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Forth Crossing Bridge Constructors

HOCHTIEF Solutions
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Project **FORTH REPLACEMENT CROSSING**

Document title

**AIR QUALITY MONITORING REPORT
DECEMBER 2015**

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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 December 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 (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.

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. A weather station, located at the sound level meters at Echline (these are adjacent to the light scatter meters at these monitoring locations), record weather data including; temperature, relative humidity, wind speed and wind direction. The weather stations at Whinnyhill and Dundas are currently unavailable and are getting repaired.

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.



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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 December
M1	Whinny Hill	Frisbee	21/03/12	<ul style="list-style-type: none"> • Earthworks/Fill Placement • New Ferrytoll Road • Bridge works at Ferrytoll • Roadworks
		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 • Central Tower rebar, formwork, concreting works, deck table installation works • South Tower rebar, formwork, concreting works, deck table installation works • South Tower Deck Segment Lifts
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 • Central Tower rebar, formwork, concreting works, deck table installation works • South Tower rebar, formwork, concreting works, deck table installation works • South Tower Deck Segment Lifts
M9	Barracks East	Frisbee	31/08/11	
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 table installation works. • South Tower Deck Segment Lifts
		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 • South Tower Deck Segment Lifts
		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 • B800 Piling Works • South-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 • B800 Piling Works • Main carriageway works • South-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 December 2015 have been presented in a monthly chart; this can be found in Appendix A. Results show that the PM₁₀ levels were well below threshold levels throughout the month with the exception of the 28th December where all monitors, with the exception of Echline, showed an exceedance. As all monitors show an increase on this day and there were no construction works through the Christmas period, it is concluded that these exceedances were caused by regional air quality.

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 December 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 December was largely driven by regional changes in air quality.

3.1.3. During December, site operations continued around the B800 north of the bridge over the A90. These works currently extend up to the fence line where the Scotstoun PM₁₀ monitor is located. These works include landscaping, surfacing and earthworks in the vicinity of the monitor. This means that the monitor is essentially on-site and that operations are now closer to some receptors. However, results throughout the month are all under the threshold. FCBC will continue to monitor this area closely over the next few months as works in this area progress, and provide mitigation as necessary.

3.2. Total Suspended Particles

3.2.1. The TSP results for December 2015 have been presented in a monthly chart; this can be found in Appendix B. The TSP levels at monitoring locations during December were found to be low and all within the threshold. All locations across the site were mostly 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 December 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 December; these occurred on the 2th and 16th December 2015.
- 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 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 December there was one exceedance of the review level at Clufflat Brae for the fortnight concluding 2nd December. The Clufflat Brae light scatter meter registered levels well below the action levels for both TSP and PM₁₀ during the period. The other two Frisbees in that area at Clufflat and Inchgarvie were also well under the review level for dust deposition. The Clufflat Brae frisbee is located at least 100m away from the closest works. Ground conditions for the period were mostly wet. Therefore, it is considered unlikely that construction activities contributed to the dust deposition result. FCBC will continue to monitor this area and provide mitigation as necessary. There were also 2 exceedances at Scotstoun and Dundas for the period concluding 16 December. Although there were works in the area, the ground conditions for this period were mostly wet and there was no dust



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observed on site. In addition, the light scatter meters at Scotstoun and Dundas indicated very low levels of PM₁₀ during this fortnight. It is considered unlikely that construction works caused these exceedances. There is anecdotal information that garden waste was being burnt at property at Scotstoun and Dundas in this time period, which may have contributed to the results.

