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Project

**FORTH REPLACEMENT CROSSING**

Document title

**AIR QUALITY MONITORING REPORT  
 DECEMBER 2014**

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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 2014.

**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 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 December
M1	Whinny Hill	Frisbee	21/03/12	<ul style="list-style-type: none"> <li>• Rock Trimming</li> <li>• CMC Piles</li> </ul>
		Automatic light scatter meter	16/02/12	
M7	Butlaw Fisheries	Frisbee	05/10/11	<ul style="list-style-type: none"> <li>• Marine works</li> <li>• Assembling and fixing rebar and formwork works at Pier S1</li> <li>• Concrete pouring at Pier S1</li> <li>• Excavation at Pier S2</li> </ul>
M8	Barracks West	Frisbee	31/08/11	<ul style="list-style-type: none"> <li>• Marine works</li> <li>• Assembling and fixing rebar and formwork works at Pier S1</li> <li>• Concrete pouring at Pier S1</li> <li>• Excavation at Pier S2</li> </ul>
M9	Barracks East	Frisbee	31/08/11	
M10	Inchgarvie Lodge	Frisbee	22/08/11	<ul style="list-style-type: none"> <li>• Launch – Element joints and welding</li> <li>• Assembling and fixing rebar and formwork works at Pier S1</li> <li>• Concrete pouring at Pier S1</li> <li>• Excavation at Pier S2</li> </ul>
		Automatic light scatter meter	17/10/11	
M11	Linn Mill	Frisbee	22/08/11	<ul style="list-style-type: none"> <li>• Launch – Element joints and welding</li> </ul>
		Automatic light scatter meter	06/12/11	
M12	Clufflat	Frisbee	29/08/11	<ul style="list-style-type: none"> <li>• Launch – Element joints and welding</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>• Launch – Element joints and welding</li> <li>• Excavation and haulage from mainline north of A904 to Dundas area</li> </ul>
M15	Echline	Frisbee	16/08/11	<ul style="list-style-type: none"> <li>• Launch – Element joints and welding</li> <li>• Paving and kerbing at A904 and earthworks adjacent to A904</li> </ul>
		Automatic light scatter meter	10/11/11	



M16	Scotstoun	Frisbee	07/09/11	<ul style="list-style-type: none"> <li>• Earthworks at B800</li> <li>• Utility works</li> <li>• Bearings and protection installation</li> <li>• Drainage works</li> </ul>
		Automatic light scatter meter	14/02/12	
M17	Dundas Home Farm	Frisbee	29/08/11	<ul style="list-style-type: none"> <li>• Haulage of excavated materials from Echline</li> <li>• Construction of road formation from Dundas to Queensferry gyratory</li> <li>• Gantry foundations</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 December 2014 have been presented in a monthly chart; this can be found in Appendix A. Results show that the PM<sub>10</sub> levels were below threshold levels throughout the month. All the monitors follow the same general pattern throughout the month. The Echline monitor registered increased levels on the 26<sup>th</sup> and 29<sup>th</sup> although the action level was not reached and there were no works taking place on site during this time. Increased levels were observed at all monitors on the 26<sup>th</sup>, although the Echline monitor was the most pronounced.

**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, Edinburgh. 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 at similar levels, indicating that the pattern observed throughout December was largely driven by regional changes in air quality.

## **3.2. Total Suspended Particles**

**3.2.1.** The TSP results for December 2014 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 level. All locations across the site were mostly found to follow a similar pattern, demonstrating 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 December 2014 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. One collection was made in December, on the 10<sup>th</sup>. No collection took place on the 24<sup>th</sup> due to the festive period. The next collection will take place on the 8<sup>th</sup> January 2015 and will cover the previous 4 weeks rather than a fortnight.

**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 December 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**

<b>Fortnight ending</b>	<b>Threshold Exceeded</b>	<b>Monitoring Location</b>	<b>Considerations</b>	<b>Weather conditions during period</b>
10/12/2014	Review	Linn Mill	No dust generating construction activities in the area	Generally windy and wet

**3.3.4.** For the exceedances of the review level a review of the works in each of the areas, 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.** During the two week period ending the 10<sup>th</sup> December the Linn Mill gauge registered above the Review Level. However, a review of works was undertaken and it was found that no construction activities that would be likely to give rise to dust took place in the area during this period. PM<sub>10</sub> and TSP data were low for the period at the same location. After a thorough review it was concluded that the results cannot be explained by FCBC construction activities undertaken during this period.

