



Contractor



Forth Crossing Bridge Constructors

HOCHTIEF Solutions
 American Bridge International
 DRAGADOS
 Morrison Construction

Project

FORTH REPLACEMENT CROSSING

Document title

**AIR QUALITY MONITORING REPORT
 MARCH 2014**

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Contents

- 1. Introduction**
- 2. Monitoring Equipment and Locations**
- 3. Air Quality Monitoring Results**
 - 3.1. Automatic Light Scatter Meter Particulate Matter Monitoring Results**
 - 3.2. Total Suspended Particle Results**
 - 3.3. Frisbee Dust Deposition Results**
 - 3.4. Daily Dust Log and Weekly Environmental Inspections**

Appendices:

- Appendix A: Particulate Matter Results**
- Appendix B: Total Suspended Particle Results**
- Appendix C: Frisbee Dust Deposition Results**
- Appendix D: Daily Dust Log Summary**

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 March 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, 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). Any issues relating to air quality can therefore 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 March
M1	Whinny Hill	Frisbee	21/03/12	<ul style="list-style-type: none"> • Verge filling • Rock excavation
		Automatic light scatter meter	16/02/12	
M7	Butlaw Fisheries	Frisbee	05/10/11	<ul style="list-style-type: none"> • Marine works • Assembling and fixing rebar and formwork works at Pier S6 • Bearing fitting at S 7 & 8
M8	Barracks West	Frisbee	31/08/11	<ul style="list-style-type: none"> • Marine works • Assembling and fixing rebar and formwork works at Pier S6 • Bearing fitting at S 7 & 8
M9	Barracks East	Frisbee	31/08/11	
M10	Inchgarvie Lodge	Frisbee	22/08/11	<ul style="list-style-type: none"> • Launch - Install plates and strands to props, king post works and structural steel works • Assembling and fixing rebar and formwork works at Pier S6 • Bearings fitting at S7&8
		Automatic light scatter meter	17/10/11	
M11	Linn Mill	Frisbee	22/08/11	<ul style="list-style-type: none"> • Launch - Install plates and strands to props, king post works and structural steel works
		Automatic light scatter meter	06/12/11	
M12	Clufflat	Frisbee	29/08/11	<ul style="list-style-type: none"> • Launch - Install plates and strands to props, king post works and structural steel works
M13	Clufflat Brae	Frisbee	21/09/11	
		Automatic light scatter meter	24/10/11	
M14	Springfield	Frisbee	15/08/11	<ul style="list-style-type: none"> • Launch - Install plates and strands 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 • Brash removal
		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 • Planting • 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 March 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 the month with the exception of 29th to 31st March. All monitors showed an increase through the 29th and 30th with levels starting decreasing on the 31st. All monitors with the exception of Echline and Inchgarvie Lodge exceeded the action on one or more days during this short period. All 7 monitors follow the same general pattern throughout the month.
- 3.1.2.** It was noted that high levels of fog occurred on the 29th and 30th March which can affect the meter readings (see section 2.2). Also the first reports of anecdotal evidence of dust from a Saharan dust storm were noted during this period the dust storm was subsequently widely reported in the news in early April. The raised levels also occurred during a weekend with limited works activity occurring on site. The fact that all 7 monitors showed the same pattern would suggest that a regional event affected the levels across the whole area rather than the increases being related to works activities in one specific area affecting only a few monitors.
- 3.1.3.** 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). The same increase in levels at the end of March can be seen in the TEOM data, confirming that the increases were likely to be caused by a regional event rather than works activities.

3.2. Total Suspended Particles

3.2.1. The TSP results for March 2014 have been presented in a monthly chart; this can be found in Appendix B. The TSP levels at monitoring locations during March 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. The same increase at the end of the month (29th-31st March) that was observed in the TEOM and PM₁₀ data is observed in the TSP also, though the action level is never reached.

