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Project **FORTH REPLACEMENT CROSSING**

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**AIR QUALITY MONITORING REPORT  
NOVEMBER 2015**

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### Distribution

Name	Email Address	Copy Sent (Y/N)
Michael Martin	<a href="mailto:Michael.martin@fbcjv.co.uk">Michael.martin@fbcjv.co.uk</a>	



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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 November 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<sub>10</sub>) 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), have previously recorded weather data including; temperature, relative humidity, wind speed and wind direction. However, in recent months the weather data collection has been problematic with missing data and erroneous results. FCBC has therefore used the weather station located at the Marine Yard at Rosyth to provide this data. Unfortunately, this weather station is still experiencing technical problems and will be replaced. As an interim measure during November, wind speed and direction for the Forth area has been sourced from available data on the internet.

**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 November
M1	Whinny Hill	Frisbee	21/03/12	<ul style="list-style-type: none"> <li>• Earthworks/Fill Placement</li> <li>• New Ferrytoll Road</li> <li>• Bridge works at Ferrytoll</li> <li>• Roadworks</li> </ul>
		Automatic light scatter meter	16/02/12	
M7	Butlaw Fisheries	Frisbee	05/10/11	<ul style="list-style-type: none"> <li>• Pier S1 rebar, formwork &amp; concrete works</li> <li>• Pier S2 rebar, formwork &amp; concrete works</li> <li>• Central Tower rebar, formwork, concreting works, deck table installation works</li> <li>• South Tower rebar, formwork, concreting works, deck table installation works</li> <li>• South Tower Deck Segment Lifts</li> </ul>
M8	Barracks West	Frisbee	31/08/11	<ul style="list-style-type: none"> <li>• Pier S1 rebar, formwork &amp; concrete works</li> <li>• Pier S2 rebar, formwork &amp; concrete works</li> <li>• Central Tower rebar, formwork, concreting works, deck table installation works</li> <li>• South Tower rebar, formwork, concreting works, deck table installation works</li> <li>• South Tower Deck Segment Lifts</li> </ul>
M9	Barracks East	Frisbee	31/08/11	
M10	Inchgarvie Lodge	Frisbee	22/08/11	<ul style="list-style-type: none"> <li>• AVS Scaffolding, shuttering and reinforcement to deck</li> <li>• Main carriageway earthworks</li> <li>• Pier S1 rebar, formwork &amp; concrete works</li> <li>• Pier S2 formwork and concrete works</li> <li>• South Tower rebar, formwork, concreting works, deck table installation works.</li> <li>• South Tower Deck Segment Lifts</li> </ul>
		Automatic light scatter meter	17/10/11	
M11	Linn Mill	Frisbee	22/08/11	<ul style="list-style-type: none"> <li>• AVS Scaffolding, shuttering and reinforcement to deck</li> <li>• Main carriageway earthworks</li> <li>• South Tower Deck Segment Lifts</li> </ul>
		Automatic light scatter meter	06/12/11	

M12	Clufflat	Frisbee	29/08/11	<ul style="list-style-type: none"> <li>• AVS Scaffolding, shuttering and reinforcement to deck</li> <li>• Main carriageway earthworks</li> </ul>
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"> <li>• AVS Scaffolding, shuttering and reinforcement to deck</li> <li>• Main carriageway earthworks</li> </ul>
M15	Echline	Frisbee	16/08/11	<ul style="list-style-type: none"> <li>• AVS Scaffolding, shuttering and reinforcement to deck</li> <li>• Main carriageway earthworks</li> </ul>
		Automatic light scatter meter	10/11/11	
M16	Scotstoun	Frisbee	07/09/11	<ul style="list-style-type: none"> <li>• Footpath works</li> <li>• Utility works</li> <li>• B800 Bridge demolition</li> <li>• South-bound bus link</li> </ul>
		Automatic light scatter meter	14/02/12	
M17	Dundas Home Farm	Frisbee	29/08/11	<ul style="list-style-type: none"> <li>• Utility works</li> <li>• Main carriageway works</li> <li>• B800 Bridge demolition</li> <li>• South-bound bus link</li> </ul>
		Automatic light scatter meter	23/02/12	
M18	Newton	Frisbee	22/08/11	<ul style="list-style-type: none"> <li>• None</li> </ul>
		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 November 2015 have been presented in a monthly chart; this can be found in Appendix A. Results show that the PM<sub>10</sub> levels were mostly below threshold levels throughout the month with the exception of one exceedance at Scotstoun on the 1<sup>st</sup> November. This exceedance corresponds to dry weather conditions and is likely to have been caused by the B800 bridge demolition work that took place on this day (see 3.1.3).

