S5&6
		Automatic light scatter meter	06/12/11	
M12	Clufflat	Frisbee	29/08/11	<ul style="list-style-type: none"> • Launch – install plates to props, king post works and structural steel works • Society Road TARMAC coring
M13	Clufflat Brae	Automatic light scatter meter	24/10/11	
M14	Springfield	Frisbee	15/08/11	<ul style="list-style-type: none"> • Launch – install plates to props, king post works and structural steel works
M15	Echline	Frisbee	16/08/11	<ul style="list-style-type: none"> • Launch – install plates to props, king post works and structural steel works • Gyrotory – cut batters/shaping rock • A904 tie in road works, including verge fill, kerbing and placing/trimming of type 1 sub-base for footpath
		Automatic light scatter meter	10/11/11	
M16	Scotstoun	Frisbee	07/09/11	<ul style="list-style-type: none"> • Utilities works • Structure works
		Automatic light scatter meter	14/02/12	

M17	Dundas Home Farm	Frisbee	29/08/11	<ul style="list-style-type: none"> • Fill south bund/landscape • Utility works
		Automatic light scatter meter	23/02/12	
M18	Newton	Frisbee	22/08/11	<ul style="list-style-type: none"> • None
		TEOM	23/05/12	

3. AIR QUALITY MONITORING RESULTS

3.1. Automatic Light Scatter Dust Meter Monitoring Results

- 3.1.1.** Light scatter results for February 2014 have been presented in a monthly chart; this can be found in Appendix A. Results show that the PM₁₀ levels were below threshold levels throughout February and generally followed the same pattern across the site. Deviations from the pattern were however observed at Whinny Hill on 5, 6, 9 and 10 February. However, following consultation with the manufacturer regarding recent issues with the monitor, these deviations are considered to have occurred due to a device error rather than relate to construction works.
- 3.1.2.** The PM₁₀ results have also been compared to the daily mean results obtained from the TEOM air quality monitoring stations located in Newton, Rosyth, and Broxburn, and from the TEOM FDMS stations located at Queensferry Road, Edinburgh and St Leonards, Edinburgh (an urban background site). A number of these external monitors show incomplete results and/or a number of high readings during February 2014.
- 3.1.3.** Considering the lack of construction activities that would be likely to give rise to dust, the low levels of PM₁₀ recorded at monitors on or close to site and the variations shown across the external TEOM monitors, the site results are not considered to warrant further investigation.

3.2. Total Suspended Particles

3.2.1. The TSP results for February 2014 have been presented in a monthly chart; this can be found in Appendix B. The TSP levels at monitoring locations during February were found to be low and all within the threshold level. All locations were mostly found to follow a similar pattern across the site, demonstrating that, in general, the levels were influenced by regional changes in TSP levels, rather than construction works. With regard to the peaks observed for Whinny Hill, the deviations are considered to have occurred due to a device error which was subsequently corrected and are not, therefore, related to construction works.

3.3. Frisbee Dust Deposition Results

3.3.1. The Frisbee dust deposition results for February 2014 have been presented in charts and can be found in Appendix C. Frisbee dust deposition results were collected fortnightly, and the results averaged over this fortnight period to give a daily dust deposition rate. Two collections were made in February, on the 5th and 19th. The next collection will take place on the 5th March 2014.

3.3.2. The site action level for the dust deposition rate has been set at 250 mg/m²/day. Exceedances of this level are treated as a potential incident and a review of the works in the vicinity of the site is instigated. A lower, site review level has been set at 140 mg/m²/day. Where concentrations exceed the lower action threshold the site works are reviewed to ensure good practice is implemented; it is essentially a warning that additional controls may be required.

3.3.3. During February there were four exceedances of the site review level (see Table 4) and one exceedance of the action level. With the exception of the locations where exceedances occurred, Frisbee results from monitoring locations across site were generally found to be low. It should also be noted that the sample collected for Echline on 19th February was misplaced by the courier during transport to the laboratory for testing.

