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Project **FORTH REPLACEMENT CROSSING**

Document title

**AIR QUALITY MONITORING REPORT
MAY 2016**

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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 May 2016.

- 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).



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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. Twelve Frisbee gauges are currently 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, 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.



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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, Linn Mill and Whinnyhill (these are adjacent to the light scatter meters at these monitoring locations), 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 to determine if any actions are 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.



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 May
M1	Whinny Hill	Frisbee	21/03/12	<ul style="list-style-type: none"> • Earthworks/Fill Placement • Hope Street roadworks • Bridge works at Ferrytoll • Main carriageway roadworks • Rock crushing
		Automatic light scatter meter	16/02/12	
M7	Butlaw Fisheries	Frisbee	05/10/11	<ul style="list-style-type: none"> • Pier S1 rebar, formwork & concrete works • Pier S2 rebar, formwork & concrete works • South Tower rebar, formwork, concreting works, deck segment lifts, deck table installation works
M8	Barracks West	Frisbee	31/08/11	<ul style="list-style-type: none"> • Pier S1 rebar, formwork & concrete works • Pier S2 rebar, formwork & concrete works • South Tower rebar, formwork, concreting works, deck segment lifts, deck table installation works
M10	Inchgarvie Lodge	Frisbee	22/08/11	<ul style="list-style-type: none"> • AVS Scaffolding, shuttering and reinforcement to deck • Main carriageway earthworks • Pier S1 rebar, formwork & concrete works • Pier S2 formwork and concrete works • South Tower rebar, formwork, concreting works, deck segment lifts, deck table installation works
		Automatic light scatter meter	17/10/11	
M11	Linn Mill	Frisbee	22/08/11	<ul style="list-style-type: none"> • AVS Scaffolding, shuttering and reinforcement to deck • Main carriageway earthworks • Pier S1 rebar, formwork & concrete works • Pier S2 formwork and concrete works • Excavating SUDS detention basin
		Automatic light scatter meter	06/12/11	
M12	Clufflat	Frisbee	29/08/11	<ul style="list-style-type: none"> • AVS Scaffolding, shuttering and reinforcement to deck • Main carriageway earthworks
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"> AVS Scaffolding, shuttering and reinforcement to deck Main carriageway earthworks
M15	Echline	Frisbee	16/08/11	<ul style="list-style-type: none"> AVS Scaffolding, shuttering and reinforcement to deck Main carriageway earthworks
		Automatic light scatter meter	10/11/11	
M16	Scotstoun	Frisbee	07/09/11	<ul style="list-style-type: none"> Footpath works Utility works Main carriageway works North-bound bus link
		Automatic light scatter meter	14/02/12	
M17	Dundas Home Farm	Frisbee	29/08/11	<ul style="list-style-type: none"> Utility works Main carriageway works North-bound bus link
		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 May 2016 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 May with the exception of Linn Mill on the 10th May. All monitors generally follow the same pattern throughout the month. However, the PM₁₀ results for Linn Mill show a slight increase on the 10th May which just exceeds the threshold. On this day the Linn Mill light scatter meter registered 15 minute exceedances for PM₁₀. The FCBC Environmental Coordinator investigated the area and confirmed that conditions were not dusty and that sufficient mitigation was in place. All other monitors also showed an increase on this day.



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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 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 January 2012. The comparison between the light scatter and TEOM results demonstrates that both sets of results generally follow the same pattern, although the light scatter meter results indicate some higher peaks of PM₁₀ throughout May. The higher levels of PM₁₀ observed at Linn Mill (3.1.1 above) are largely consistent with the TEOM results for the same period. The pattern observed throughout May was largely driven by regional changes in air quality.

3.2. Total Suspended Particles

3.2.1. The TSP results for May 2016 have been presented in a monthly chart; this can be found in Appendix B. The TSP levels at monitoring locations during May were found to be low and all within the threshold. All locations across the site were found to follow a similar pattern (similar to that observed for PM₁₀ levels). As with PM₁₀ it is considered that the TSP levels across site were influenced by regional changes in TSP levels.

3.3. Frisbee Dust Deposition Results

3.3.1. The Frisbee dust deposition results for May 2016 have been presented in a chart and can be found in Appendix C. Two collections were made in May; these occurred on the 11th and 25th May 2016.

