Contractor

Forth Crossing Bridge Constructors

HOCHTIEF Solutions
American Bridge International
DRAGADOS
Morrison Construction

Project

FORTH REPLACEMENT CROSSING

Document title

AIR QUALITY MONITORING REPORT APRIL 2015

00	05/03/2015	First revision	SSN	KHN	SSN
Rev	**Rev. Date**	**Purpose of revision**	**Made**	**Checked**	**Reviewed**

Document status

FOR REVIEW

Made by Stuart Swainson	Checked By: Kathryn Hamilton
Initials: SSN	Initials: LSN

Document number	Rev
REP -00227	00

Distribution

Name	Email Address	Copy Sent (Y/N)
Michael Martin	Michael.martin@fcbcjv.co.uk	

Contents

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 April 2015.

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 Quality Management Plan (DAQMP) 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 (PM_{10}) 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, including the date it was installed.

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, 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 provides a visual record of the weather conditions at the time of the inspection, including conditions that can affect readings, such as fog.

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 April
M1	Whinny Hill	Frisbee	21/03/12	• Rock Trimming/Breaking/Crushing • Earth Works
		Automatic light scatter meter	16/02/12	
M7	Butlaw Fisheries	Frisbee	05/10/11	• Marine works • Assembling and fixing rebar and formwork works at Pier S3 • Concrete pouring at Pier S3 • Excavation/Cleaning at Pier S2
M8	Barracks West	Frisbee	31/08/11	• Marine works • Assembling and fixing rebar and formwork works at Pier S3 • Concrete pouring at Pier S3 • Excavation/Cleaning at Pier S2
M9	Barracks East	Frisbee	31/08/11	
M10	Inchgarvie Lodge	Frisbee	22/08/11	• Launch – Painting works, snagging and bearing installation • Assembling and fixing rebar and formwork works at Pier S3 • Concrete pouring at Pier S3 • Excavation/Cleaning at Pier S2
		Automatic light scatter meter	17/10/11	
M11	Linn Mill	Frisbee	22/08/11	• Launch – Painting works, snagging and bearing installation
		Automatic light scatter meter	06/12/11	
M12	Clufflat	Frisbee	29/08/11	• Launch – Painting works, snagging and bearing installation
M13	Clufflat Brae	Frisbee	21/09/11	
		Automatic light scatter meter	24/10/11	
M14	Springfield	Frisbee	15/08/11	• Launch – Painting works, snagging and bearing installation
M15	Echline	Frisbee	16/08/11	• Launch – Painting works, snagging and bearing installation • Earth bund landscaping and Fencing • Planting
		Automatic light scatter meter	10/11/11	
M16	Scotstoun	Frisbee	07/09/11	• Arup Access Earthworks

		Automatic light scatter meter	14/02/12	• Drainage works • Utility works • Concrete finishing ESQ04
M17	Dundas Home Farm	Frisbee	29/08/11	• Construction of road formation and drainage from Dundas to Queensferry gyratory
		Automatic light scatter meter	23/02/12	
M18	Newton	Frisbee	22/08/11	• 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 April 2015 have been presented in a monthly chart; this can be found in Appendix A. Results show that the PM_{10} levels were below threshold levels throughout the month with the exception of the three periods; 8th-11th, 22nd-25th and 27th April. During each of these periods a number of monitors registered above the action level.

3.1.2. During the period of high readings which occurred on 8th-10th April the Department of the Environment, Food and Rural Affairs issued an alert regarding an area of increased levels of air pollution passing across much of the UK. Raised levels were also observed across the TEOM monitors in the area. This combined with the fact all monitors registered high levels suggests that the results were driven by regional/national changes in air quality rather than being driven by construction related activities.

3.1.3. Clufflat Brae, Linn Mill and Scotstoun monitors all registered levels above the action level on at least one day between 22nd – 25th April. All monitors, including the TEOMs, registered increased levels during this period. The Rosyth TEOM registered higher than the action level for two days. This combined with the fact all monitors registered high levels suggests that the results were driven by regional/national changes in air quality rather than being driven by construction related activities.