Table 4: Exceedances of the dust deposition thresholds

Fortnight ending	Threshold Exceeded	Monitoring Location	Considerations	Weather conditions during period
05/02/2014	Action	Barracks East	No dust generating construction activities in the area	Low winds/ Generally wet/damp
	Review	Barracks West	No dust generating construction activities in the area	
	Review	Inchgarvie lodge	No dust generating construction activities in the area	
19/02/2014	Review	Barracks West	No dust generating construction activities in the area. Filter discovered on ground upon collection	Low winds/ Generally wet/damp
	Review	Springfield	No dust generating construction activities in the area	

3.3.4. For each of the exceedances of the review level, a review of the works in each of the areas, weather conditions, and the mitigation measures in place was undertaken. Other considerations were also made, such as where the gauge is located. Where available, the Frisbee results were also considered alongside the particulate matter data for the same period; particulate matter levels were low and comfortably within the threshold levels at all locations throughout the month.

3.3.5. During the two week period ending 5th February 2014 the Barracks East Frisbee registered an unusually high level of dust deposition (329 mg/m²/day). Slight exceedances of the review level also occurred at Barracks West and Inchgarvie Lodge during this period. However, a review of works was undertaken and it was found that no construction activities that would be likely to give rise to dust took place in the area. Other indicators such as PM₁₀ and TSP data were very low for the period at the nearest meter (Inchgarvie).

Activities taking place in the area were checked for dust generation during inspections. Vehicle movement in the area was minimal due to the closed nature of the work going on and material being tracked out of the compound was negligible. There are also minimal exposed areas in the vicinity that could generate dust and almost constant damp or wet conditions on the ground. After a thorough review it was concluded that the results cannot be explained by FCBC construction activities undertaken during this period.

- 3.3.6.** With regard to the exceedance of the review level at Barracks West for the two weeks concluding 19th February 2014, a further review into works undertaken in the vicinity took place. However, during the period in question no construction activities that would be likely to give rise to dust took place in the area, indicating that the exceedance at this location was not related to construction works. The filter for the Frisbee was found on the ground adjacent to the monitor. Therefore, contamination of the sample may have accounted for the high reading.
- 3.3.7.** The exceedance of the review level for Springfield was also subject to further review into works undertaken in the vicinity. However, during the period in question no construction activities that would be likely to give rise to dust took place in the area and damp ground conditions will have suppressed windblown dust from bare ground. This indicates that the exceedance at this location was not related to construction works.