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



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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 May there was one exceedance of the review level at the temporary Frisbee at Scotstoun Arups for the fortnight concluding 11th May. However, this is an erroneous result as the filter of the Frisbee was found on the ground during collection. There were also exceedances of the review level at Scotstoun and Echline for the fortnight concluding 25 May. With regards to the exceedance at Scotstoun, the light scatter meter at this location indicated mostly low levels of PM₁₀ and TSP during this fortnight. The temporary Frisbee at Scotstoun Arups, which is located closer to the FCBC works, indicates a significantly lower result than for the permanent Frisbee during this period. This suggests that the higher results obtained recently at the permanent monitoring location are not entirely due to FCBC activities. As noted in previous reports, other construction work (not project related) is ongoing in the Scotstoun area. However, FCBC will continue to monitor Forth Replacement Crossing construction closely as works progress and provide mitigation as necessary. With regards to the exceedance at Echline, the light scatter meter at this location indicated mostly low levels of PM₁₀ and TSP during this fortnight. The closest FCBC works during this time were over 150m away and are considered unlikely to cause high levels of dust. During the same time period the FCBC noise monitor indicated residential works taking place in this vicinity. It is possible that these works may have been the cause of the exceedance.



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3.4. Daily Dust Log and Environmental Inspections

- 3.4.1.** A summary of the daily dust log for May can be found in Appendix D.

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



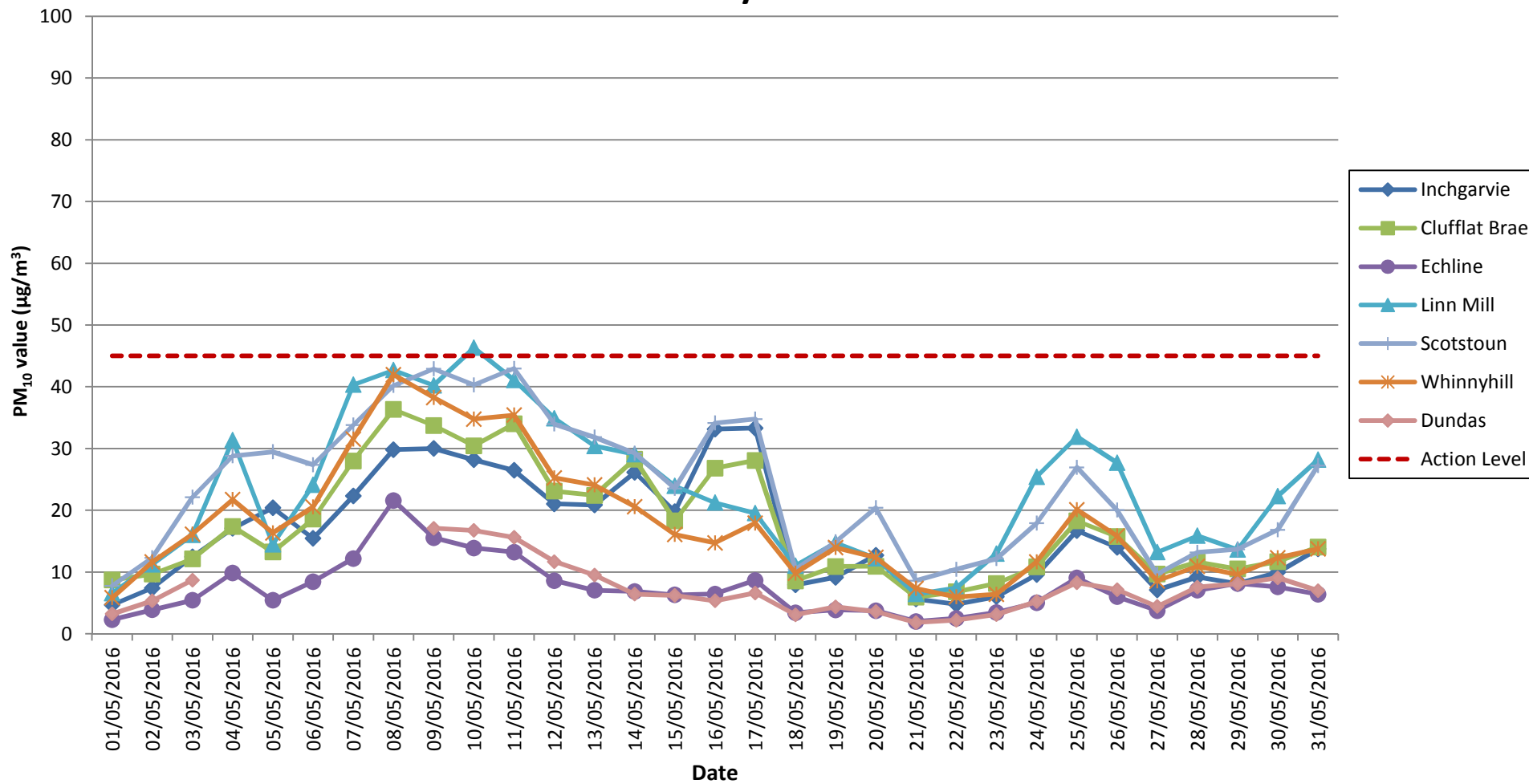
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APPENDIX A: LIGHT SCATTER METER RESULTS

