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Forth Crossing Bridge Constructors

HOCHTIEF Solutions
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Project **FORTH REPLACEMENT CROSSING**

Document title

**AIR QUALITY MONITORING REPORT
SEPTEMBER 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 September 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. Weather stations, located at the sound level meters at Echline and Linn Mill (these 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 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.

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.



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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 September
M1	Whinny Hill	Frisbee	21/03/12	<ul style="list-style-type: none"> • Earthworks/Fill Placement • Works at railway bridge at Ferrytoll • Reinforced earth wall at Castlandhill Road • 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 foundation work • 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 foundation work • 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"> • Test pier removal • Launch – snagging and bearing installation • Main carriageway earthworks • Pier S1 rebar, formwork & concrete works • Pier S2 foundation work • 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"> • Launch – snagging and bearing installation • 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"> • Test pier removal



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M13	Clufflat Brae	Frisbee	21/09/11	<ul style="list-style-type: none"> • Launch – snagging and bearing installation • Main carriageway earthworks
		Automatic light scatter meter	24/10/11	
M14	Springfield	Frisbee	15/08/11	<ul style="list-style-type: none"> • Test pier removal • Launch – snagging and bearing installation • Main carriageway earthworks
M15	Echline	Frisbee	16/08/11	<ul style="list-style-type: none"> • Launch – snagging and bearing installation • 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 North road works including bridge works (these works are directly in the location of the meter which now sits within the construction boundary).
		Automatic light scatter meter	14/02/12	
M17	Dundas Home Farm	Frisbee	29/08/11	<ul style="list-style-type: none"> • Utility works • Concrete finishing works at B800 Bridge • B800 South road works including bridge works • Main carriageway 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 September 2015 have been presented in a monthly chart; this can be found in Appendix A. Results show that the PM₁₀ levels were mostly below threshold levels throughout the month with the exception of four exceedances. One exceedance occurred on the 10th September at Linn Mill. The other three exceedances occurred at Clufflat Brae on the 23rd – 25th September. With regards to the exceedance on the 10th at Linn Mill, this corresponds with dry weather

conditions and may be due partly to construction activities, particularly earthworks undertaken in the vicinity. The PM₁₀ results at this location between the 8th and 11th September are also generally elevated compared to other locations. Bowser activity will continue in the earthworks area, particularly during dry conditions. The exceedances on the 23rd – 25th at Clufflat also correspond with dry weather conditions and are likely to have been caused by the test pier removal located close to Clufflat (approx. 180m). The other monitor in the area (Inchgarvie) also showed a slight increase on the 23rd (although well below the action level) so it appears that the dust produced from the test pier removal was not entirely localised.

- 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 September 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 September was largely driven by regional changes in air quality, with the exception of the exceedances noted in 3.1.1 above. The increases observed for Clufflat and Linn Mill during the month may be due to construction activities, particularly main carriageway earthworks and the test pier removal. TEOM data shows low concentrations of PM₁₀ for the 23rd September, further suggesting that site works were responsible for the high levels recorded at Clufflat on that date. Bowser activity will continue in the earthworks area, particularly during dry conditions. The test pier removal was completed on the 25th September.
- 3.1.3.** During September, 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 the Scotstoun PM₁₀ results throughout the month of September are all under the threshold. However, it is noted that during the 22nd and 23rd September, the PM₁₀ levels were elevated compared to the other monitors. 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 September 2015 have been presented in a monthly chart; this can be found in Appendix B. The TSP levels at monitoring locations during September were found to be generally 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) but with higher levels noted at a few locations. As with PM₁₀ it is considered that, in general, the TSP levels across site were influenced by regional changes in TSP levels, with the exception of the increases corresponding to the higher PM₁₀ levels noted in 3.1.1.

3.3. Frisbee Dust Deposition Results

3.3.1. The Frisbee dust deposition results for September 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 to cover the results for September; these occurred on the 9th and 23rd September 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 September there was one exceedance of the review level at Springfield for the fortnight concluding 23rd September. It is considered possible that this result may be partly due to the test pier removal that started on the 23rd September, see section 3.1.1, although the other Frisbees located nearby do not show elevated levels (Clufflat and Clufflat Brae). This activity was located approximately 120m from the Springfield Frisbee. The test pier removal work is now complete.