3.3. Frisbee Dust Deposition Results

3.3.1. The Frisbee dust deposition results for March 2014 have been presented in a chart 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 March, on the 5th and 19th. The next collection will take place on the 3rd April 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 March there were three exceedances of the site review level (see Table 4) and no exceedances 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, with the exception of Newton (19/04/2014). It should also be noted that the collection bottle for the sample for Barracks

West was found overturned and located away from the Frisbee during both collections in March. As such, a review of the location and setup is underway.

Table 4: Exceedances of the dust deposition thresholds

Fortnight ending	Threshold Exceeded	Monitoring Location	Considerations	Weather conditions during period
05/03/2014	Review	Barracks East	No dust generating construction activities in the area	Low winds/ Generally damp
19/03/2014	Review	Barracks East	No dust generating construction activities in the area.	Low winds/ Generally 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 period of the time covered by the dust deposition monitoring.

3.3.5. During both two week periods the Barracks East Frisbee registered levels above the review level. 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. Activities taking place in the area were checked for dust during inspection on the 17th and 21st March. Work in the barracks area around Pier S6 has predominantly been rebar work and activities related to concrete pours. Vehicle movement in the area were 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 of ground in the vicinity that could generate dust and almost constant damp or wet conditions on the

ground. Other indicators such as PM₁₀, TSP and Frisbee data were very low for the period at the nearest meter (Inchgarvie). After a thorough review it was concluded that the results cannot be explained by FCBC construction activities undertaken during this period. However, given the ongoing issue of unexplained elevated results at Barracks East, an alternative location for the Frisbee, in the same vicinity, is currently being investigated.

- 3.3.6.** With regard to the exceedance of the review level at Springfield for the week concluding 19th March 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 and damp ground conditions will have suppressed windblown dust from bare ground. Three other monitoring locations are situated within 250m of the Springfield Frisbee (Clufflat, Clufflat Brae and Inchgarvie Lodge), all of which showed low levels for indicators (TSP, PM₁₀ and Frisbee data) during this period. These factors would indicate that the exceedance at this location was not related to FCBC works. However, considering the elevated levels in consecutive months FCBC will conduct increased inspections in the vicinity to ensure construction activities are not causing these results.