Air Quality Monitoring

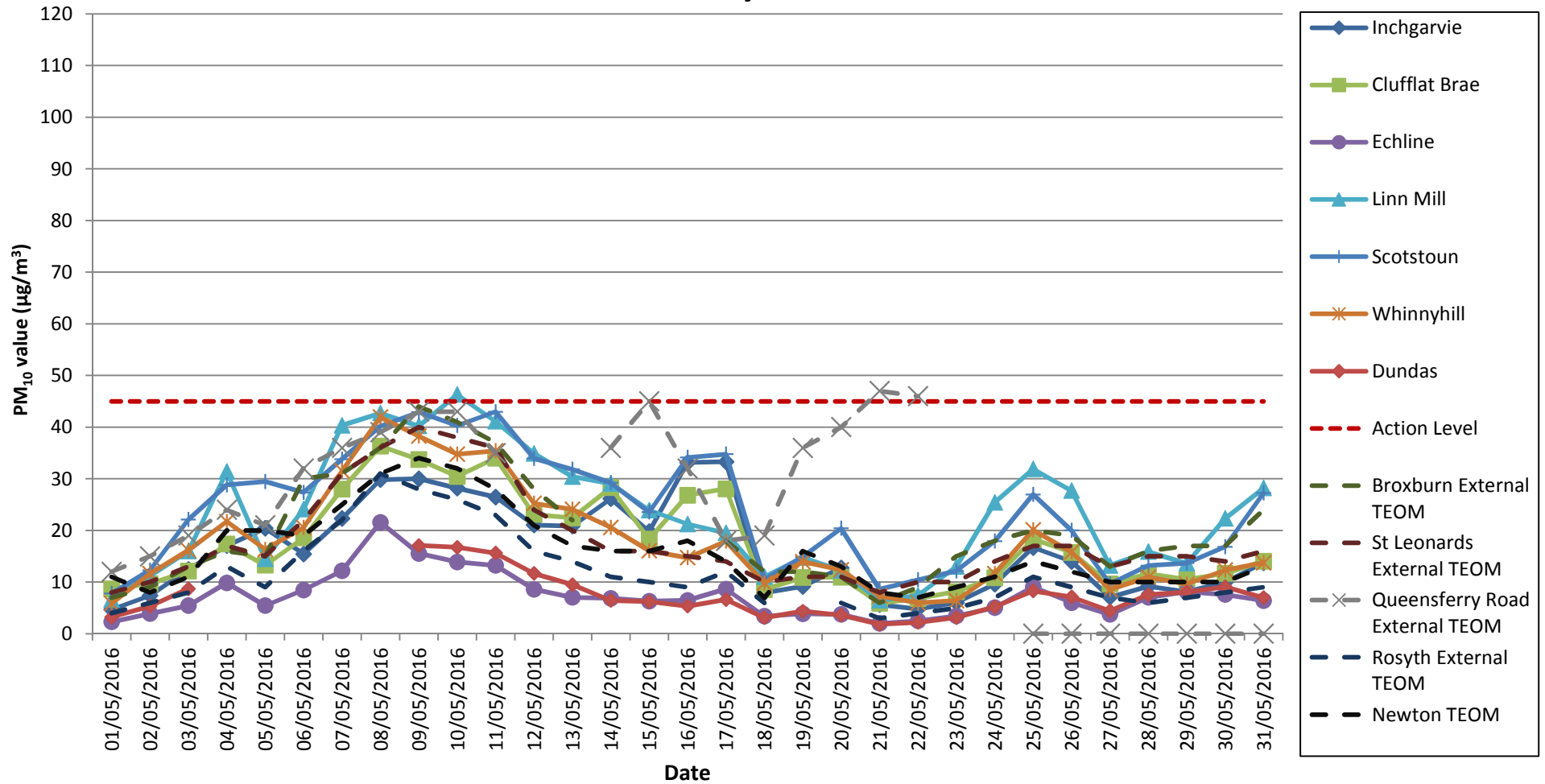
Particulate Matter (PM10) Results for all Monitoring Locations