3.1.4. All monitors registered elevated levels on the 27th April. During this day all monitors received their annual service and calibration from AQM (in some cases this continued on the 28th). This is conducted without turning the monitor off and leads to extremely high readings for a short period while servicing is taking place. For example the Whinny Hill monitor registered levels over 1000 for a number of 5 minute periods. All monitors saw increased levels during servicing. A member of the environmental team was on site with AQM at all times and no dust issues were noted on either day. It is concluded that these raised levels were due to servicing and calibration rather than being driven by construction related activities.

3.1.5. The PM_{10} 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 station located at Queensferry Road and St Leonards, Edinburgh (an urban background site). The TEOM at Newton was installed by West Lothian Council, facilitated by FCBC, during May 2012. The comparison between the light scatter and TEOM results demonstrates that both sets of results generally follow the same pattern, indicating that the pattern observed throughout April was largely driven by regional changes in air quality rather than by construction related activities.

3.1.6. During April site operations extended around the B800 north of the bridge over the A90. These works currently extend up to the fence line where the Scotstoun PM_{10} monitor is located. These works include landscaping and earthworks in the vicinity of the monitor location. This means that this monitor is essentially on-site and that operations are now closer to some receptors. Although results are widely in line with other monitors, and there were no construction related exceedances during April, the monitor generally registered some of the highest levels across site during April. FCBC will continue to monitor this area closely over the next few months as works in this area progress.

3.2. Total Suspended Particles

3.2.1. The TSP results for April 2015 have been presented in a monthly chart; this can be found in Appendix B. The TSP levels at monitoring locations during April were found to be low and all within the threshold level. All locations across the site were mostly found to follow a similar pattern similar to that observed for PM_{10} levels. This demonstrates that, in general, the levels were influenced by regional changes in TSP levels, rather than construction works.

3.3. Frisbee Dust Deposition Results

3.3.1. The Frisbee dust deposition results for April 2015 have been presented in a chart and can be found in Appendix C. This includes an additional Frisbee (Echline Corner) currently located south of the A904 in proximity to the Echline monitor. This temporary Frisbee is used to provide additional information and its results are presented alongside the 13 permanent monitors. 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 April, on the 8th and 22nd. The next collection will take place on the 6th May 2015.

3.3.2. The site action level for the dust deposition rate has been set at 250 mg/m^2/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/m^2/day. Where concentrations exceed the lower review 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 April there was one exceedance of the site review level and no exceedances of the action level (see Table 2).

Table 2: Exceedances of the dust deposition thresholds

Fortnight ending	Threshold Exceeded	Monitoring Location	Considerations	Weather conditions during period
22/04/2015	Review	Newton	No dust generating construction activities in close proximity.	Generally dry with some wind

3.3.4. For the exceedance of the review level a review of the works in the area, 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 gauge results were also considered alongside the particulate matter data for the same period.

3.3.5. The exceedance of the review level for Newton on 22nd April was also subject to further review into works undertaken in the vicinity. However, during the period in question no FCBC construction activities that would be likely to give rise to dust took place in the area (no activity within 1 mile). This indicates that the exceedance at this location was not related to construction works from the project.