3.4. Daily Dust Log and Environmental Inspections

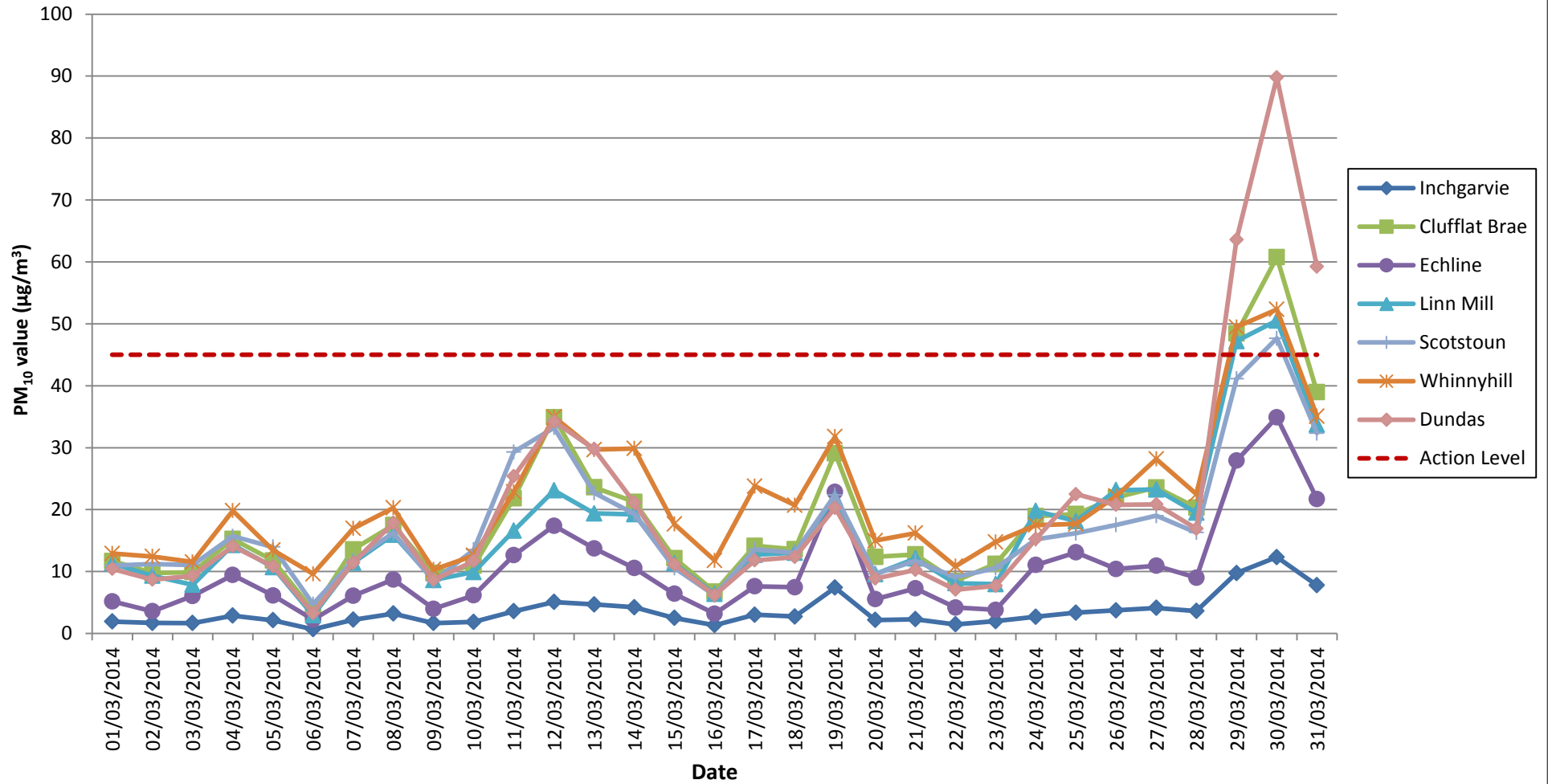
- 3.4.1.** A summary of the daily dust log for March can be found in Appendix D. During this period no instances of dust were noted on site.
- 3.4.2.** During this period full environmental inspections were also undertaken across the site and covered areas where works were being undertaken. In March,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