3.4. Daily Dust Log and Environmental Inspections

3.4.1. A summary of the daily dust log for September can be found in Appendix D. There is no information for wind/wind direction after the 11th September due to there being an IT server problem, this problem is currently being dealt with. 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.



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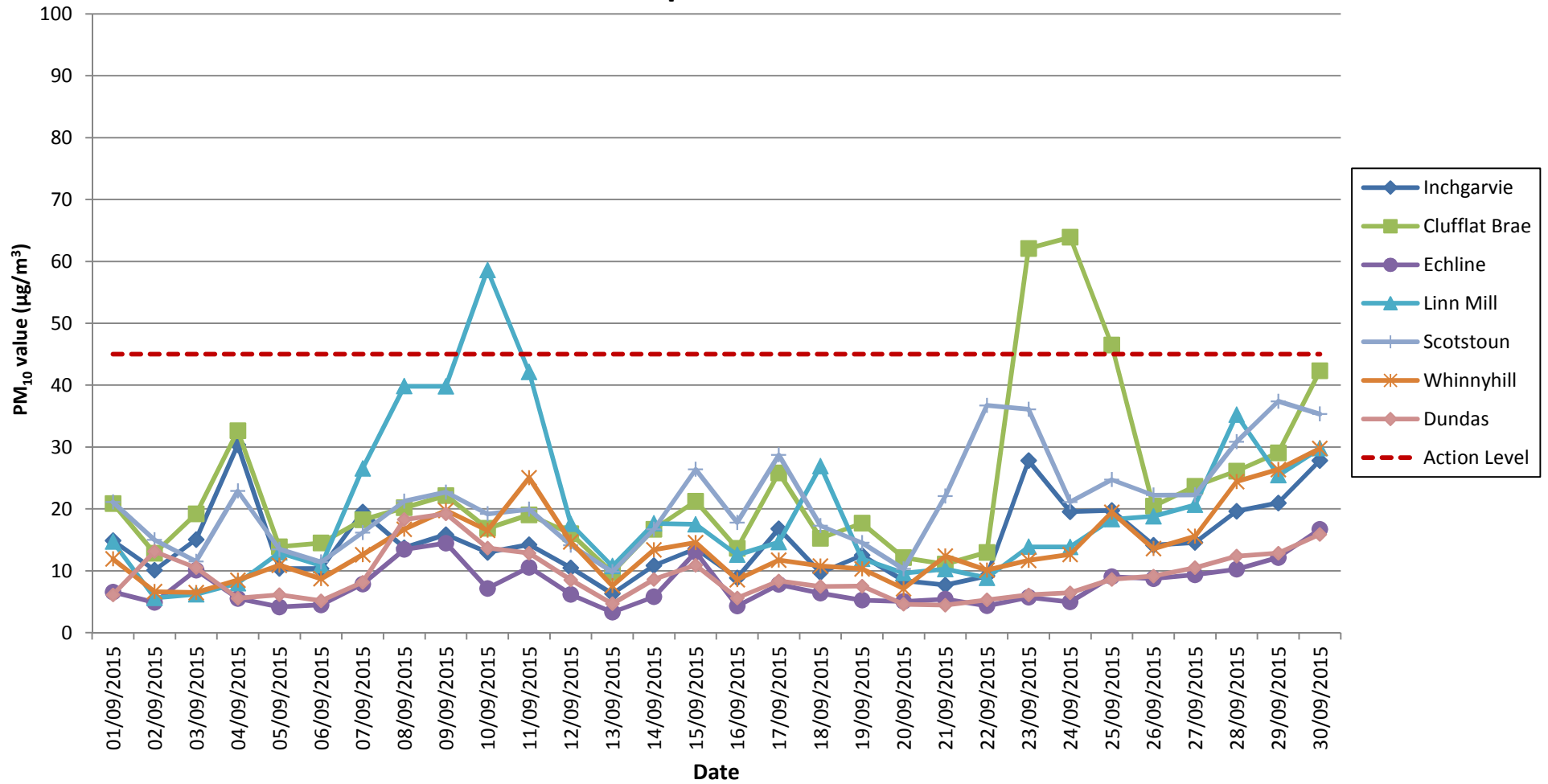
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APPENDIX A: LIGHT SCATTER METER RESULTS