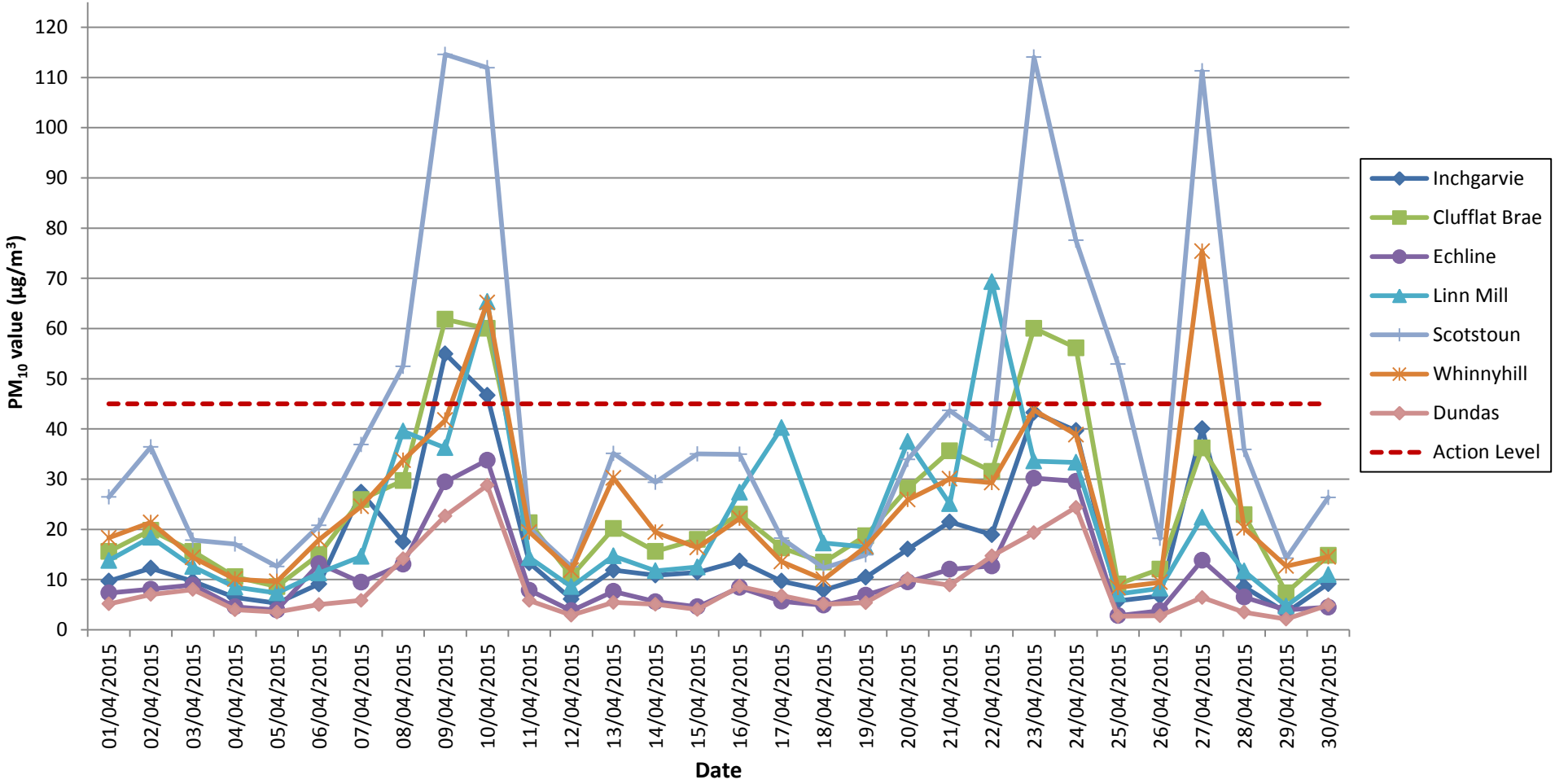
3.4. Daily Dust Log and Environmental Inspections

3.4.1. A summary of the daily dust log for April can be found in Appendix D. No instances of dust relating to FCBC works were noted on site.