3.4. Daily Dust Log and Environmental Inspections

- 3.4.1. A summary of the daily dust log for December 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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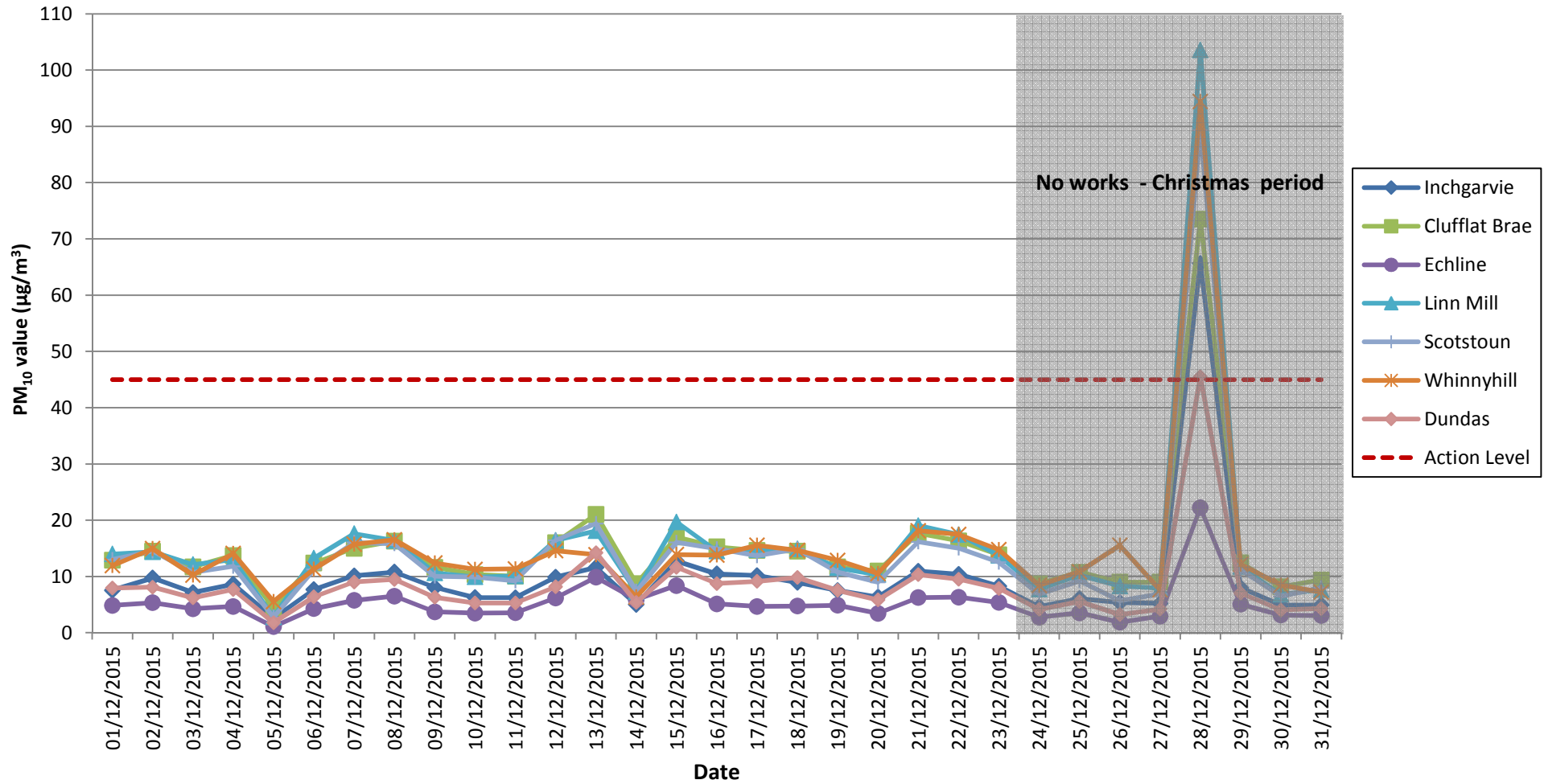
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APPENDIX A: LIGHT SCATTER METER RESULTS