APPENDIX A: LIGHT SCATTER METER RESULTS

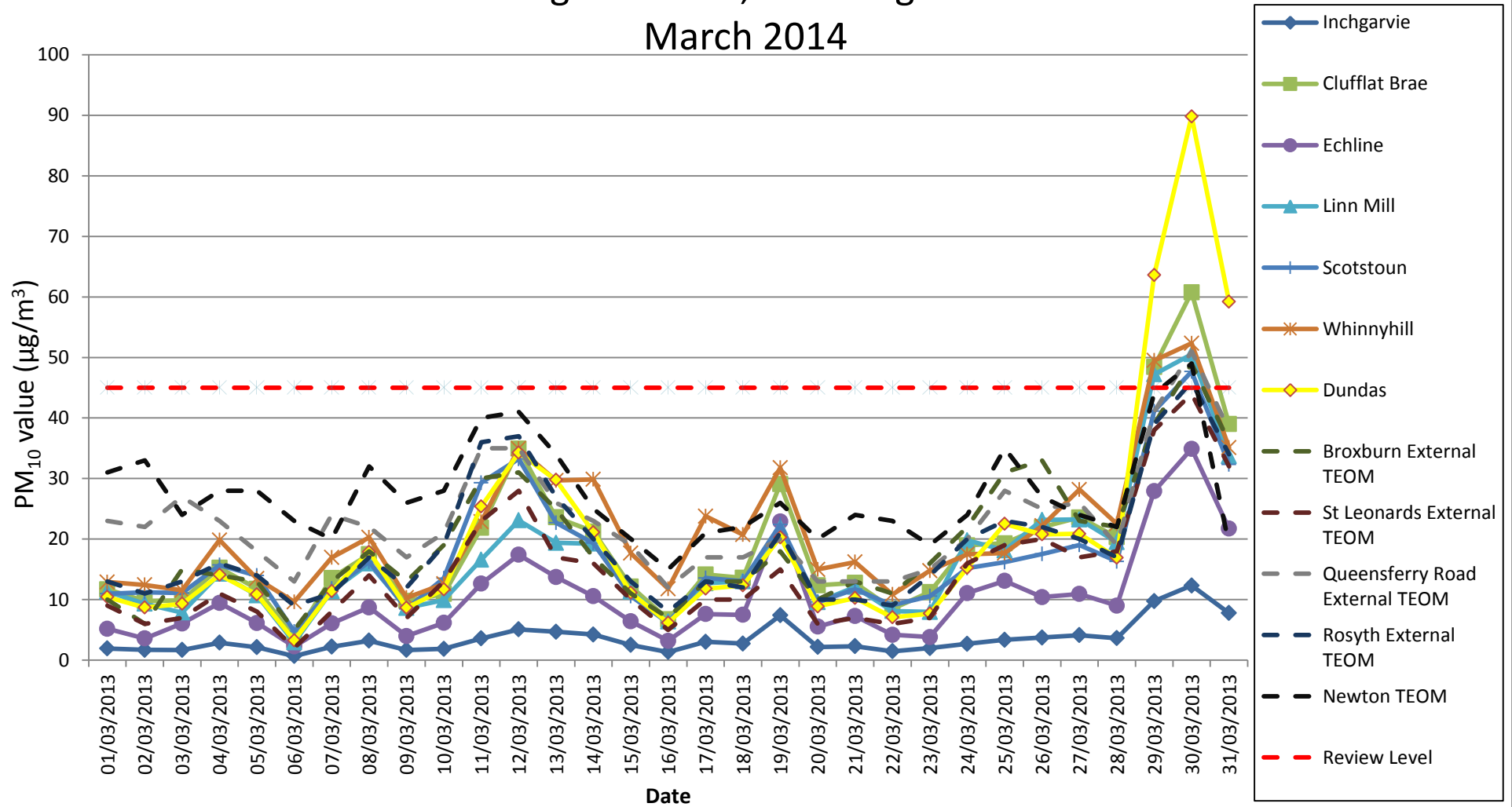
Air Quality Monitoring

Particulate Matter (PM10) Results for all Monitoring Locations