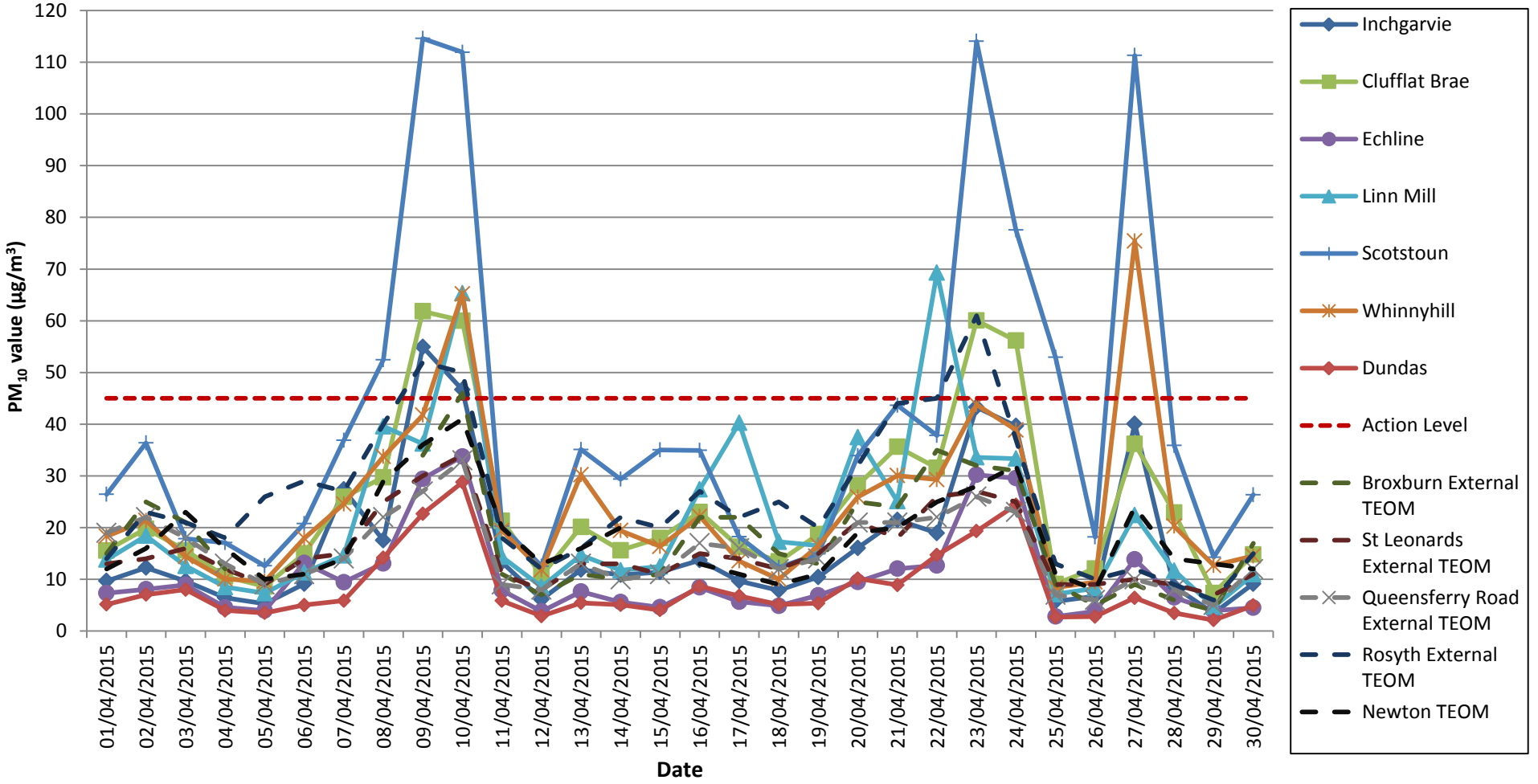
3.4.2. During this period full environmental inspections were also undertaken across the site and covered areas where works were being carried out.

APPENDIX A: LIGHT SCATTER METER RESULTS

Air Quality Monitoring
Particulate Matter (PM10) Results for all Monitoring Locations
April 2015