**3.1.2.** The PM<sub>10</sub> 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 November 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 November was largely driven by regional changes in air quality. However, there were a few exceptions at Scotstoun (see 3.1.3).

- 3.1.3.** During November, 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 PM<sub>10</sub> monitor is located. These works include landscaping, surfacing and earthworks in the vicinity of the monitor. The demolition of the B800 bridge was also a major activity with the second section being demolished over the weekend of 31<sup>st</sup> October/ 1<sup>st</sup> November. This means that the monitor is essentially on-site and that operations are now closer to some receptors. However, with the exception of the exceedance on the 1<sup>st</sup> November, results throughout the month are all under the threshold. It is noted that on the 2<sup>nd</sup>, 3<sup>rd</sup>, 13<sup>th</sup>, 15<sup>th</sup> and 16<sup>th</sup> November, the PM<sub>10</sub> levels were slightly 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, and provide mitigation as necessary. Demolition of the B800 bridge is now complete.

## **3.2. Total Suspended Particles**

- 3.2.1.** The TSP results for November 2015 have been presented in a monthly chart; this can be found in Appendix B. The TSP levels at monitoring locations during November 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 PM<sub>10</sub> levels). As with PM<sub>10</sub> 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 PM<sub>10</sub> levels noted at Scotstoun on the 2<sup>nd</sup>, 3<sup>rd</sup>, 13<sup>th</sup>, 15<sup>th</sup> and 16<sup>th</sup> November.

### **3.3. Frisbee Dust Deposition Results**

- 3.3.1.** The Frisbee dust deposition results for November 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 November; these occurred on the 4<sup>th</sup> and 18<sup>th</sup> November 2015.
- 3.3.2.** The site action level for the dust deposition rate has been set at 250 mg/m<sup>2</sup>/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<sup>2</sup>/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 November there was one exceedance of the review level at Inchgarvie for the fortnight concluding 18<sup>th</sup> November. The Inchgarvie light scatter meter registered levels well below the action levels for both TSP and PM<sub>10</sub> during the period. The other two Frisbees in that area at Clufflat and Clufflat brae were also well under the review level. The main carriageway works being undertaken during this period potentially gave rise to dust although dusty conditions were not observed during site visits or reported. The ground conditions for the period were mostly

wet. Therefore, it is unlikely that construction activities contributed to the dust deposition result. FCBC will continue to monitor this area and provide mitigation as necessary.