May 2016



Note: Please note there was no data at Dundas from the 4th-8th May due to a problem with the monitor.

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



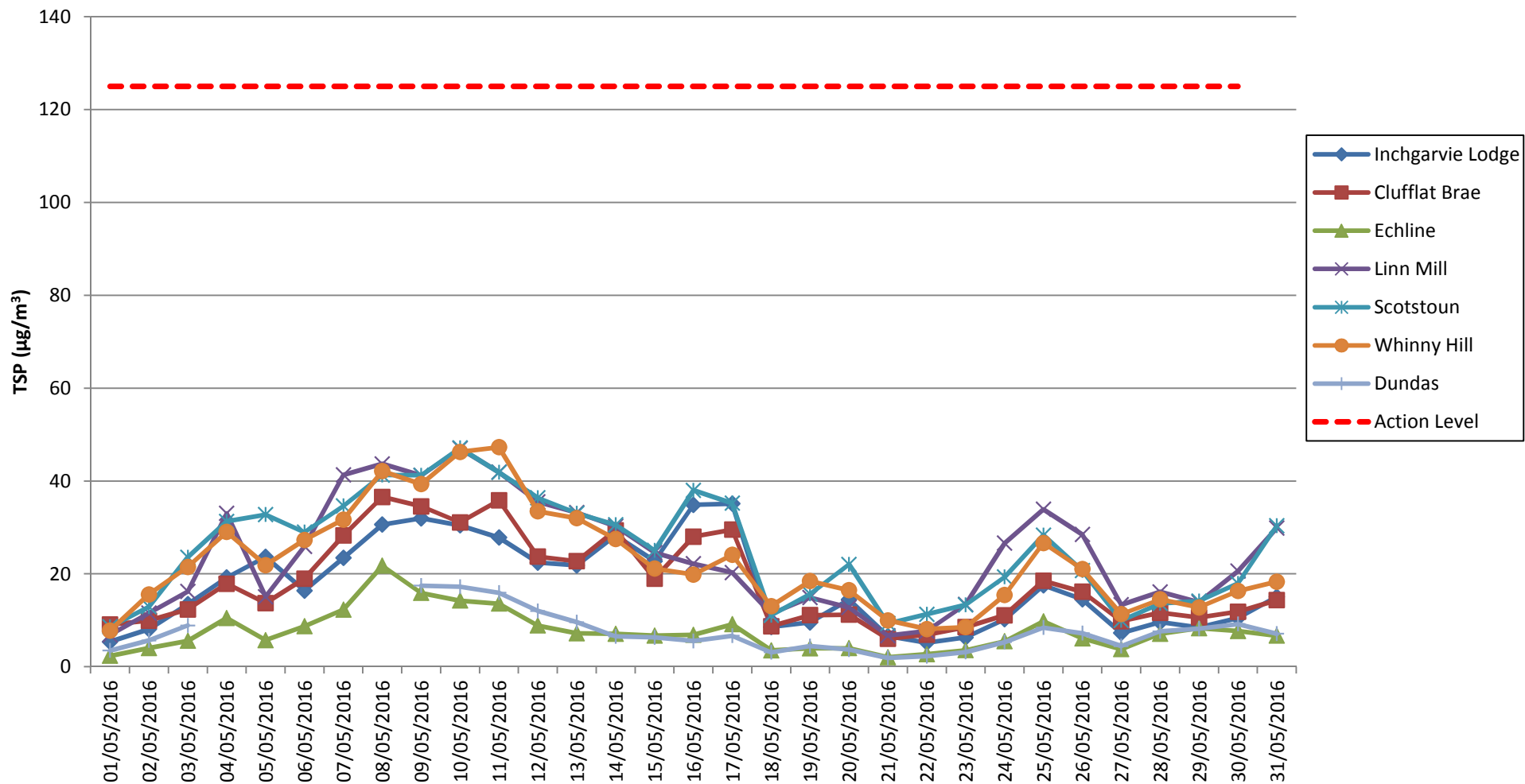
Note: Please note there was no data at Dundas from the 4th-8th May due to a problem with the monitor.