**3.3.6.** The sample bottle for the Echline Corner Frisbee gauge was found approximately 10m away from the gauge, upturned and completely empty of liquid. The gauge was also found on the ground, presumably blown over. During the early part of December the site experienced sustained periods of strong wind (Appendix D). The Echline Corner gauge is situated in a location that is more exposed than the other gauge locations.

### **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. During December 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 undertaken. In December, no instances of dust were noted during inspections.



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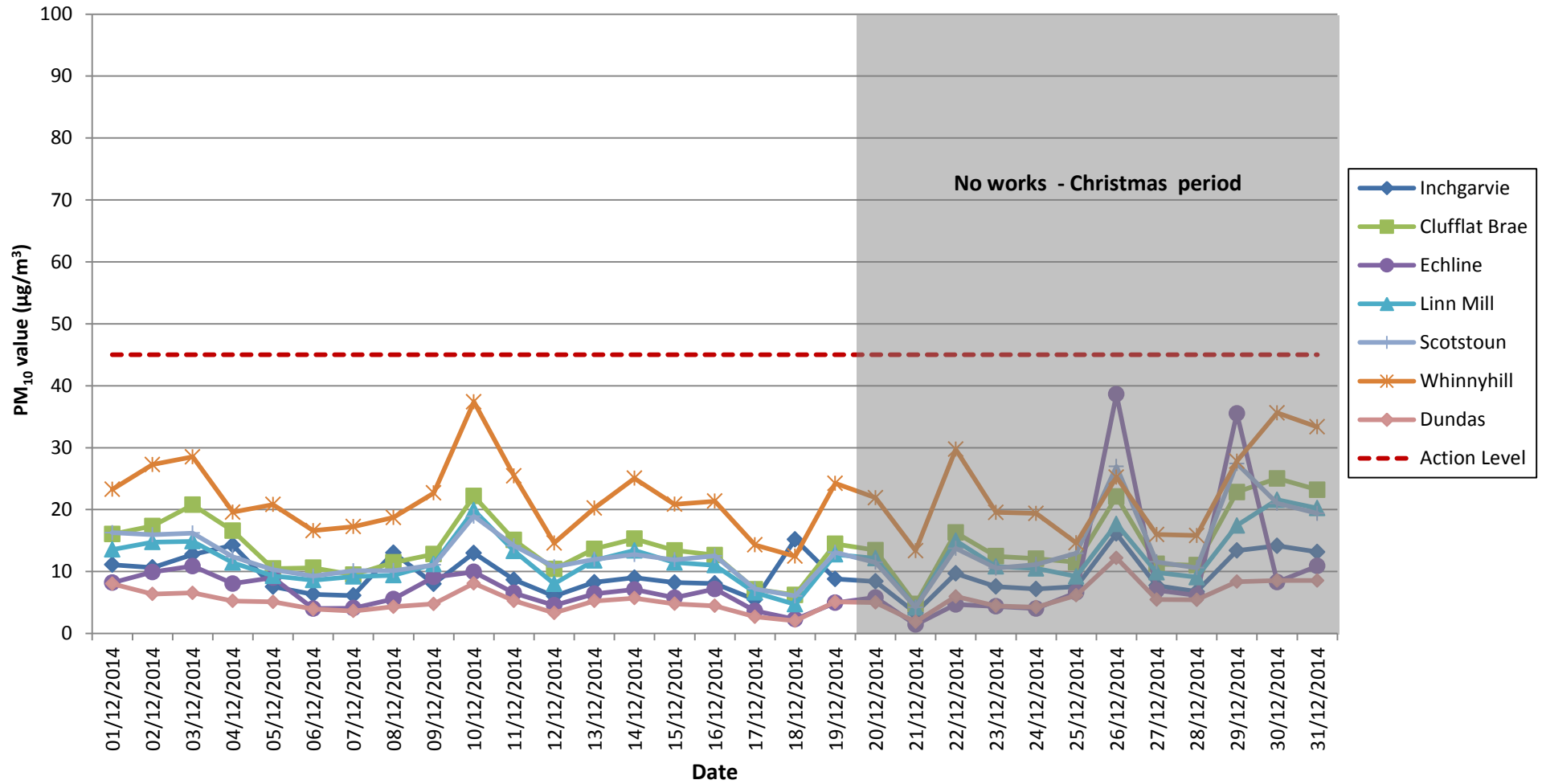
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## **APPENDIX A: LIGHT SCATTER METER RESULTS**