### **3.4. Daily Dust Log and Environmental Inspections**

- 3.4.1.** A summary of the daily dust log for November can be found in Appendix D. As outlined in section 2.3 as an interim measure, weather data from the internet has been used for wind speed and wind direction. 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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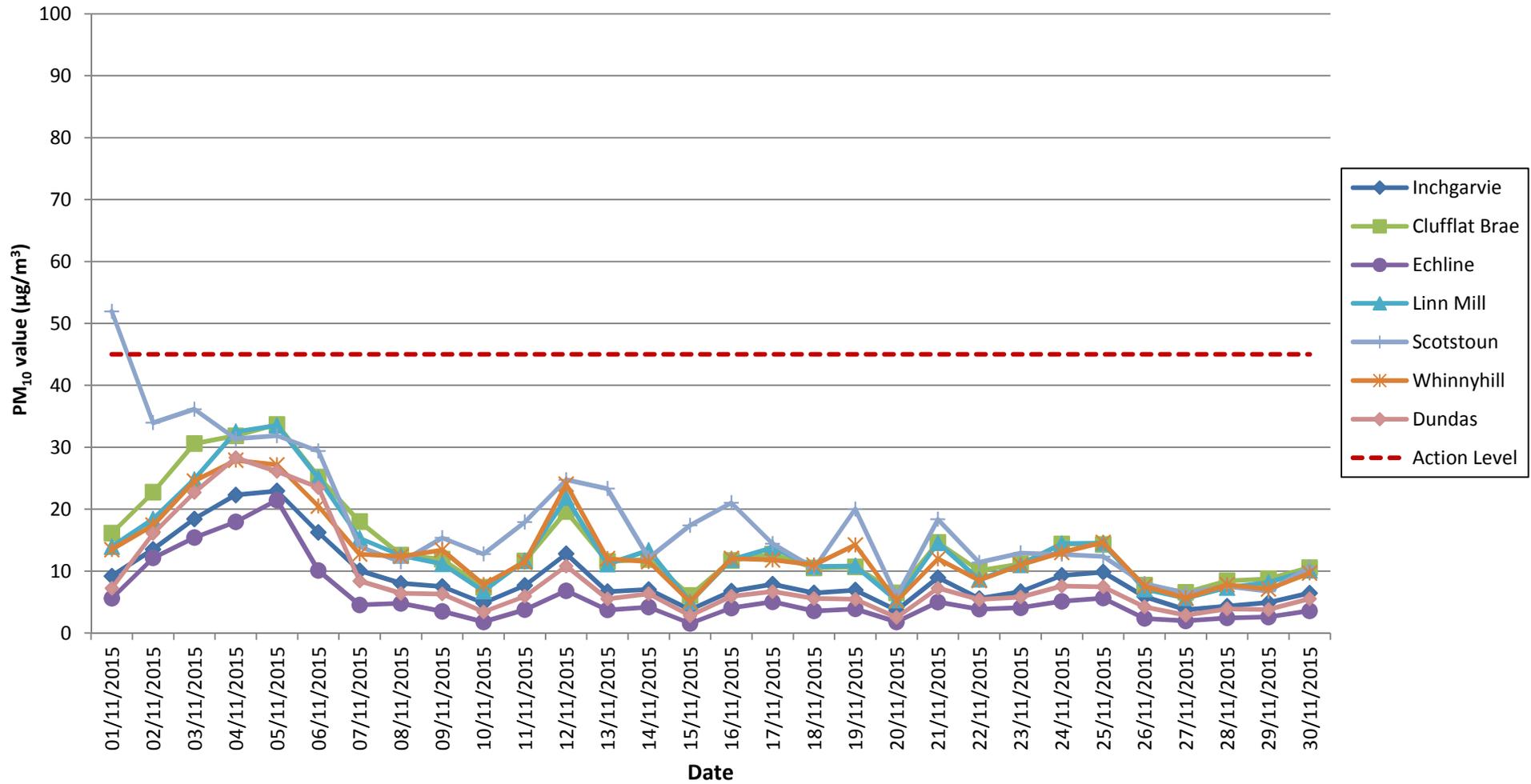
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## **APPENDIX A: LIGHT SCATTER METER RESULTS**

