



Contractor



Forth Crossing Bridge Constructors

HOCHTIEF Solutions
 American Bridge International
 DRAGADOS
 Morrison Construction

Project

FORTH REPLACEMENT CROSSING

Document title

**AIR QUALITY MONITORING REPORT
 DECEMBER 2012**

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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 2012.

- 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 Pollution Management Plan (DAPMP) 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). Table 1 lists the air quality monitoring equipment present at each monitoring location. The installation of the air quality monitoring equipment has not been simultaneous across the site, thus installation dates are also given in Table 1.

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, weather conditions (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 records the weather conditions at the time of the inspection.

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 Meters



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	Breaking of rock Loading of rock
		Automatic light scatter meter	16/02/12	
M7	Butlaw Fisheries	Frisbee	05/10/11	Grit blasting at S7 and S8 Backfilling of S7 Earthbund at S6 Marine works Site clearance
M8	Barracks West	Frisbee	31/08/11	Marine works Grit blasting at S7 and S8 Backfilling of S7 Earthbund at S6 Site clearance
M9	Barracks East	Frisbee	31/08/11	Marine works Grit blasting at S7 and S8 Backfilling of S7 Earthbund at S6 Site clearance
M10	Inchgarvie Lodge	Frisbee	22/08/11	Grit blasting at S7 and S8 Backfilling of S7 Break out rock from launch Works at South Abutment including concrete pour
		Automatic light scatter meter	17/10/11	
M11	Linn Mill	Frisbee	22/08/11	Break out rock from launch Works at South Abutment including concrete pour
		Automatic light scatter meter	06/12/11	
M12	Clufflat	Frisbee	29/08/11	Break out rock from launch Works at South Abutment including concrete pour
M13	Clufflat Brae	Frisbee	21/09/11	
		Automatic light scatter meter	24/10/11	
M14	Springfield	Frisbee	15/08/11	Break out rock from launch

M15	Echline	Frisbee	16/08/11	Generate rock at Queensferry gyratory Works on A904
		Automatic light scatter meter	10/11/11	
M16	Scotstoun	Frisbee	07/09/11	Site clearance Utility works
		Automatic light scatter meter	14/02/12	
M17	Dundas Home Farm	Frisbee	29/08/11	Utilities works
		Automatic light scatter meter	23/02/12	
M18	Newton	Frisbee	22/08/11	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 2012 have been presented in a monthly chart; this can be found in Appendix A. Results show that the PM₁₀ levels were low and largely followed the same pattern across the site. There were no exceedances of the threshold throughout December. It should be noted that no land-based works were undertaken over the Christmas period (21/12/12 to 07/01/13), indicating that changes in the particulate matter results during this period were not likely to be associated with construction works but were rather due to non-construction related factors. Damp weather conditions over this time would also restrict any dust arising from the site.

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, Broxburn, Queensferry Road, Edinburgh and St Leonards, Edinburgh (an urban background site). The TEOM at Newton was installed by West Lothian Council, facilitated by FCBC,

during May. 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 due to regional changes in air quality.

- 3.1.3.** Due to a pump failure with the Echline meter, data is missing for this monitoring location between 1 and 10 December. Whilst the Echline meter was sent for repair, the Whinny Hill device was relocated to Echline as a temporary measure. As a result, data is missing at Whinny Hill between 11 and 31 December. During site operating times over this period, there were increased visual inspections by the FCBC environmental team at Whinny Hill. However, it should be noted that works at Whinny Hill were demobilised for the Christmas period on 14 December, with no blasting or drilling occurring between the 10 and 14 December. Therefore, it was considered that the meter would be better placed at Echline.

3.2. Total Suspended Particles

- 3.2.1.** The TSP results for December 2012 have been presented in a monthly chart; this can be found in Appendix B. The TSP levels at all monitoring locations throughout December were within the threshold level and largely found to follow a similar pattern across the site, demonstrating that in general the levels are influenced by regional changes in TSP levels, rather than construction works.
- 3.2.2.** Data is missing for Echline between the 1 and 10 December due to a pump failure with this device. Data is also missing from Whinny Hill between 11 and 31 December as the Whinny Hill meter was temporarily relocated to Echline. Please refer to paragraph 3.1.3 for further information.

3.3. Frisbee Dust Deposition Results

3.3.1. The Frisbee dust deposition results for December 2012 have been presented in charts and can be found in Appendix C. To present results, all the monitoring locations have been grouped, based on locality, into the following:

- **Group 1:** M7 Butlaw Fisheries, M8 Barracks West, M9 Barracks East, M10 Inchgarvie Lodge and M11 Linn Mill;
- **Group 2:** M12 Clufflat, M13 Clufflat Brae, M14 Springfield and M15 Echline;
- **Group 3:** M16 Scotstoun Park and M17 Dundas Home Farm;
- **Group 4:** M18 Newton; and
- **Group 5:** M1 Whinny Hill.

3.3.2. Frisbee dust data deposition results are collected fortnightly, and the results averaged over this fortnight period to give a daily dust deposition rate. Due to the Christmas break (21/12/12 to 07/01/13) only one collection date fell during December on 12 December 2012. The next collection date is due on the 9 January 2013. During December there were no exceedances of either the site review level or the site action level across the site and all results were found to be low.