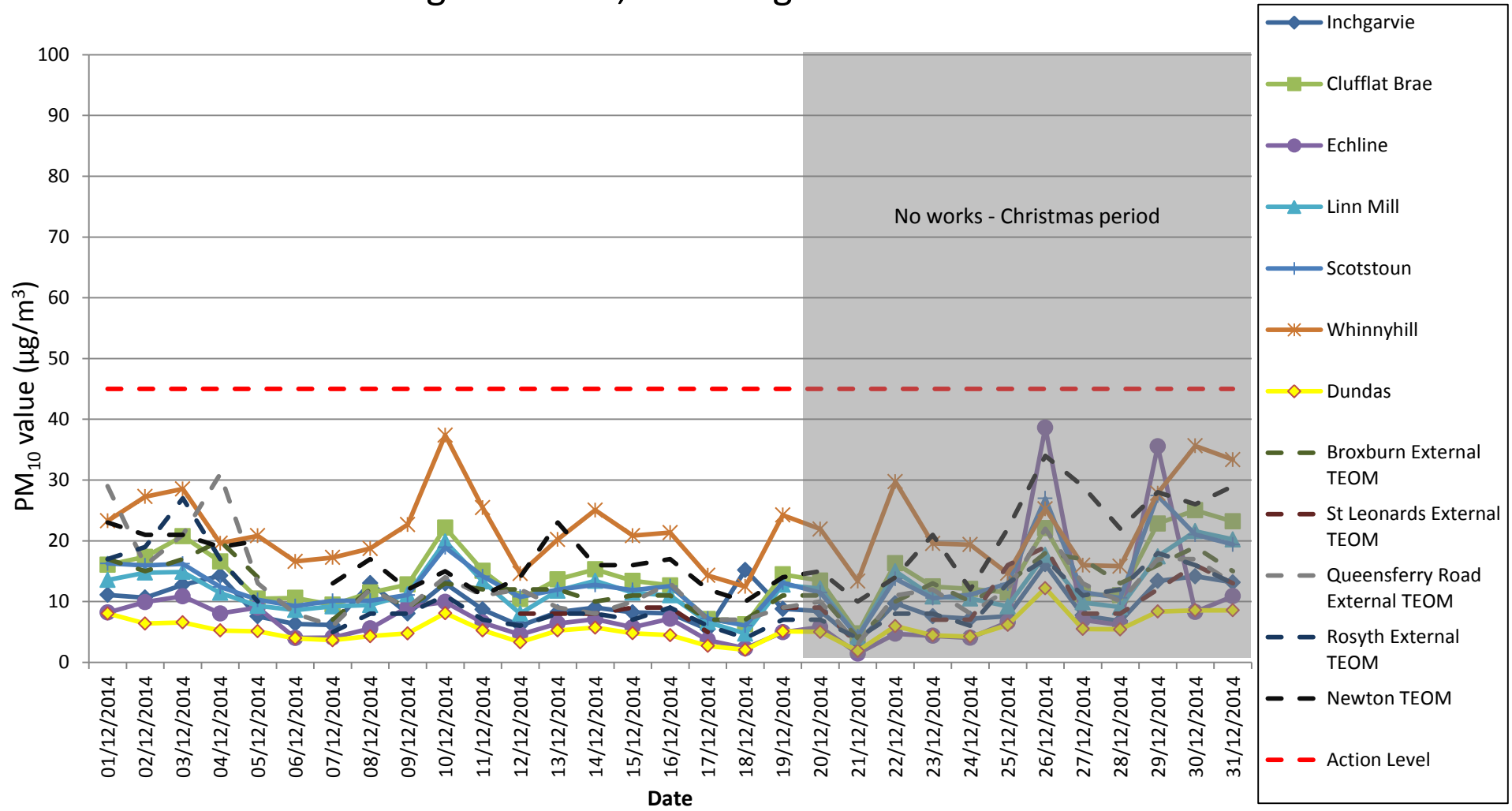
# Air Quality Monitoring

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

### December 2014



## Air Quality Monitoring: Particulate Matter (PM10) Results for all Monitoring Locations, including TEOM data December 2014



Note: TEOM data missing from scottish air quality for the St Leonards monitor since 12<sup>th</sup> September until 12<sup>th</sup> December. Data is also missing at St Leonards for the 18<sup>th</sup> and 22<sup>nd</sup> and for the 06<sup>th</sup> at Broxburn, Rosyth and Newton.