# Air Quality Monitoring

## Particulate Matter (PM10) Results for all Monitoring Locations

### November 2015





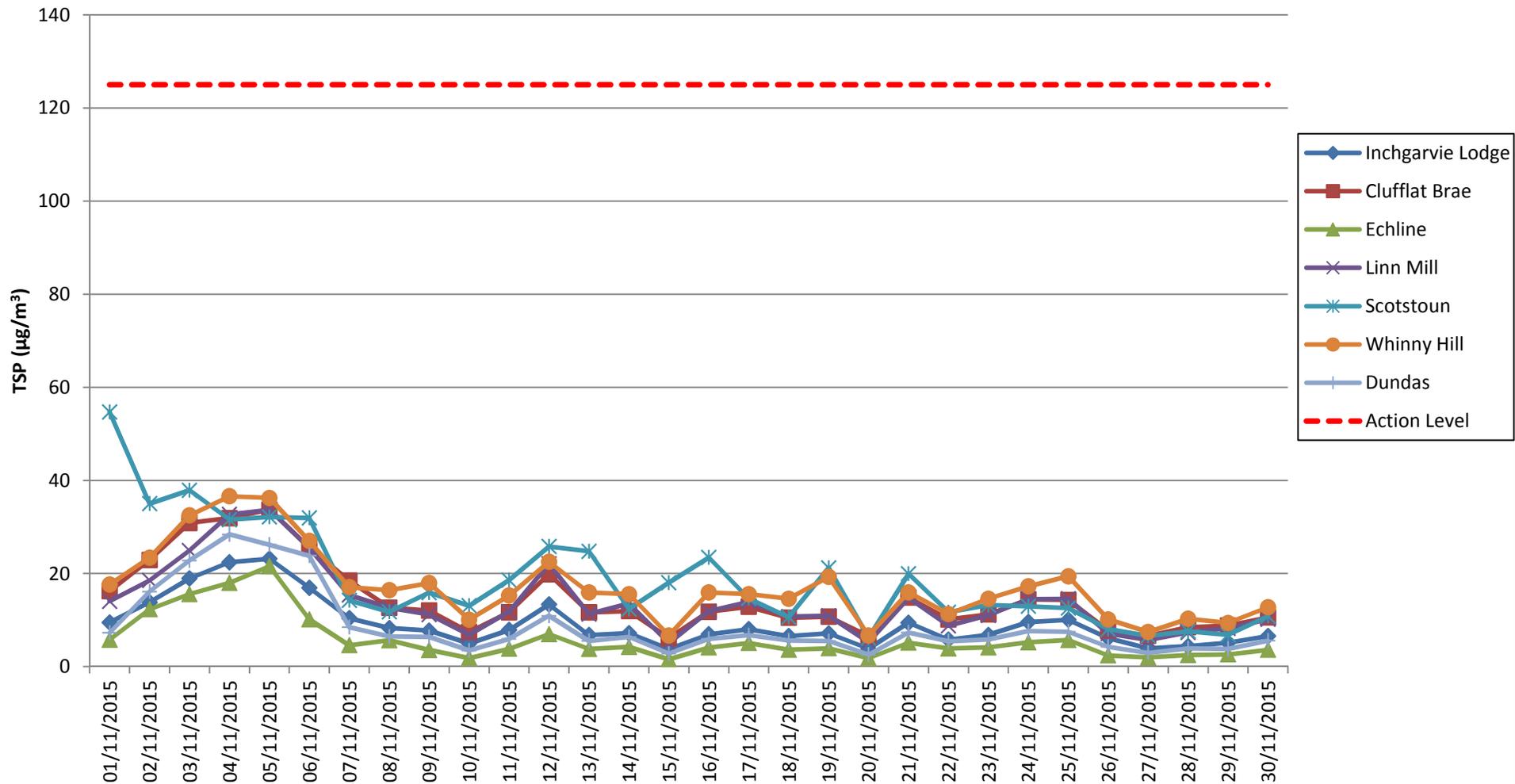


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## **APPENDIX B: TOTAL SUSPENDED PARTICLES**