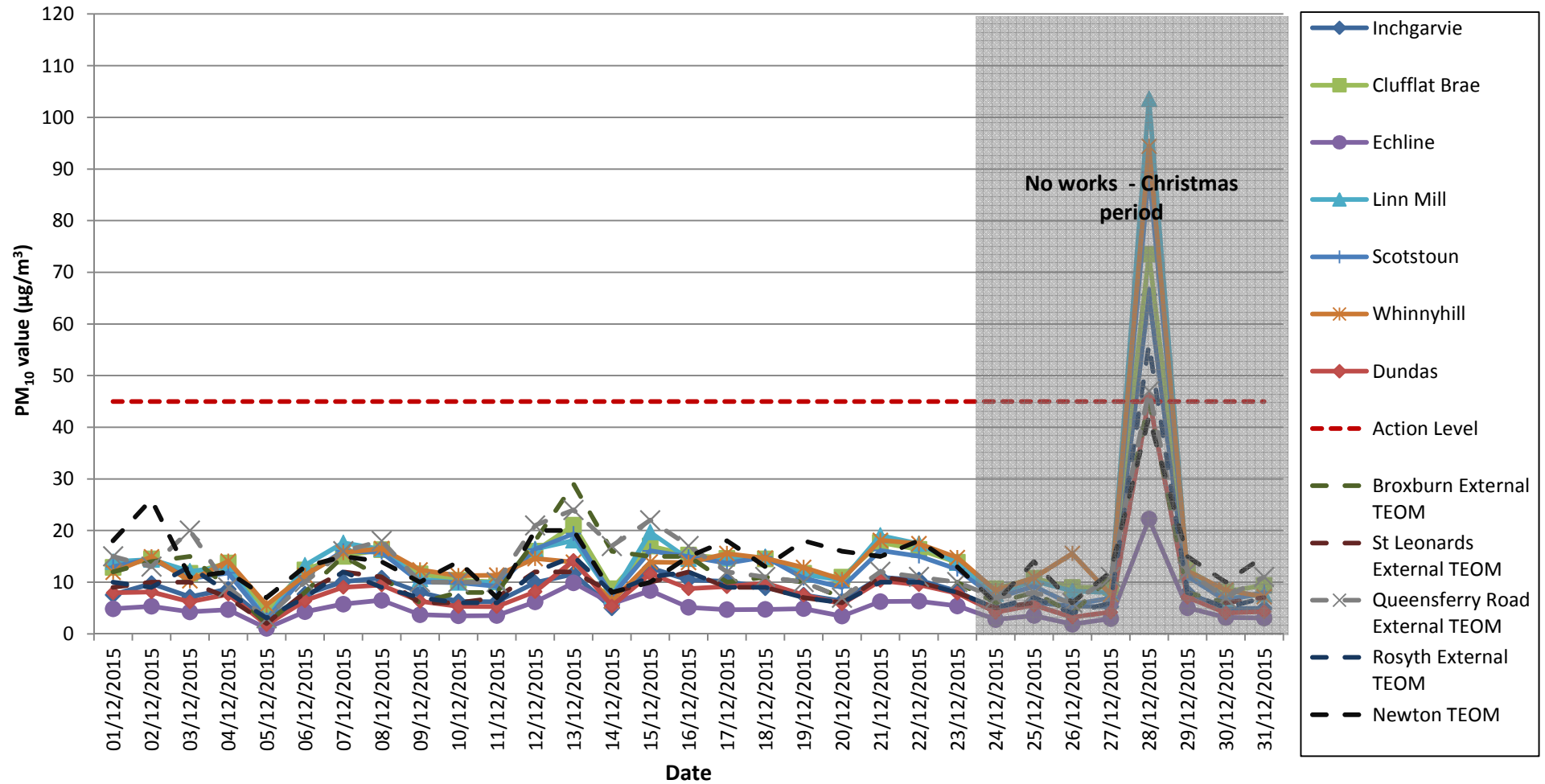
Air Quality Monitoring

Particulate Matter (PM10) Results for all Monitoring Locations

December 2015