3.4. Daily Dust Log and Environmental Inspections

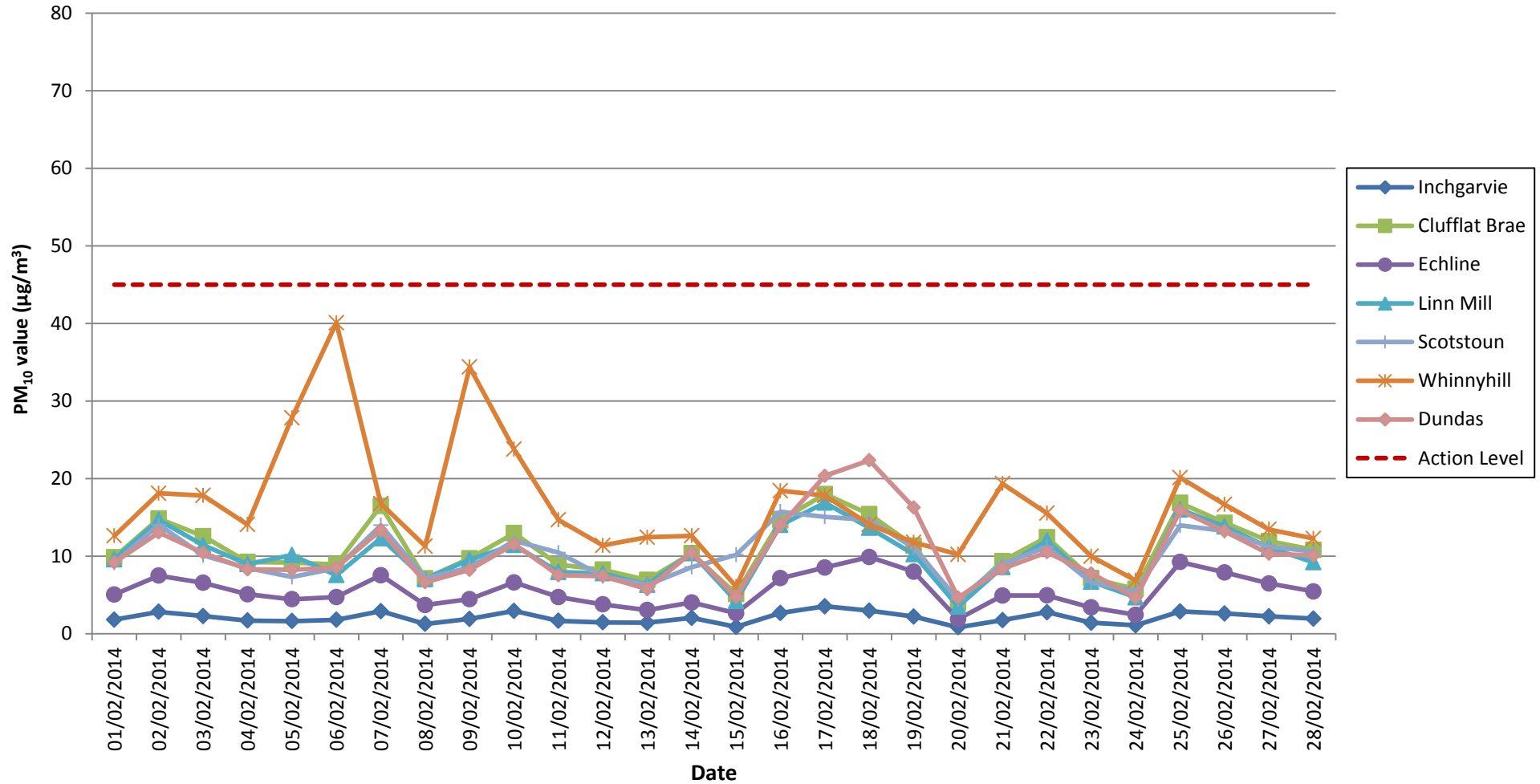
- 3.4.1.** A summary of the daily dust log for February can be found in Appendix D. During this period no instances of dust were noted on site.
- 3.4.2.** During this period full environmental inspections were also undertaken across the site and covered areas where works were being undertaken. In February, no instances of dust were noted during inspections.