March 2014

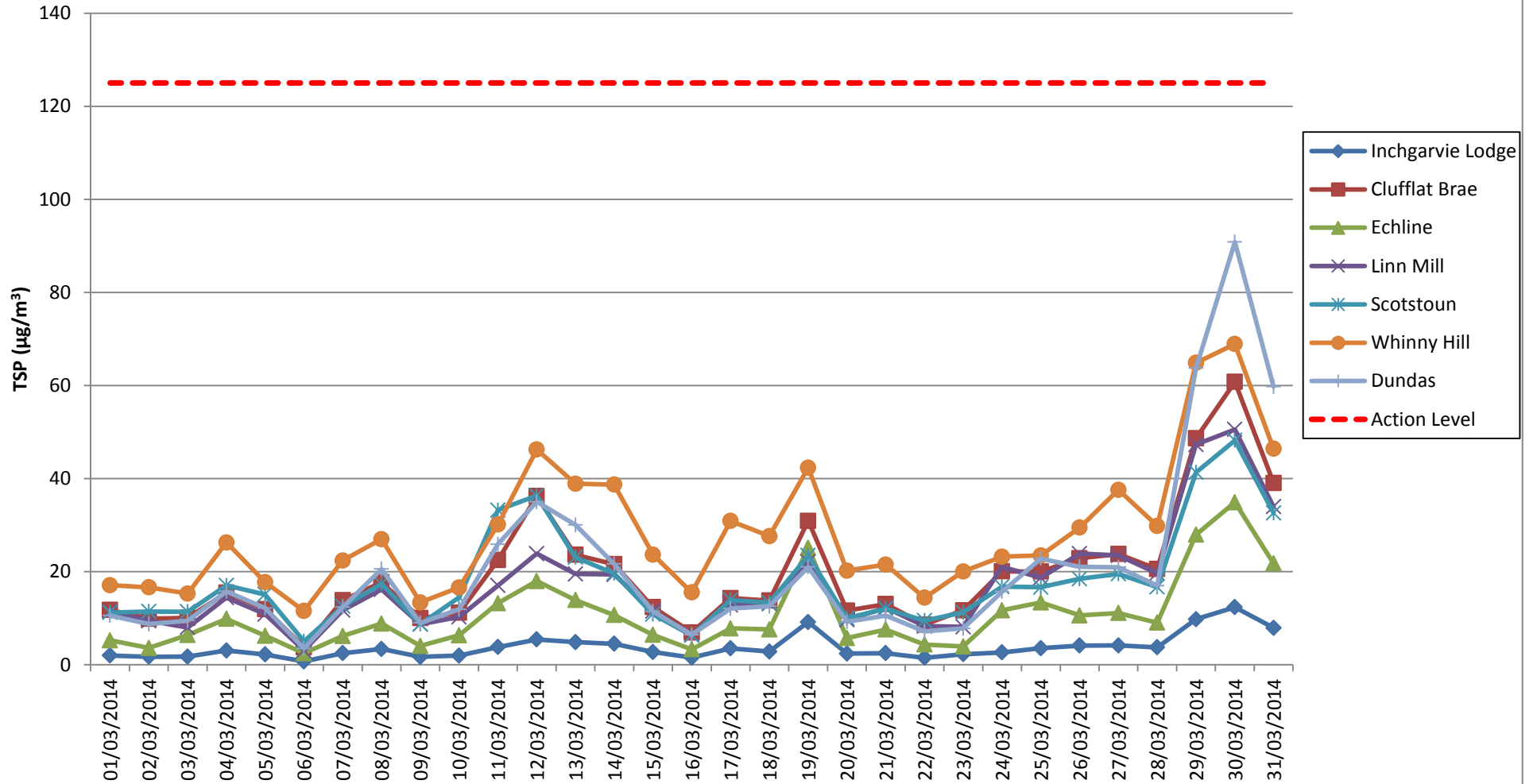


Air Quality Monitoring: Particulate Matter (PM10) Results for all Monitoring Locations, including TEOM data March 2014