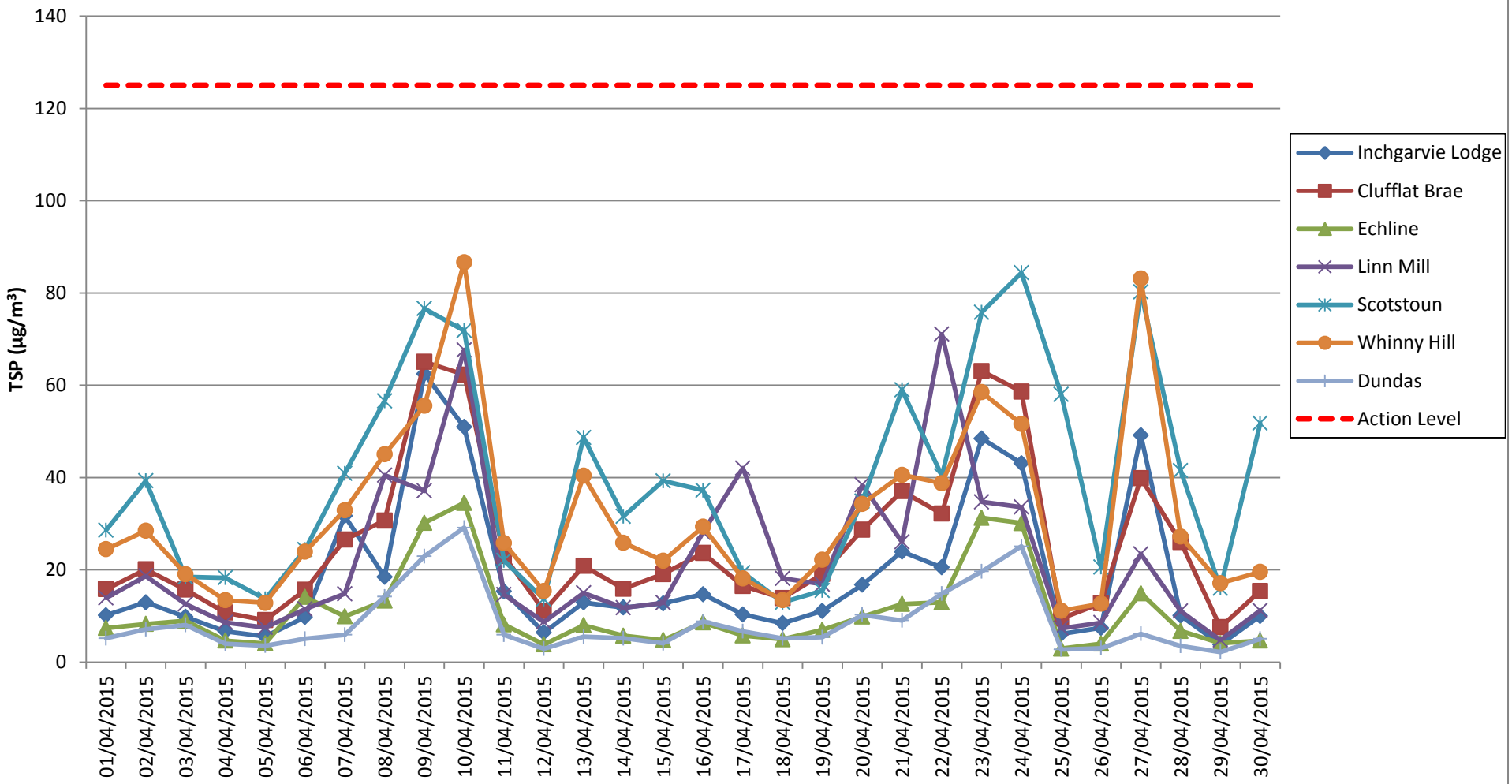


Air Quality Monitoring: Particulate Matter (PM10) Results for all Monitoring Locations, inlcuding TEOM data
April 2015