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APPENDIX B: TOTAL SUSPENDED PARTICLES

Total Suspended Particles (TSP) Results May 2016



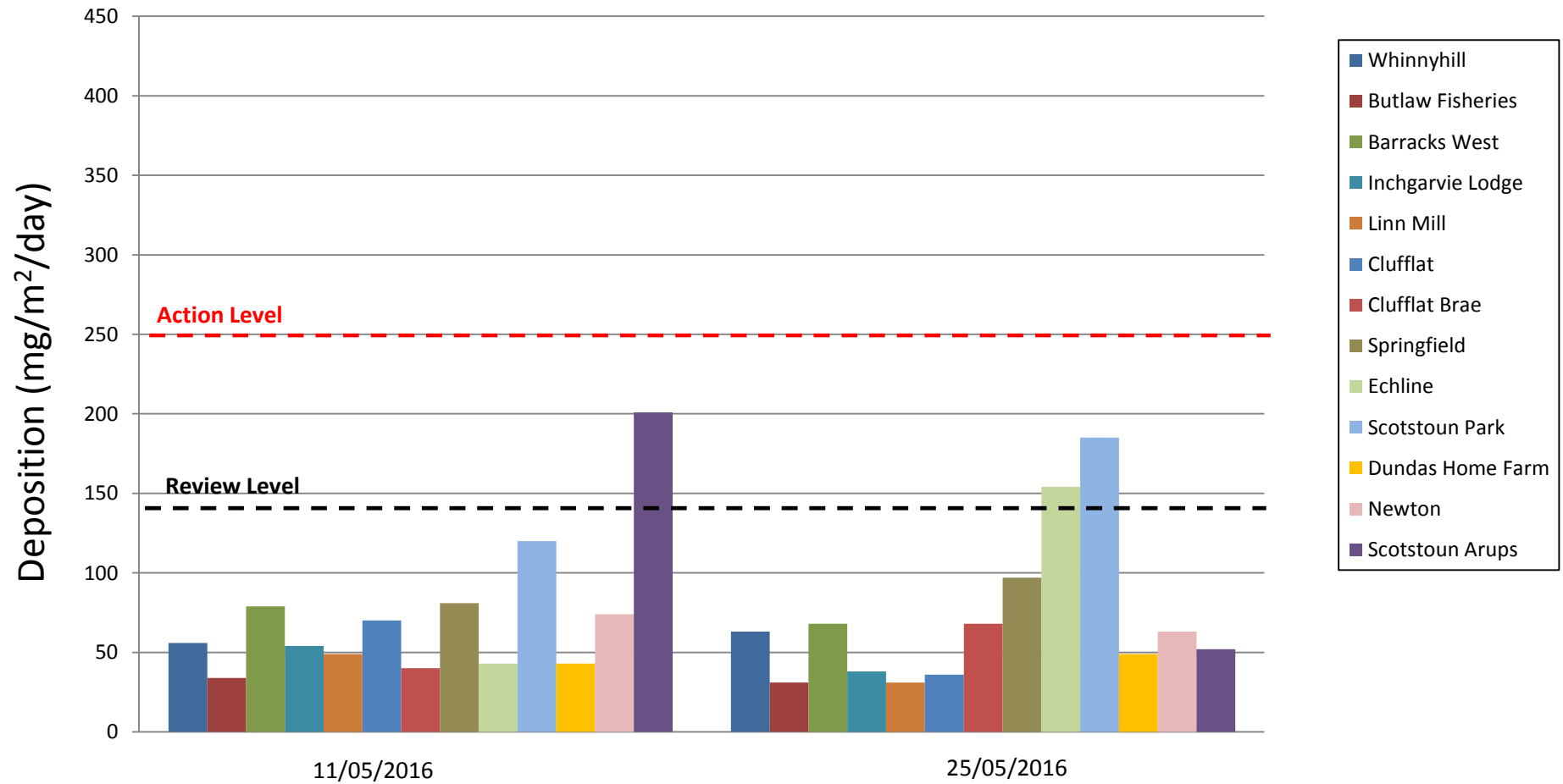
Note: Please note there was no data at Dundas from the 4th-8th May due to a problem with the monitor.