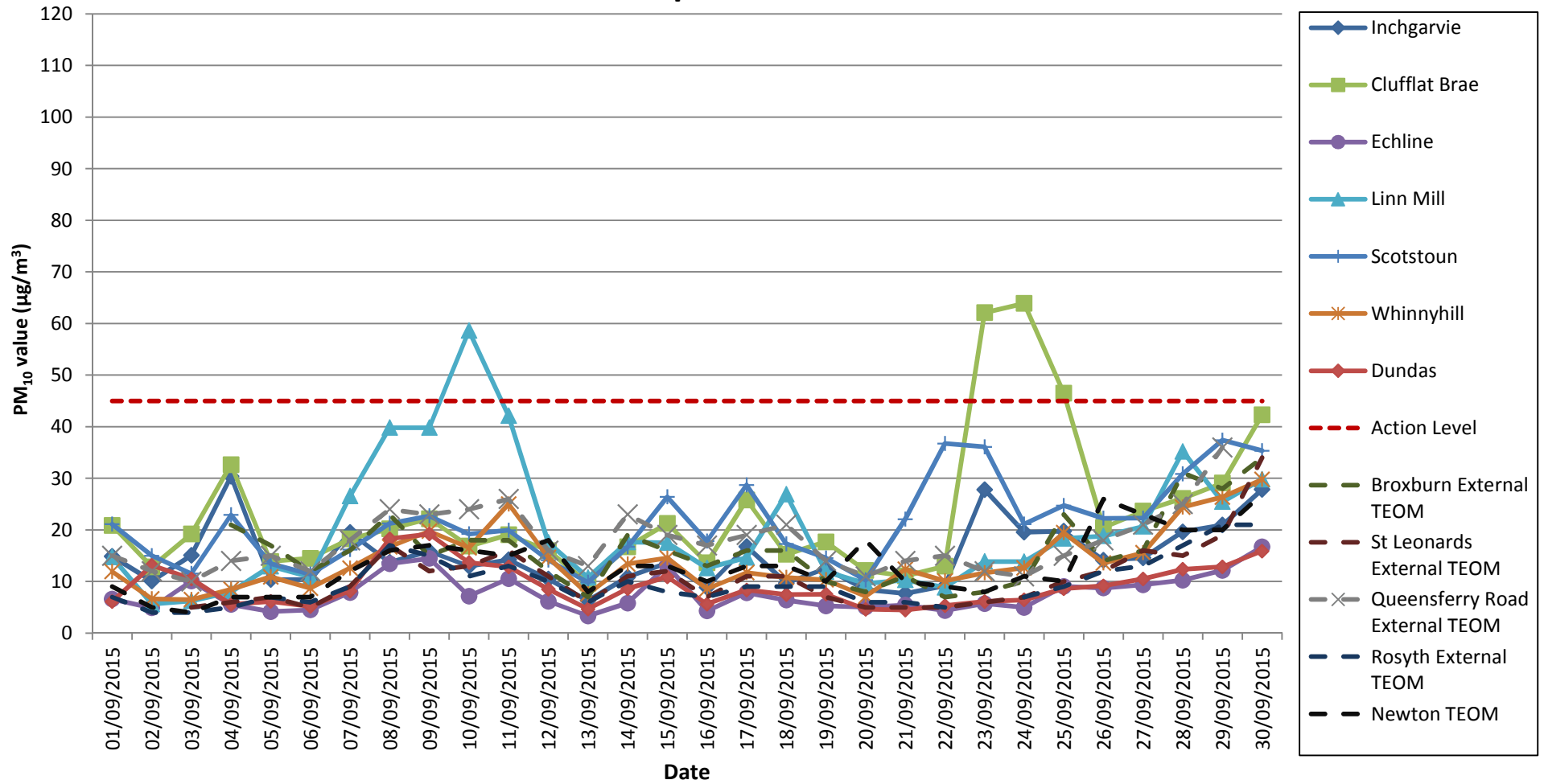
Air Quality Monitoring

Particulate Matter (PM10) Results for all Monitoring Locations

September 2015