APPENDIX A: LIGHT SCATTER METER RESULTS

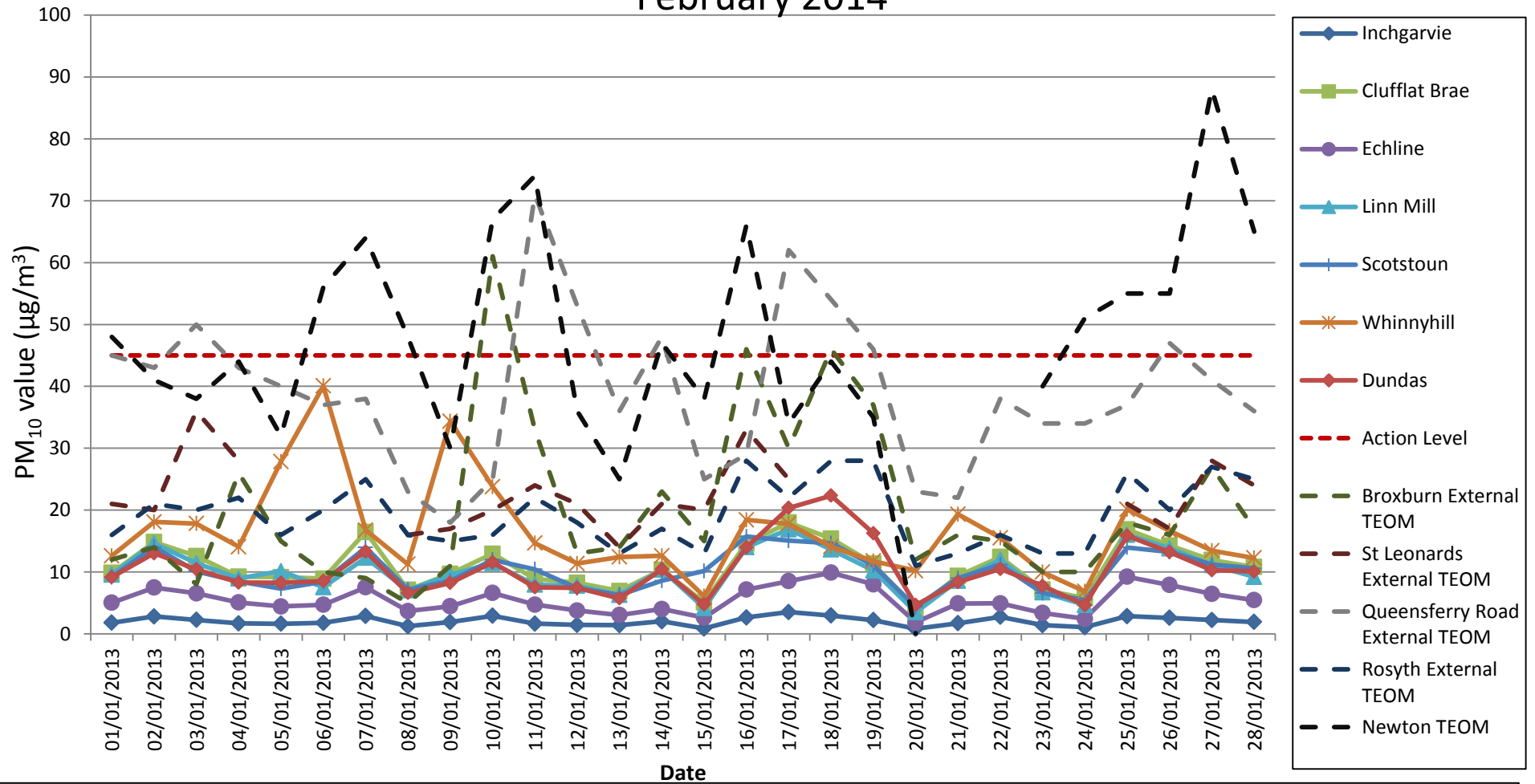
Air Quality Monitoring

Particulate Matter (PM10) Results for all Monitoring Locations

February 2014



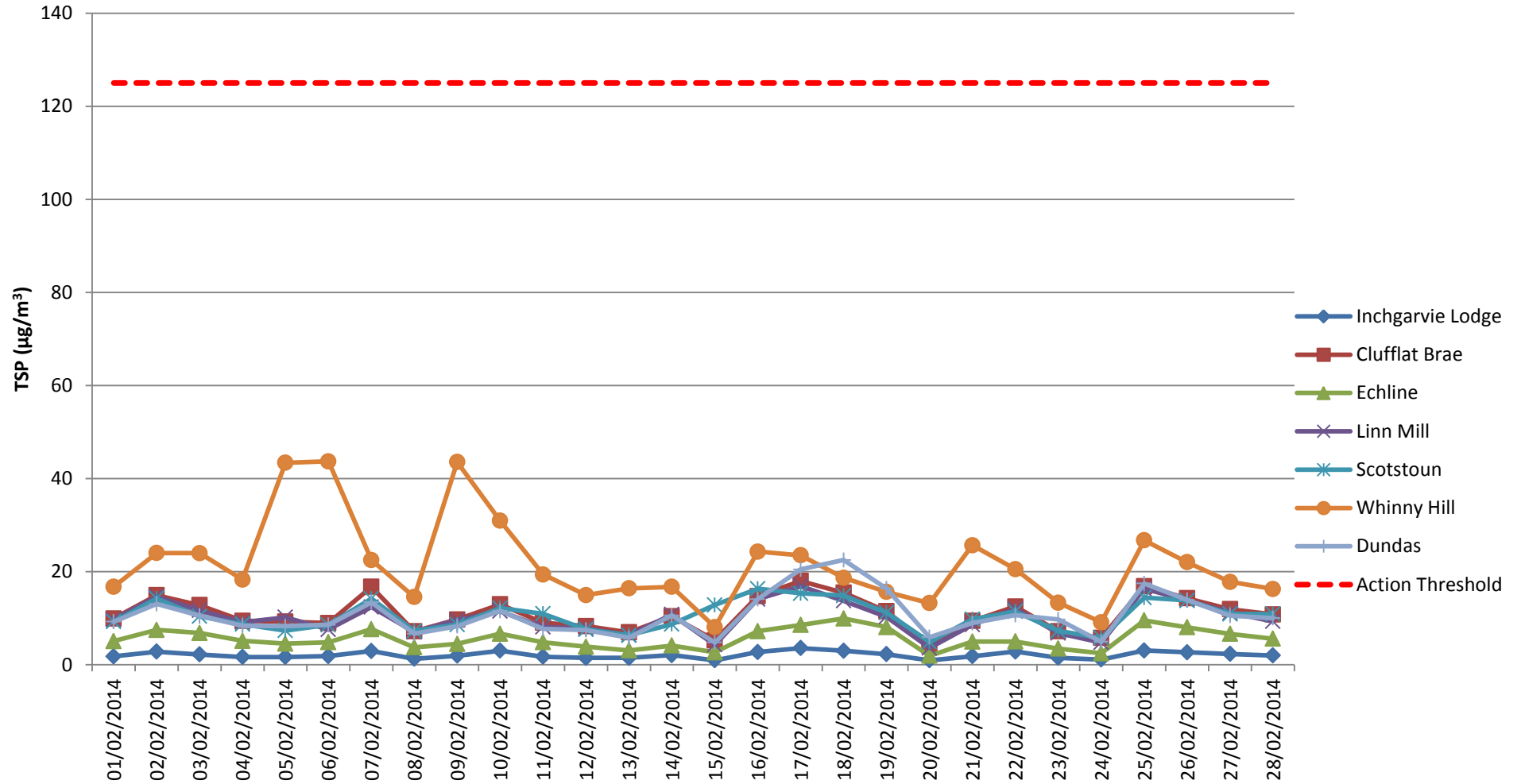
Air Quality Monitoring: Particulate Matter (PM10) Results for all Monitoring Locations, including TEOM data February 2014



Note: TEOM data missing from scottish air quality for 05-07 & 18-24 February 2014 for St Leonards and the 20-22 for Newton.