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APPENDIX C: FRISBEE GAUGE RESULTS

Frisbee Dust Deposition Results: May 2016



Note: The result for Scotstoun Arups for fortnight ending 11 May was erroneous due to filter being found on ground



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APPENDIX D: DAILY DUST LOG

Daily Dust Log - North - May 2016

DATE	LOCATION	WIND	WIND DIRECTION	GROUND SURFACE	VISIBLE DUST	DUST DUE TO WORKS (if applicable)	CAUSES OF DUST (if applicable)	COMMENTS AND ACTIONS
01/05/2016	N							
02/05/2016	N	LIGHT	SW					SITE CLOSED
03/05/2016	N	LIGHT	SW	DAMP				
04/05/2016	N	LIGHT	S	DAMP				
05/05/2016	N	LIGHT	S	DRY				
06/05/2016	N	LIGHT	SE	DRY				
07/05/2016	N							
08/05/2016	N							
09/05/2016	N	LIGHT	S	DRY				
10/05/2016	N	LIGHT	W	DRY				
11/05/2016	N	LIGHT	W	DRY				
12/05/2016	N	LIGHT	W	Dry				
13/05/2016	N	LIGHT	W	Dry				
14/05/2016	N							
15/05/2016	N							
16/05/2016	N	LIGHT	S	Dry				
17/05/2016	N	LIGHT	S	Dry				
18/05/2016	N	LIGHT	SE	Damp				
19/05/2016	N	LIGHT	SE	Damp				
20/05/2016	N	LIGHT	S	Dry				
21/05/2016	N							
22/05/2016	N							
23/05/2016	N	LIGHT	SE	Dry				
24/05/2016	N	LIGHT	E	Dry				
25/05/2016	N	LIGHT	E	Dry				
26/05/2016	N	LIGHT	W	Dry				
27/05/2016	N	LIGHT	W	Damp				
28/05/2016	N							
29/05/2016	N							
30/05/2016	N	Light	W	Dry				
31/05/2016	N	Light	SW	Dry				

Daily Dust Log -South - May 2016

DATE	LOCATION	WIND	WIND DIRECTION	GROUND SURFACE	VISIBLE DUST	DUST DUE TO WORKS (if applicable)	CAUSES OF DUST (if applicable)	COMMENTS AND ACTIONS
01/05/2016	S							
02/05/2016	S	LIGHT	SE					SITE CLOSED
03/05/2016	S	LIGHT	SE	DAMP				
04/05/2016	S	LIGHT	E	DAMP				
05/05/2016	S	LIGHT	E	DRY				
06/05/2016	S	LIGHT	SW	DRY				
07/05/2016	S							
08/05/2016	S							
09/05/2016	S	LIGHT	W	DRY				
10/05/2016	S	LIGHT	W	DRY				PM10 - 15 minute exceedances throughout day at Linn Mill. Environmental coordinator attended site. No dust observed and dust suppression was ongoing (bowser).
11/05/2016	S	LIGHT	W	DRY				
12/05/2016	S	LIGHT	W	Dry				
13/05/2016	S	LIGHT	W	Dry				
14/05/2016	S							
15/05/2016	S							
16/05/2016	S	LIGHT	SE	Dry				
17/05/2016	S	LIGHT	SE	Dry				
18/05/2016	S	LIGHT	SW	Damp				
19/05/2016	S	LIGHT	SW	Damp				
20/05/2016	S	LIGHT	SE	Dry				
21/05/2016	S							
22/05/2016	S							
23/05/2016	S	LIGHT	SW	Dry				
24/05/2016	S	LIGHT	SW	Dry				
25/05/2016	S	LIGHT	NW	Dry				
26/05/2016	S	LIGHT	W	Dry				
27/05/2016	S	LIGHT	W	Damp				
28/05/2016	S							
29/05/2016	S							
30/05/2016	S	Light	W	Dry				
31/05/2016	S	Light	SW	Dry				