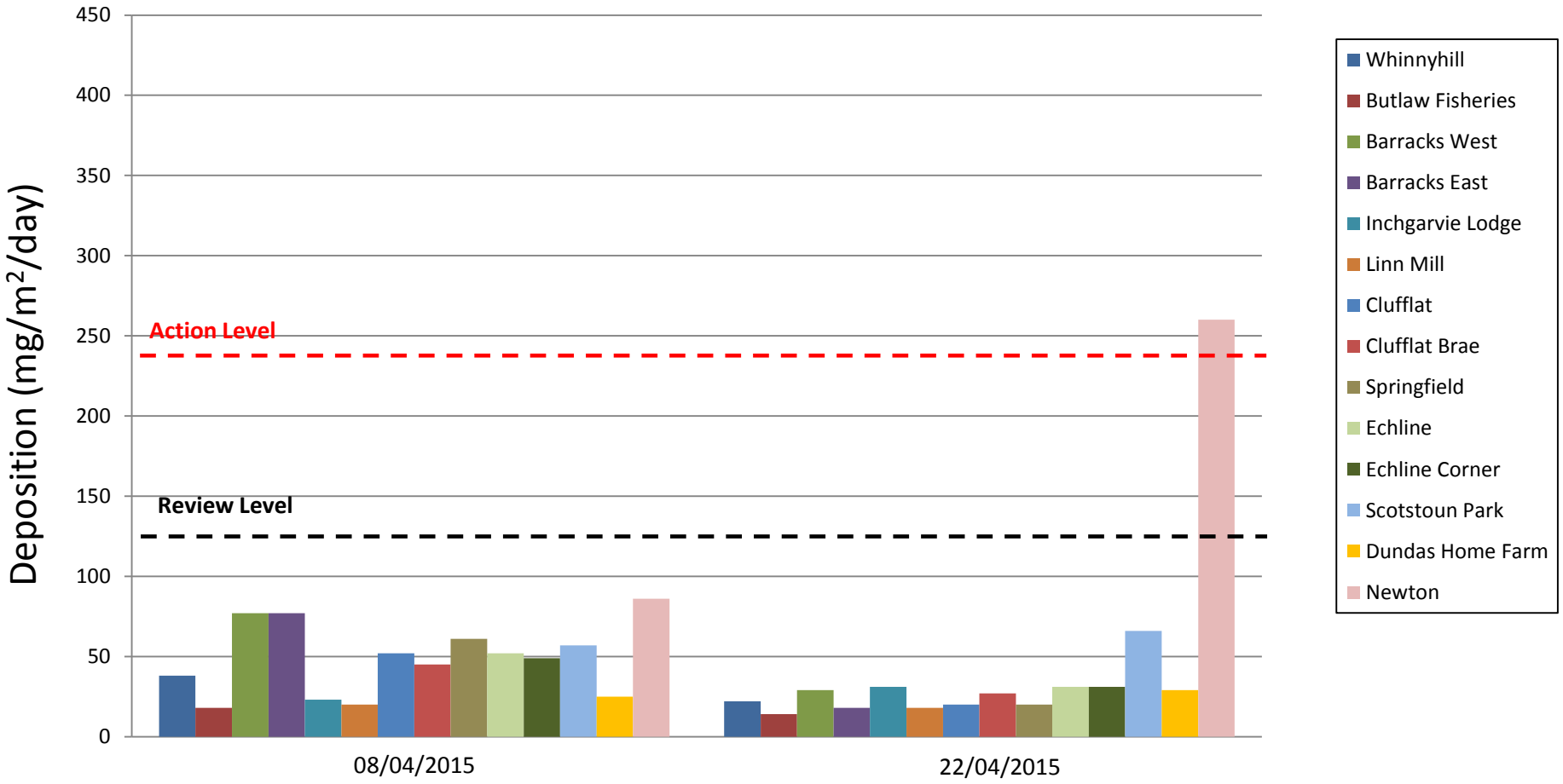
APPENDIX B: TOTAL SUSPENDED PARTICLES

Total Suspended Particles (TSP) Results
April 2015



APPENDIX C: FRISBEE GAUGE RESULTS

Frisbee Dust Deposition Results: April 2015



APPENDIX D: DAILY DUST LOG

Daily Dust Log - North - April 2015

DATE	LOCATION	WIND	WIND DIRECTION	GROUND SURFACE	VISIBLE DUST	DUST DUE TO WORKS (if applicable)	CAUSES OF DUST (if applicable)	COMMENTS AND ACTIONS
01/04/2015	N	MEDIUM	SW	DRY	N			
02/04/2015	N	LIGHT	SW	DAMP	N			
03/04/2015	N	LIGHT	SW	DAMP	N			
04/04/2015	N	LIGHT	SW		N			
05/04/2015	N	LIGHT	SW		N			
06/04/2015	N	LIGHT	SW	DRY	N			
07/04/2015	N	MEDIUM	SW	DRY	N			
08/04/2015	N	LIGHT	SW	DRY	N			
09/04/2015	N	LIGHT	SW	DRY	N			
10/04/2015	N	LIGHT	SE	DRY	N			
11/04/2015	N	STRONG	SW		N			
12/04/2015	N	MEDIUM	SW		N			
13/04/2015	N	MEDIUM	S	DRY	N			
14/04/2015	N	MEDIUM	SW	DRY	N			
15/04/2015	N	MEDIUM	SW	DRY	N			
16/04/2015	N	LIGHT	SW	DRY	N			
17/04/2015	N	LIGHT	NE	DRY	N			
18/04/2015	N	LIGHT	NE		N			
19/04/2015	N	LIGHT	NE		N			
20/04/2015	N	LIGHT	NE	DRY	N			
21/04/2015	N	LIGHT	SW	DRY	N			
22/04/2015	N	LIGHT	NE	DRY	N			
23/04/2015	N	LIGHT	SW	DRY	N			
24/04/2015	N	LIGHT	SW	DRY	N			
25/04/2015	N	LIGHT	W		N			
26/04/2015	N	MEDIUM	SW		N			