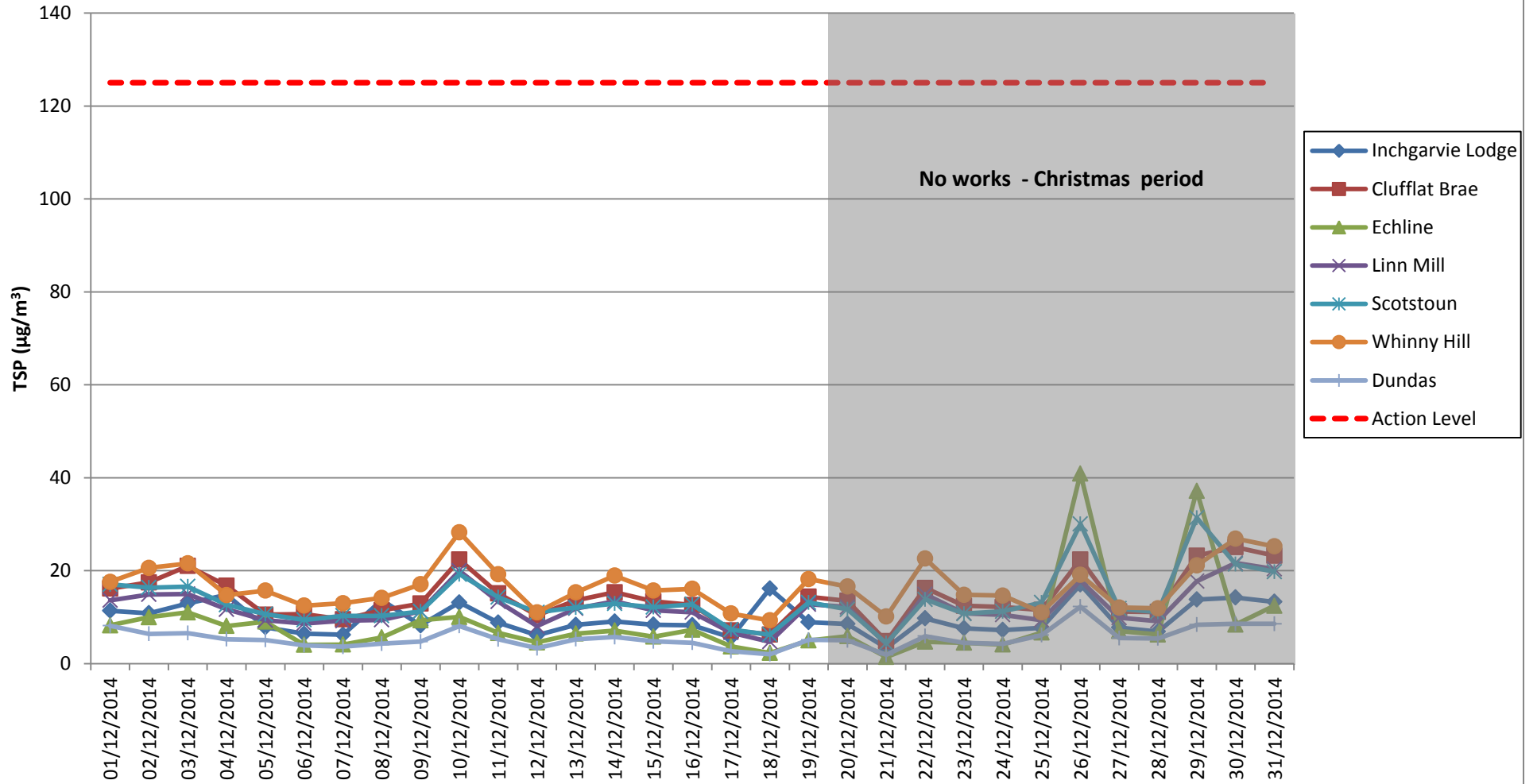


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## **APPENDIX B: TOTAL SUSPENDED PARTICLES**