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



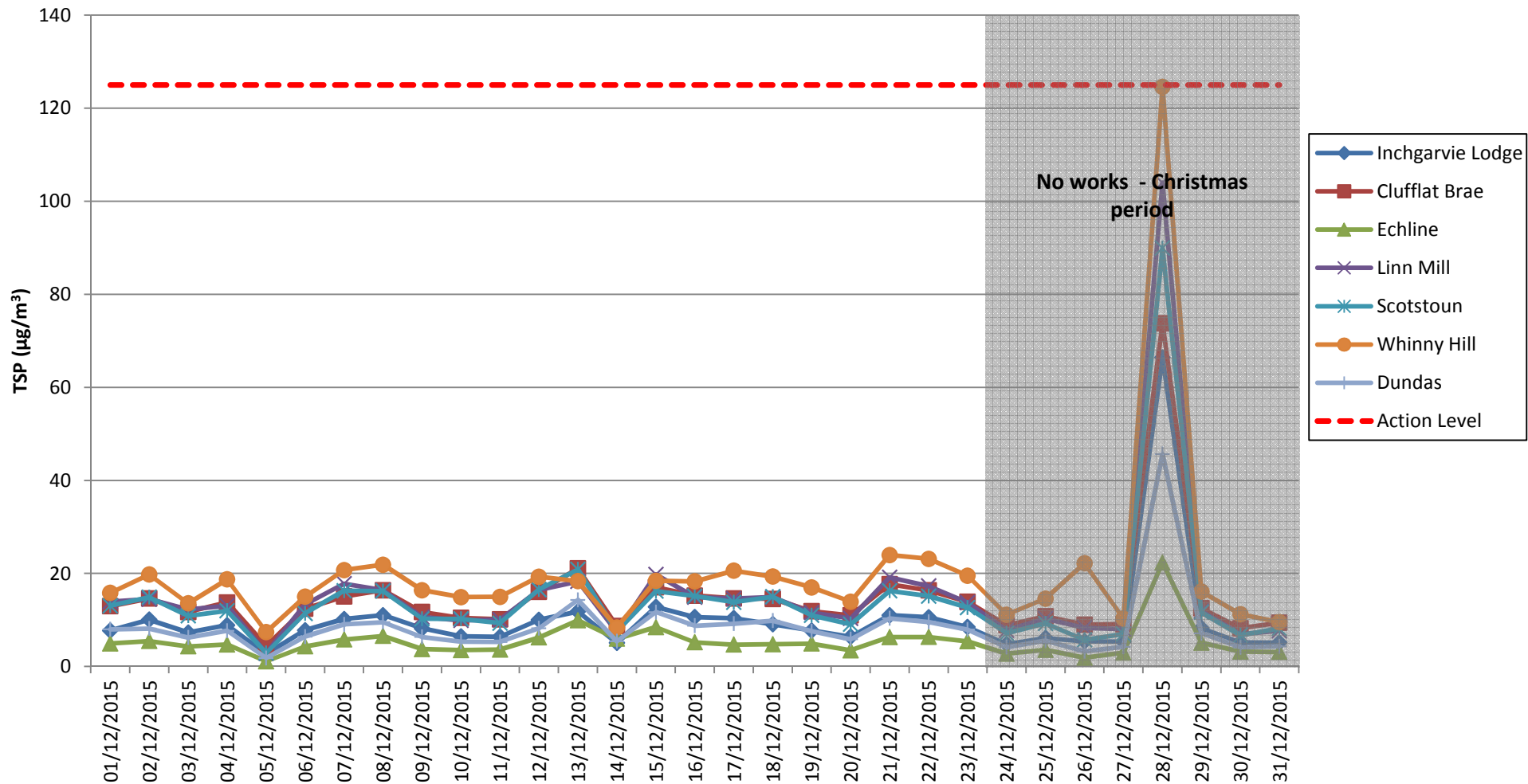


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APPENDIX B: TOTAL SUSPENDED PARTICLES