# Total Suspended Particles (TSP) Results November 2015



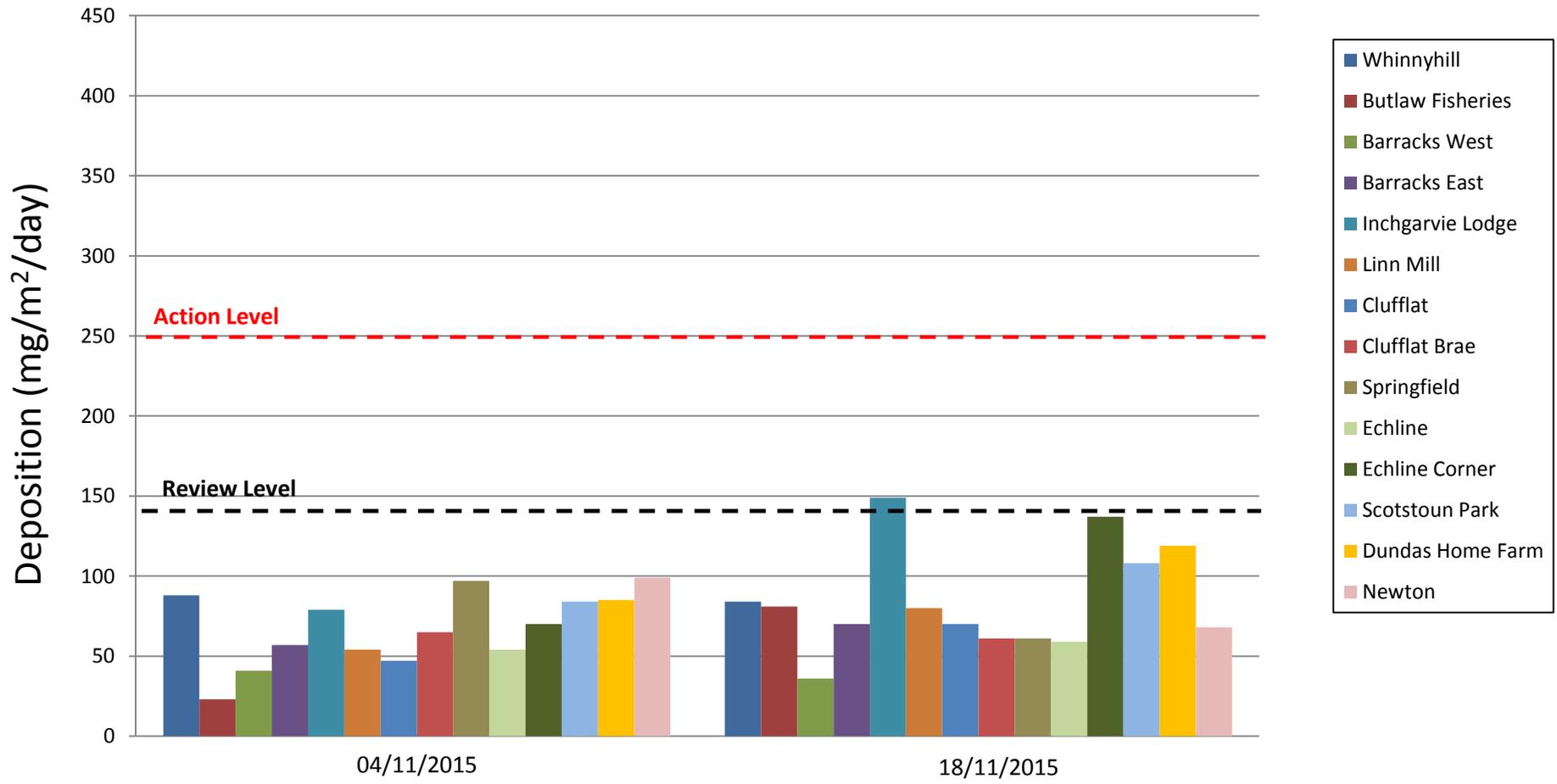


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## **APPENDIX C: FRISBEE GAUGE RESULTS**

## Frisbee Dust Deposition Results: November 2015





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## **APPENDIX D: DAILY DUST LOG**

### Daily Dust Log - North -November 2015

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

### Daily Dust Log - South -November 2015

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