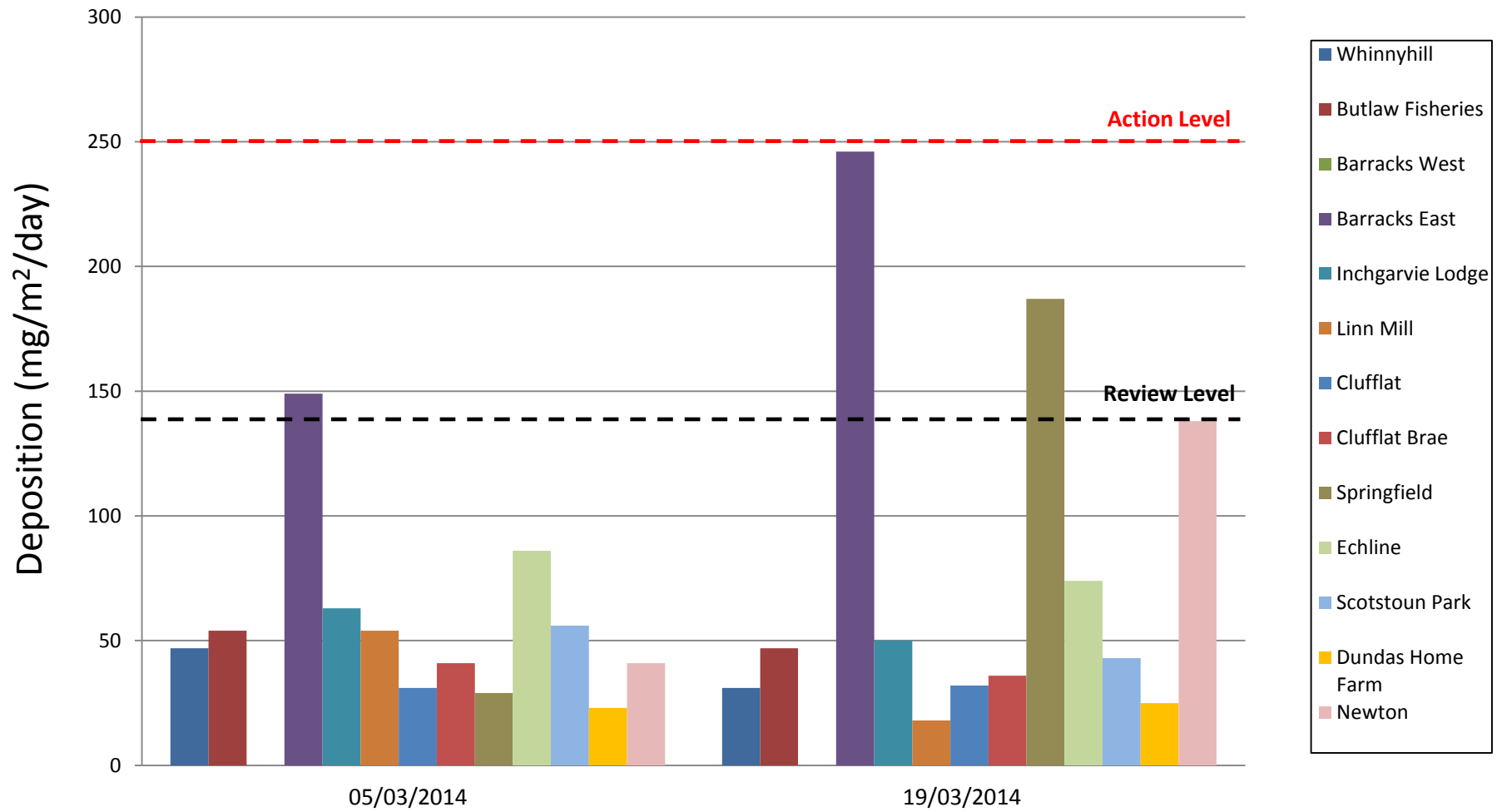
APPENDIX B: TOTAL SUSPENDED PARTICLES

Total Suspended Particles (TSP) Results March 2014



APPENDIX C: FRISBEE GAUGE RESULTS

Frisbee Dust Deposition Results: March 2014



APPENDIX D: DAILY DUST LOG

Daily Dust Log - North - March 2014

DATE	LOCATION	WIND	WIND DIRECTION	GROUND SURFACE	VISIBLE DUST	DUST DUE TO WORKS (if applicable)	CAUSES OF DUST (if applicable)	COMMENTS AND ACTIONS
01/03/2014	N	LIGHT	S	DAMP	N			
02/03/2014	N	LIGHT	E	DAMP/WET	N			
03/03/2014	N	LIGHT	SW	DAMP/WET	N			
04/03/2014	N	MEDIUM	SW	DAMP	N			
05/03/2014	N	LIGHT	SW	DAMP	N			
06/03/2014	N	LIGHT	SW	DAMP/WET	N			
07/03/2014	N	MEDIUM	SW	DAMP/WET	N			
08/03/2014	N	MEDIUM	S	DAMP	N			
09/03/2014	N	LIGHT	W	DAMP	N			
10/03/2014	N	LIGHT	SW	DAMP	N			
11/03/2014	N	LIGHT	NW	DAMP	N			
12/03/2014	N	LIGHT	SW	DRY	N			
13/03/2014	N	LIGHT	SW	DRY	N			
14/03/2014	N	MEDIUM	SW	DAMP	N			
15/03/2014	N	STRONG	SW	DAMP	N			
16/03/2014	N	STRONG	SW	DAMP	N			
17/03/2014	N	STRONG	SW	DAMP	N			
18/03/2014	N	MEDIUM	SW	DAMP	N			
19/03/2014	N	STRONG	SW	DAMP	N			
20/03/2014	N	STRONG	SW	WET	N			
21/03/2014	N	MEDIUM	SW	WET	N			
22/03/2014	N	MEDIUM	SW	DAMP	N			
23/03/2014	N	LIGHT	NW	DAMP/WET	N			
24/03/2014	N	LIGHT	NE	DAMP	N			
25/03/2014	N	LIGHT	NE	DAMP	N			
26/03/2014	N	LIGHT	NE	DAMP	N			
27/03/2014	N	LIGHT	NE	WET	N			