# Total Suspended Particles (TSP) Results December 2014



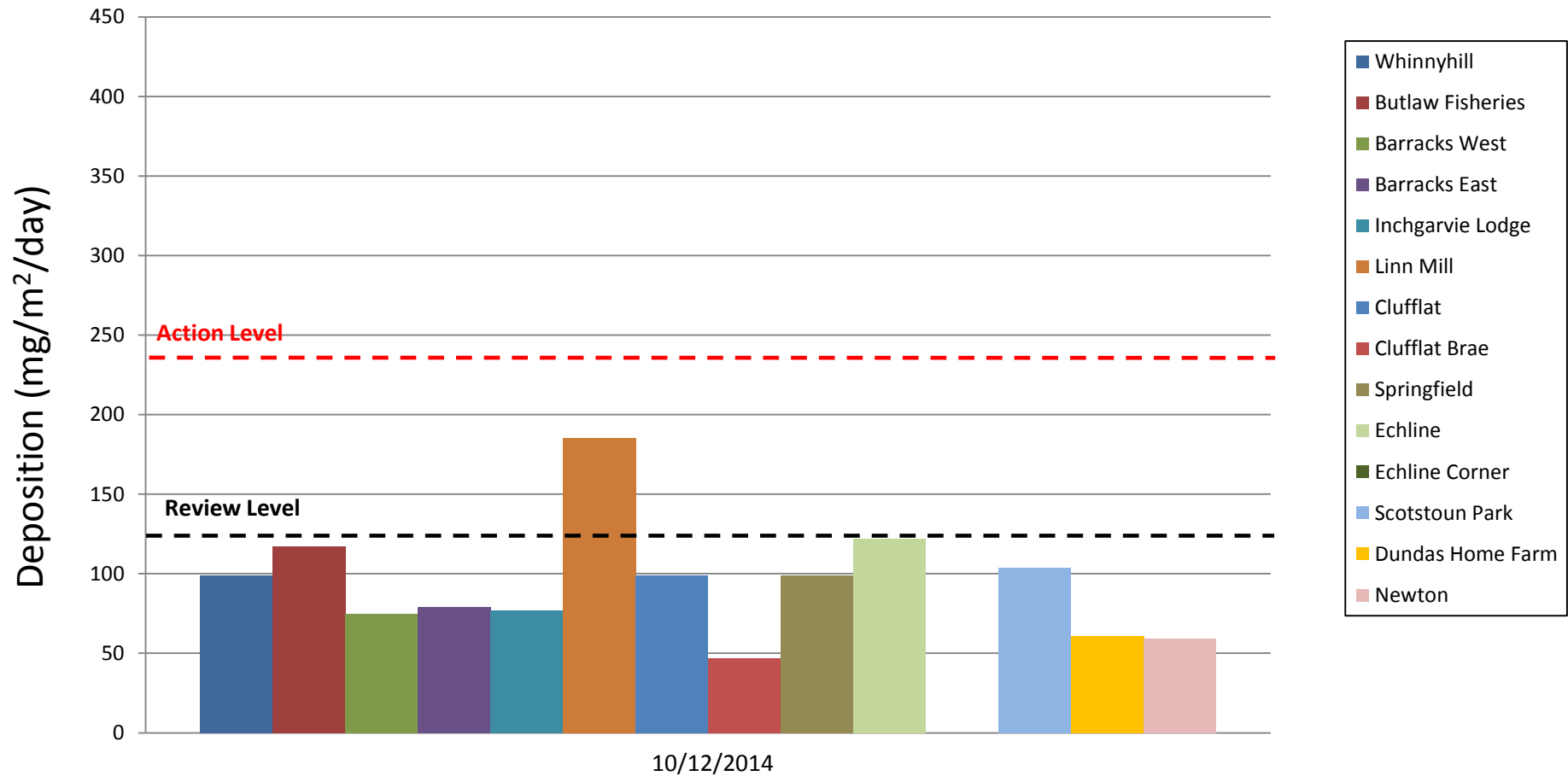


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## **APPENDIX C: FRISBEE GAUGE RESULTS**

## Frisbee Dust Deposition Results: December 2014



Note: No collection took place on the 24/12/2014 due to the Christmas period. Next collection will take place on the 08/01/2015 and will be analysed for the 4 week period. Echline Corner has been omitted due to the sample bottle being found away from the gauge, upturned and empty (see Section 3.3.6).