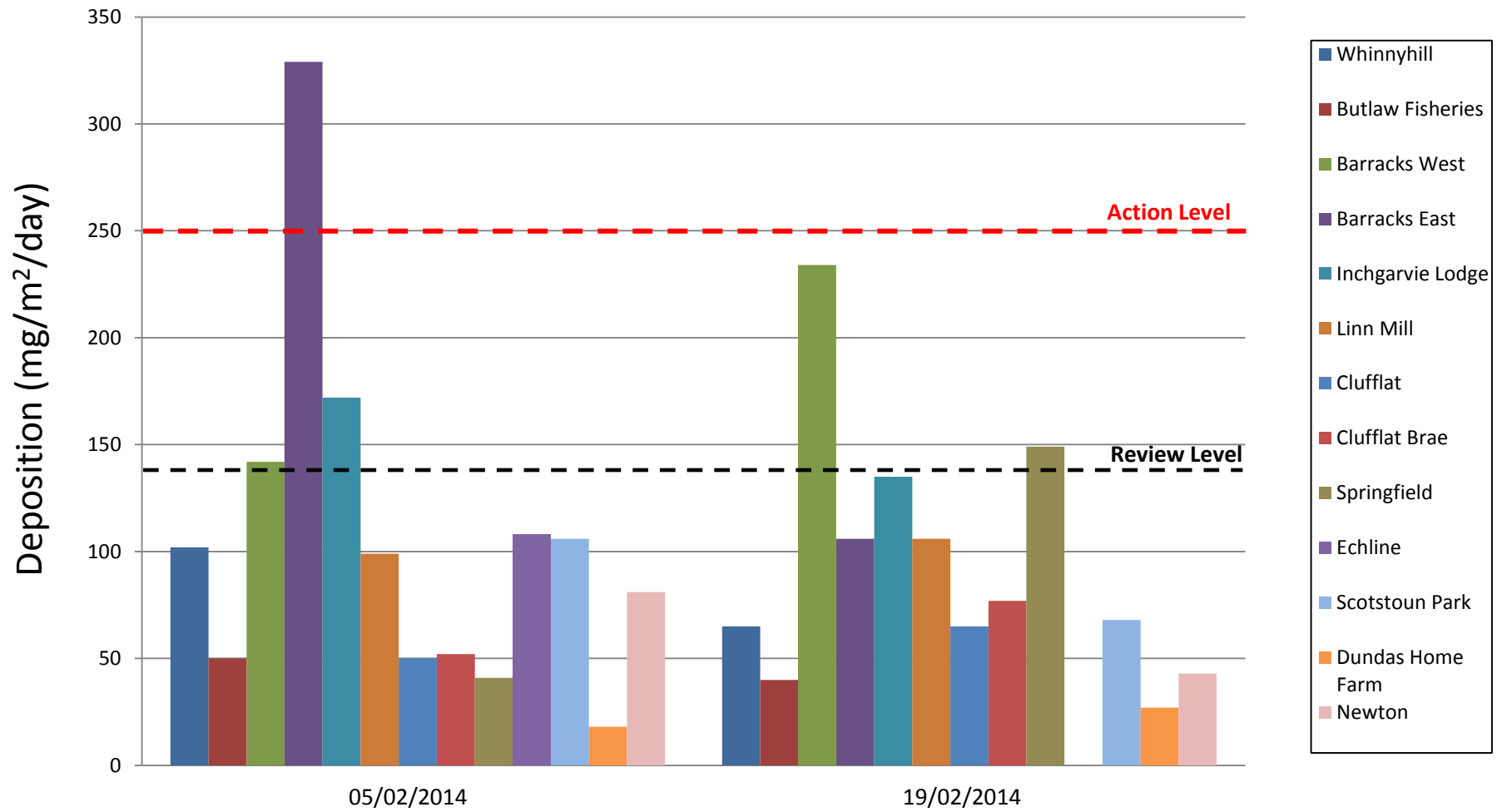
APPENDIX B: TOTAL SUSPENDED PARTICLES

Total Suspended Particles (TSP) Results February 2014



APPENDIX C: FRISBEE GAUGE RESULTS

Frisbee Dust Deposition Results: February 2014



APPENDIX D: DAILY DUST LOG

Daily Dust Log - North - January 2014

DATE	LOCATION	WIND	WIND DIRECTION	GROUND SURFACE	VISIBLE DUST	DUST DUE TO WORKS (if applicable)	CAUSES OF DUST (if applicable)	COMMENTS AND ACTIONS
01/02/2014	N	MEDIUM	SE	WET	N			
02/02/2014	N	MEDIUM	S	DAMP	N			
03/02/2014	N	MEDIUM	E	DAMP	N			
04/02/2014	N	LIGHT	E	DAMP	N			
05/02/2014	N	LIGHT	NE	DAMP	N			
06/02/2014	N	LIGHT	S	DAMP	N			
07/02/2014	N	LIGHT	SW	DAMP/WET	N			
08/02/2014	N	STRONG	SE	WET	N			
09/02/2014	N	STRONG	SW	DAMP/WET	N			
10/02/2014	N	MEDIUM	SW	DAMP	N			
11/02/2014	N	STRONG	S	WET	N			
12/02/2014	N	STRONG	NE	WET	N			
13/02/2014	N	STRONG	SW	WET	N			
14/02/2014	N	LIGHT	NE	WET	N			
15/02/2014	N	LIGHT	SW	DAMP/WET	N			
16/02/2014	N	MEDIUM	SW	DAMP/WET	N			
17/02/2014	N	LIGHT	NE	WET	N			
18/02/2014	N	LIGHT	NE	DAMP/WET	N			
19/02/2014	N	LIGHT	NE	DAMP/WET	N			
20/02/2014	N	STRONG	SW	DAMP/WET	N			
21/02/2014	N	STRONG	SW	DAMP	N			
22/02/2014	N	STRONG	SW	DAMP/WET	N			
23/02/2014	N	STRONG	S	WET	N			
24/02/2014	N	LIGHT	S	DAMP/WET	N			