27/04/2015	N	MEDIUM	SW	DAMP	N			
28/04/2015	N	MEDIUM	SW	DAMP	N			
29/04/2015	N	MEDIUM	SW	DAMP	N			
30/04/2015	N	LIGHT	NW	DAMP	N			

Daily Dust Log - South - April 2015

DATE	LOCATION	WIND	WIND DIRECTION	GROUND SURFACE	VISIBLE DUST	DUST DUE TO WORKS (if applicable)	CAUSES OF DUST (if applicable)	COMMENTS AND ACTIONS
01/04/2015	S	MEDIUM	SW	DRY	N			
02/04/2015	S	LIGHT	SW	DAMP	N			
03/04/2015	S	LIGHT	SW	DAMP	N			
04/04/2015	S	LIGHT	SW		N			
05/04/2015	S	LIGHT	SW		N			
06/04/2015	S	LIGHT	SW	DRY	N			
07/04/2015	S	MEDIUM	SW	DRY	N			
08/04/2015	S	LIGHT	SW	DRY	N			
09/04/2015	S	LIGHT	SW	DRY	N			
10/04/2015	S	LIGHT	SE	DRY	N			
11/04/2015	S	STRONG	SW		N			
12/04/2015	S	MEDIUM	SW		N			
13/04/2015	S	MEDIUM	S	DRY	N			
14/04/2015	S	MEDIUM	SW	DRY	N			
15/04/2015	S	MEDIUM	SW	DRY	N			
16/04/2015	S	LIGHT	SW	DRY	N			
17/04/2015	S	LIGHT	NE	DRY	N			
18/04/2015	S	LIGHT	NE		N			
19/04/2015	S	LIGHT	NE		N			
20/04/2015	S	LIGHT	NE	DRY	N			
21/04/2015	S	LIGHT	SW	DRY	N			
22/04/2015	S	LIGHT	NE	DRY	N			
23/04/2015	S	LIGHT	SW	DRY	N			
24/04/2015	S	LIGHT	SW	DRY	N			
25/04/2015	S	LIGHT	W		N			
26/04/2015	S	MEDIUM	SW		N			
27/04/2015	S	MEDIUM	SW	DAMP	N			
28/04/2015	S	MEDIUM	SW	DAMP	N			
29/04/2015	S	MEDIUM	SW	DAMP	N			
30/04/2015	S	LIGHT	NW	DAMP	N			