Total Suspended Particles (TSP) Results December 2015



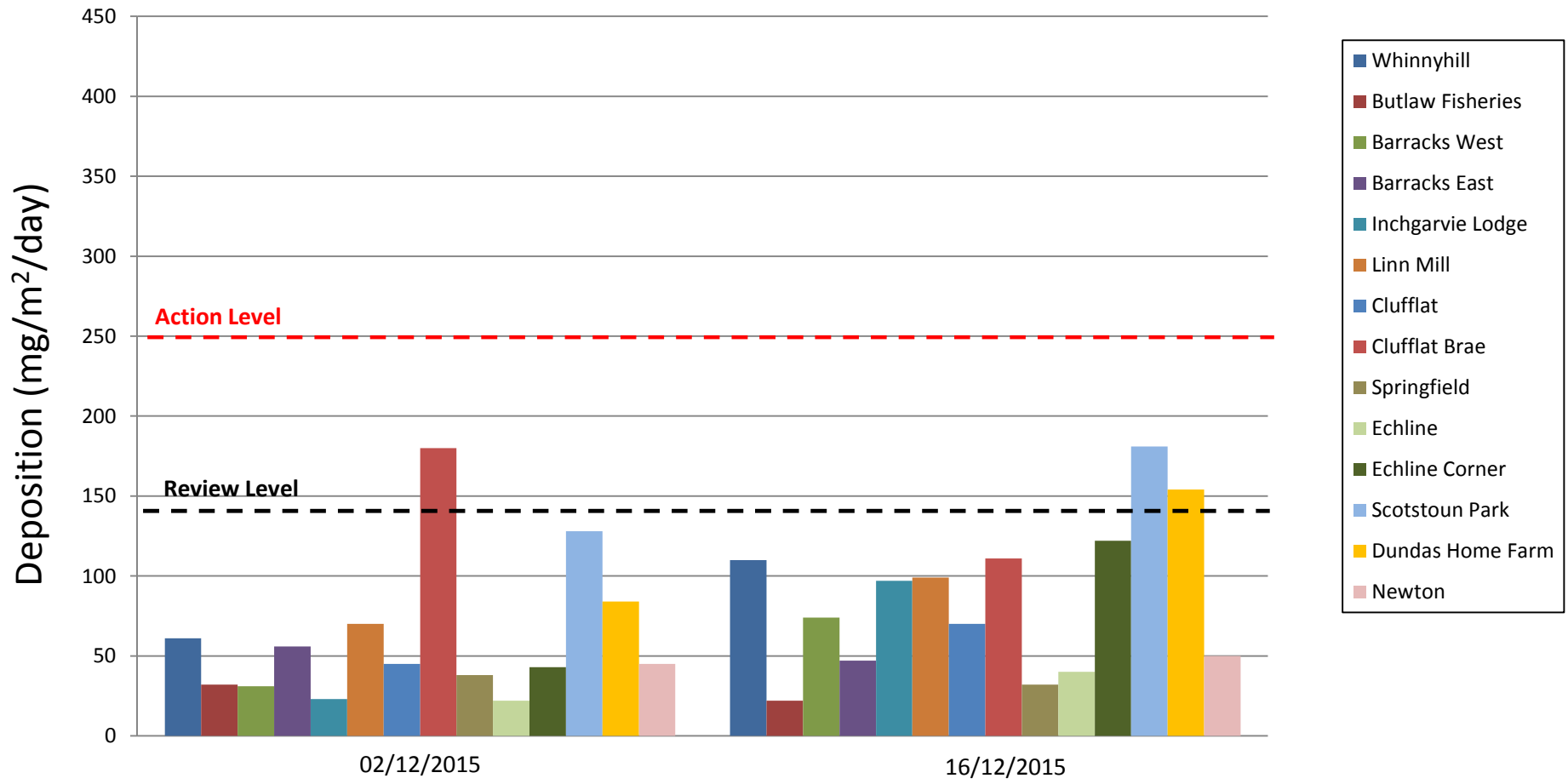


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APPENDIX C: FRISBEE GAUGE RESULTS