25/02/2014	N	STRONG	SE	DAMP/WET	N			
26/02/2014	N	STRONG	S	DAMP/WET	N			
27/02/2014	N	STRONG	SE	DAMP	N			
28/02/2014	N	MEDIUM	NE	DAMP	N			

Daily Dust Log - South - January 2014

DATE	LOCATION	WIND	WIND DIRECTION	GROUND SURFACE	VISIBLE DUST	DUST DUE TO WORKS (if applicable)	CAUSES OF DUST (if applicable)	COMMENTS AND ACTIONS
01/02/2014	N	MEDIUM	SE	WET	N			
02/02/2014	N	MEDIUM	S	DAMP	N			
03/02/2014	N	MEDIUM	E	DAMP	N			
04/02/2014	N	LIGHT	E	DAMP	N			
05/02/2014	N	LIGHT	NE	DAMP	N			
06/02/2014	N	LIGHT	S	DAMP	N			
07/02/2014	N	LIGHT	SW	DAMP/WET	N			
08/02/2014	N	STRONG	SE	WET	N			
09/02/2014	N	STRONG	SW	DAMP/WET	N			
10/02/2014	N	MEDIUM	SW	DAMP	N			
11/02/2014	N	STRONG	S	WET	N			
12/02/2014	N	STRONG	NE	WET	N			
13/02/2014	N	STRONG	SW	WET	N			
14/02/2014	N	LIGHT	NE	WET	N			
15/02/2014	N	LIGHT	SW	DAMP/WET	N			
16/02/2014	N	MEDIUM	SW	DAMP/WET	N			
17/02/2014	N	LIGHT	NE	WET	N			
18/02/2014	N	LIGHT	NE	DAMP/WET	N			
19/02/2014	N	LIGHT	NE	DAMP/WET	N			
20/02/2014	N	STRONG	SW	DAMP/WET	N			
21/02/2014	N	STRONG	SW	DAMP	N			
22/02/2014	N	STRONG	SW	DAMP/WET	N			
23/02/2014	N	STRONG	S	WET	N			
24/02/2014	N	LIGHT	S	DAMP/WET	N			
25/02/2014	N	STRONG	SE	DAMP/WET	N			
26/02/2014	N	STRONG	S	DAMP/WET	N			
27/02/2014	N	STRONG	SE	DAMP	N			
28/02/2014	N	MEDIUM	NE	DAMP	N			