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



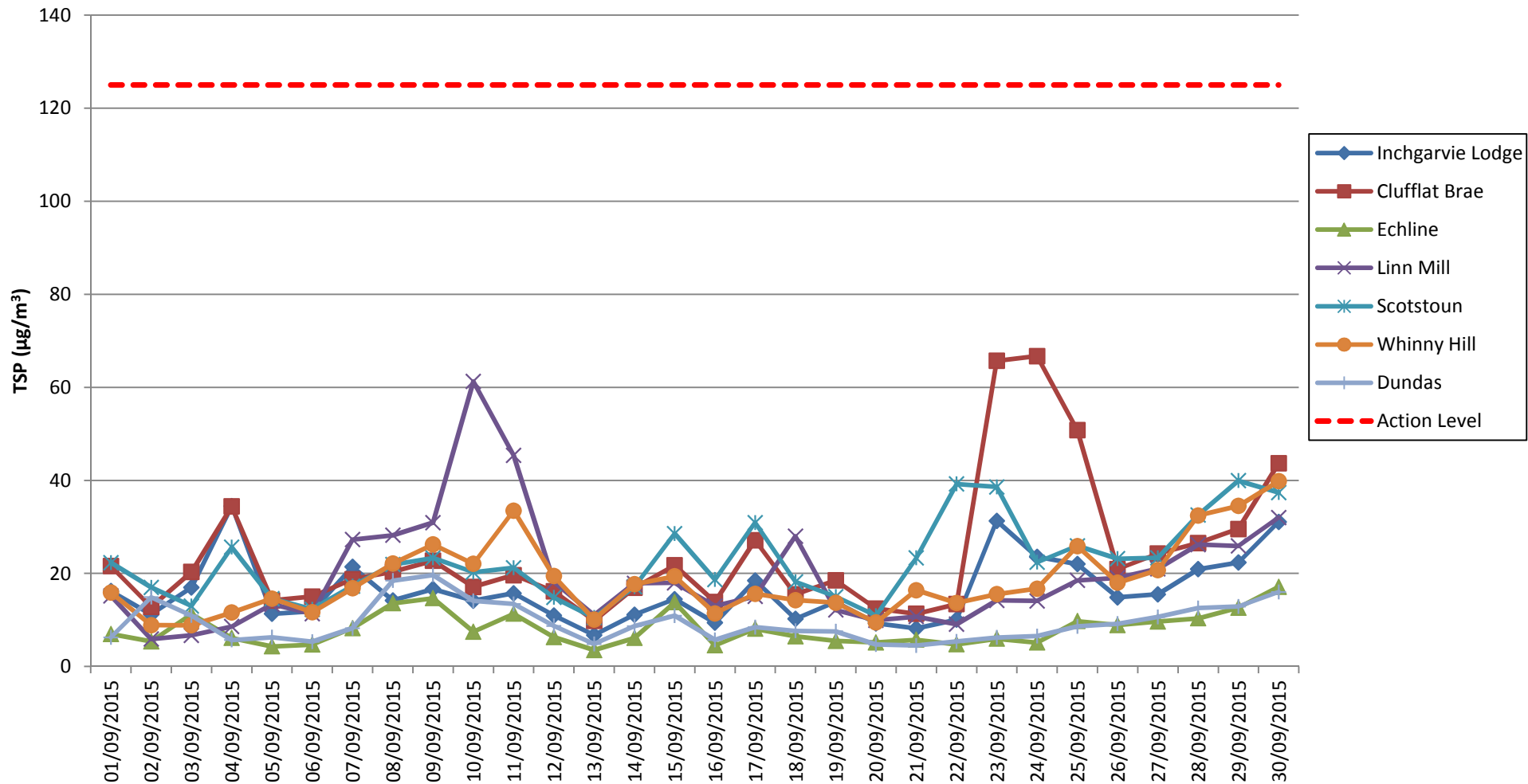


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APPENDIX B: TOTAL SUSPENDED PARTICLES