Frisbee Dust Deposition Results: December 2015





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APPENDIX D: DAILY DUST LOG

Daily Dust Log - North -December 2015

DATE	LOCATION	WIND	WIND DIRECTION	GROUND SURFACE	VISIBLE DUST	DUST DUE TO WORKS (if applicable)	CAUSES OF DUST (if applicable)	COMMENTS AND ACTIONS
01/12/2015	N	LIGHT	NE	WET				
02/12/2015	N	MEDIUM	SW	WET				
03/12/2015	N	LIGHT	W	DAMP				
04/12/2015	N	MEDIUM	SW	DAMP				
05/12/2015	N							
06/12/2015	N							
07/12/2015	N	LIGHT	NE	WET				
08/12/2015	N	LIGHT	S	DAMP				
09/12/2015	N	MEDIUM	W	WET				
10/12/2015	N	MEDIUM	W	DRY				
11/12/2015	N	MEDIUM	NW	WET				
12/12/2015	N							
13/12/2015	N							
14/12/2015	N	LIGHT	SE	WET				
15/12/2015	N	LIGHT	SE	DAMP				
16/12/2015	N	LIGHT	E	DAMP				
17/12/2015	N	LIGHT	E	DRY				
18/12/2015	N	LIGHT	SE	WET				
19/12/2015	N							
20/12/2015	N							
21/12/2015	N	LIGHT	SE	WET				
22/12/2015	N	LIGHT	SE	WET				
23/12/2015	N	LIGHT	E	DAMP				
24/12/2015	N							No Works Christmas Period
25/12/2015	N							No Works Christmas Period
26/12/2015	N							
27/12/2015	N							
28/12/2015	N							No Works Christmas Period
29/12/2015	N							No Works Christmas Period
30/12/2015	N							No Works Christmas Period
31/12/2015	N							No Works Christmas Period

Daily Dust Log - South -December 2015

DATE	LOCATION	WIND	WIND DIRECTION	GROUND SURFACE	VISIBLE DUST	DUST DUE TO WORKS (if applicable)	CAUSES OF DUST (if applicable)	COMMENTS AND ACTIONS
01/12/2015	S	LIGHT	NE	WET				
02/12/2015	S	MEDIUM	SW	WET				
03/12/2015	S	LIGHT	W	DAMP				
04/12/2015	S	MEDIUM	SW	DAMP				
05/12/2015	S							
06/12/2015	S							
07/12/2015	S	LIGHT	NE	WET				
08/12/2015	S	LIGHT	S	DAMP				
09/12/2015	S	MEDIUM	W	WET				
10/12/2015	S	MEDIUM	W	DRY				
11/12/2015	S	MEDIUM	NW	WET				
12/12/2015	S							
13/12/2015	S							
14/12/2015	S	LIGHT	SE	WET				
15/12/2015	S	LIGHT	SE	DAMP				
16/12/2015	S	LIGHT	E	DAMP				
17/12/2015	S	LIGHT	E	DRY				
18/12/2015	S	LIGHT	SE	WET				
19/12/2015	S							
20/12/2015	S							
21/12/2015	S	LIGHT	SE	WET				
22/12/2015	S	LIGHT	SE	WET				
23/12/2015	S	LIGHT	E	DAMP				
24/12/2015	S							No Works Christmas Period
25/12/2015	S							No Works Christmas Period
26/12/2015	S							
27/12/2015	S							
28/12/2015	S							No Works Christmas Period
29/12/2015	S							No Works Christmas Period
30/12/2015	S							No Works Christmas Period
31/12/2015	S							No Works Christmas Period