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

### Daily Dust Log - North - December 2014

DATE	LOCATION	WIND	WIND DIRECTION	GROUND SURFACE	VISIBLE DUST	DUST DUE TO WORKS (if applicable)	CAUSES OF DUST (if applicable)	COMMENTS AND ACTIONS
01/12/2014	N	LIGHT	NW	DAMP	N			
02/12/2014	N	MEDIUM	SW	DRY	N			
03/12/2014	N	LIGHT	NW	DRY	N			
04/12/2014	N	LIGHT	SW	DRY	N			
05/12/2014	N	STRONG	SW	DRY	N			
06/12/2014	N	STRONG	SW		N			
07/12/2014	N	STRONG	SW		N			
08/12/2014	N	STRONG	SW	WET	N			
09/12/2014	N	STRONG	S	WET	N			
10/12/2014	N	STRONG	SW	WET	N			
11/12/2014	N	STRONG	SW	WET	N			
12/12/2014	N	STRONG	SW	WET	N			
13/12/2014	N	STRONG	SW		N			
14/12/2014	N	STRONG	SW		N			
15/12/2014	N	STRONG	SW	DAMP/WET	N			
16/12/2014	N	STRONG	SW	WET	N			
17/12/2014	N	STRONG	SW	WET	N			
18/12/2014	N	STRONG	SW	WET	N			
19/12/2014	N	STRONG	SW	WET	N			
20/12/2014	N	STRONG	SW					
21/12/2014	N	STRONG	SW					
22/12/2014	N	STRONG	SW					No Works - Christmas period
23/12/2014	N	STRONG	SW					No Works - Christmas period
24/12/2014	N	STRONG	SW					No Works - Christmas period
25/12/2014	N	LIGHT	SW					No Works - Christmas period
26/12/2014	N	LIGHT	NW					No Works - Christmas period
27/12/2014	N	LIGHT	W					
28/12/2014	N	LIGHT	W					
29/12/2014	N	LIGHT	W					No Works - Christmas period
30/12/2014	N	STRONG	SW					No Works - Christmas period
31/12/2014	N	STRONG	S					No Works - Christmas period

### Daily Dust Log - South - December 2014

DATE	LOCATION	WIND	WIND DIRECTION	GROUND SURFACE	VISIBLE DUST	DUST DUE TO WORKS (if applicable)	CAUSES OF DUST (if applicable)	COMMENTS AND ACTIONS
01/12/2014	S	LIGHT	SE	WET	N			
02/12/2014	S	MEDIUM	S	DAMP	N			
03/12/2014	S	LIGHT	E	DAMP	N			
04/12/2014	S	LIGHT	E	DAMP	N			
05/12/2014	S	STRONG	NE	DAMP	N			
06/12/2014	S	STRONG	S		N			
07/12/2014	S	STRONG	SW		N			
08/12/2014	S	STRONG	SE	WET	N			
09/12/2014	S	STRONG	SW	WET	N			
10/12/2014	S	STRONG	SW	WET	N			
11/12/2014	S	STRONG	SW	WET	N			
12/12/2014	S	STRONG	SW	WET	N			
13/12/2014	S	STRONG	SW		N			
14/12/2014	S	STRONG	NE		N			
15/12/2014	S	STRONG	SW	DAMP/WET	N			
16/12/2014	S	STRONG	SW	WET	N			
17/12/2014	S	STRONG	SW	WET	N			
18/12/2014	S	STRONG	SW	WET	N			
19/12/2014	S	STRONG	SW	WET	N			
20/12/2014	S	STRONG	SW					
21/12/2014	S	STRONG	SW					
22/12/2014	S	STRONG	SW					No Works - Christmas period
23/12/2014	S	STRONG	SW					No Works - Christmas period
24/12/2014	S	STRONG	SW					No Works - Christmas period
25/12/2014	S	LIGHT	SW					No Works - Christmas period
26/12/2014	S	LIGHT	S					No Works - Christmas period
27/12/2014	S	LIGHT	SE					
28/12/2014	S	LIGHT	NE					
29/12/2014	S	LIGHT	NE					No Works - Christmas period
30/12/2014	S	STRONG	NE					No Works - Christmas period
31/12/2014	S	STRONG	NE					No Works - Christmas period