Total Suspended Particles (TSP) Results September 2015



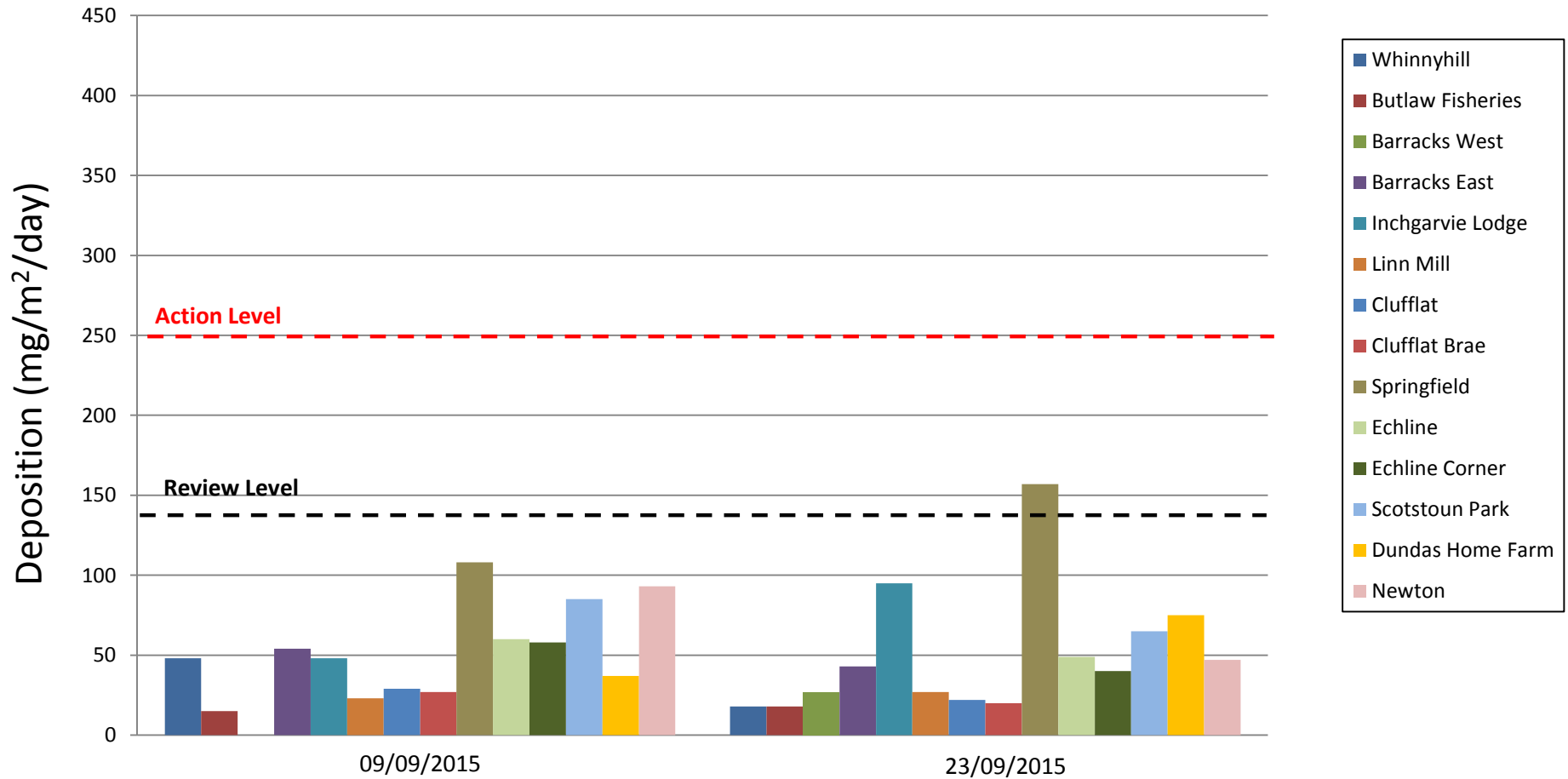


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APPENDIX C: FRISBEE GAUGE RESULTS

Frisbee Dust Deposition Results: September 2015





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APPENDIX D: DAILY DUST LOG

Daily Dust Log - North - September 2015

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

Daily Dust Log - South - September 2015

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