28/03/2014	N	LIGHT	NE	DAMP	N			
29/03/2014	N	LIGHT	NE	DAMP	N			
30/03/2014	N	LIGHT	NE	DRY	N			
31/03/2014	N	LIGHT	N	DRY	N			

Daily Dust Log - South - March 2014

DATE	LOCATION	WIND	WIND DIRECTION	GROUND SURFACE	VISIBLE DUST	DUST DUE TO WORKS (if applicable)	CAUSES OF DUST (if applicable)	COMMENTS AND ACTIONS
01/03/2014	S	LIGHT	S	DAMP	N			
02/03/2014	S	LIGHT	E	DAMP/WET	N			
03/03/2014	S	LIGHT	SW	DAMP/WET	N			
04/03/2014	S	MEDIUM	SW	DAMP	N			
05/03/2014	S	LIGHT	SW	DAMP	N			
06/03/2014	S	LIGHT	SW	DAMP/WET	N			
07/03/2014	S	MEDIUM	SW	DAMP/WET	N			
08/03/2014	S	MEDIUM	S	DAMP	N			
09/03/2014	S	LIGHT	W	DAMP	N			
10/03/2014	S	LIGHT	SW	DAMP	N			
11/03/2014	S	LIGHT	NW	DAMP	N			
12/03/2014	S	LIGHT	SW	DRY	N			
13/03/2014	S	LIGHT	SW	DRY	N			
14/03/2014	S	MEDIUM	SW	DAMP	N			
15/03/2014	S	STRONG	SW	DAMP	N			
16/03/2014	S	STRONG	SW	DAMP	N			
17/03/2014	S	STRONG	SW	DAMP	N			
18/03/2014	S	MEDIUM	SW	DAMP	N			
19/03/2014	S	STRONG	SW	DAMP	N			
20/03/2014	S	STRONG	SW	WET	N			
21/03/2014	S	MEDIUM	SW	WET	N			
22/03/2014	S	MEDIUM	SW	DAMP	N			
23/03/2014	S	LIGHT	NW	DAMP/WET	N			
24/03/2014	S	LIGHT	NE	DAMP	N			
25/03/2014	S	LIGHT	NE	DAMP	N			
26/03/2014	S	LIGHT	NE	DAMP	N			
27/03/2014	S	LIGHT	NE	WET	N			
28/03/2014	S	LIGHT	NE	DAMP	N			
29/03/2014	S	LIGHT	NE	DAMP	N			
30/03/2014	S	LIGHT	NE	DRY	N			
31/03/2014	S	LIGHT	N	DRY	N			