3.3.3. The site action level for the dust deposition rate has been set at 250 mg/m²/day. Exceedances of this will be treated as a potential incident and a formal review of the works in the vicinity of the site will be instigated. A lower, site review level has been set at 140 mg/m²/day. Where concentrations exceed the lower action threshold the site works will be reviewed to ensure good practice is implemented; it is essentially a warning that additional controls may be required.

3.4. Daily Dust Log and Environmental Inspections

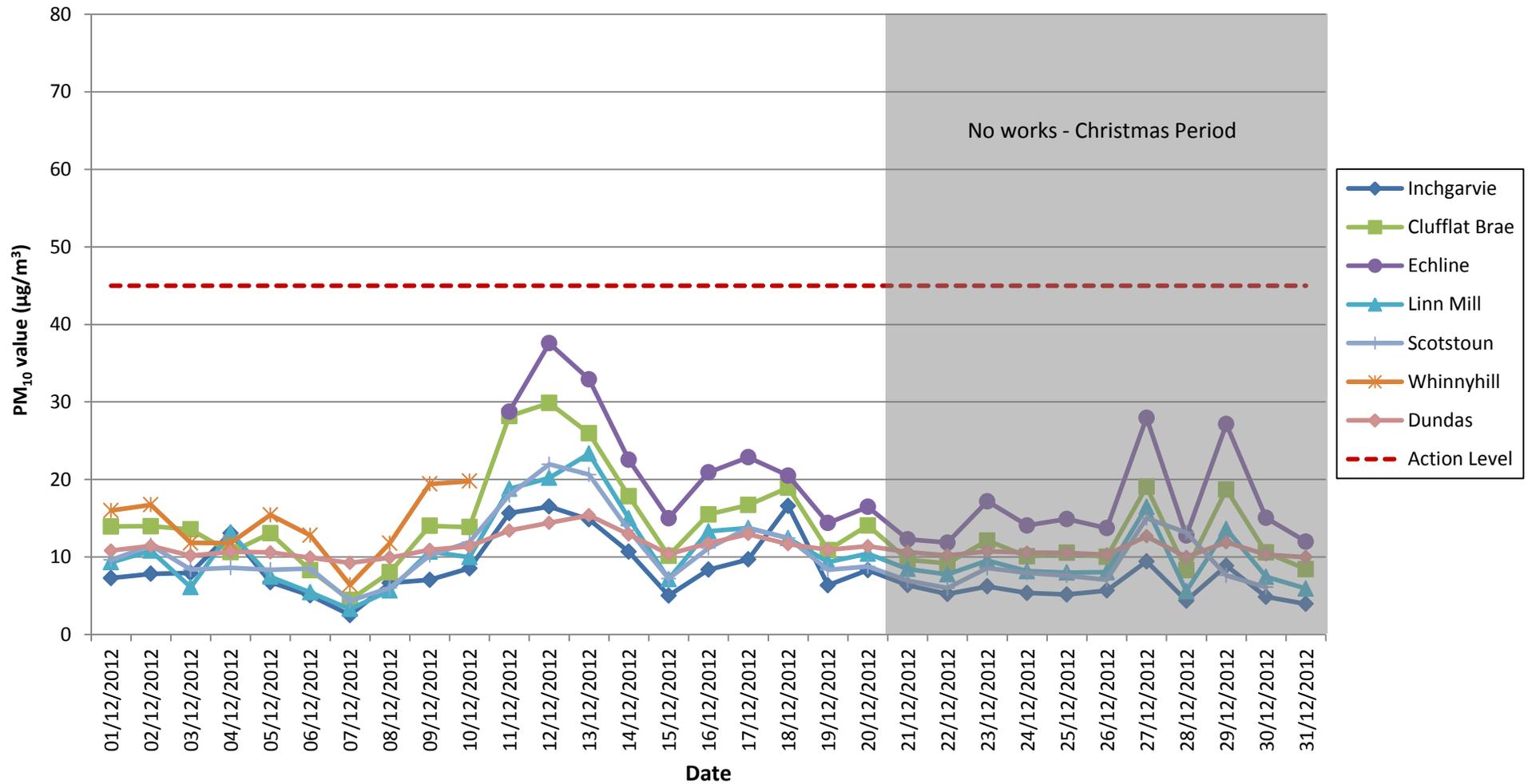
- 3.4.1.** A summary of the daily dust log for December can be found in Appendix D. No instances of visual dust on site were noted in either the southern or northern networks areas during December. No daily dust inspections were undertaken over the Christmas period (21/12/12 to 07/01/13) as no land-based works were undertaken during this period.
- 3.4.2.** During this period a number of environmental inspections were also undertaken across the site. A summary of the Dust and Air Quality section of these environmental checks has been included in Appendix E. A total of 6 inspections were undertaken during this period. Due to the stand down of works in the lead up to the Christmas period, fewer inspections were undertaken in comparison to November. No instances of air quality issues were noted during any of these inspections.



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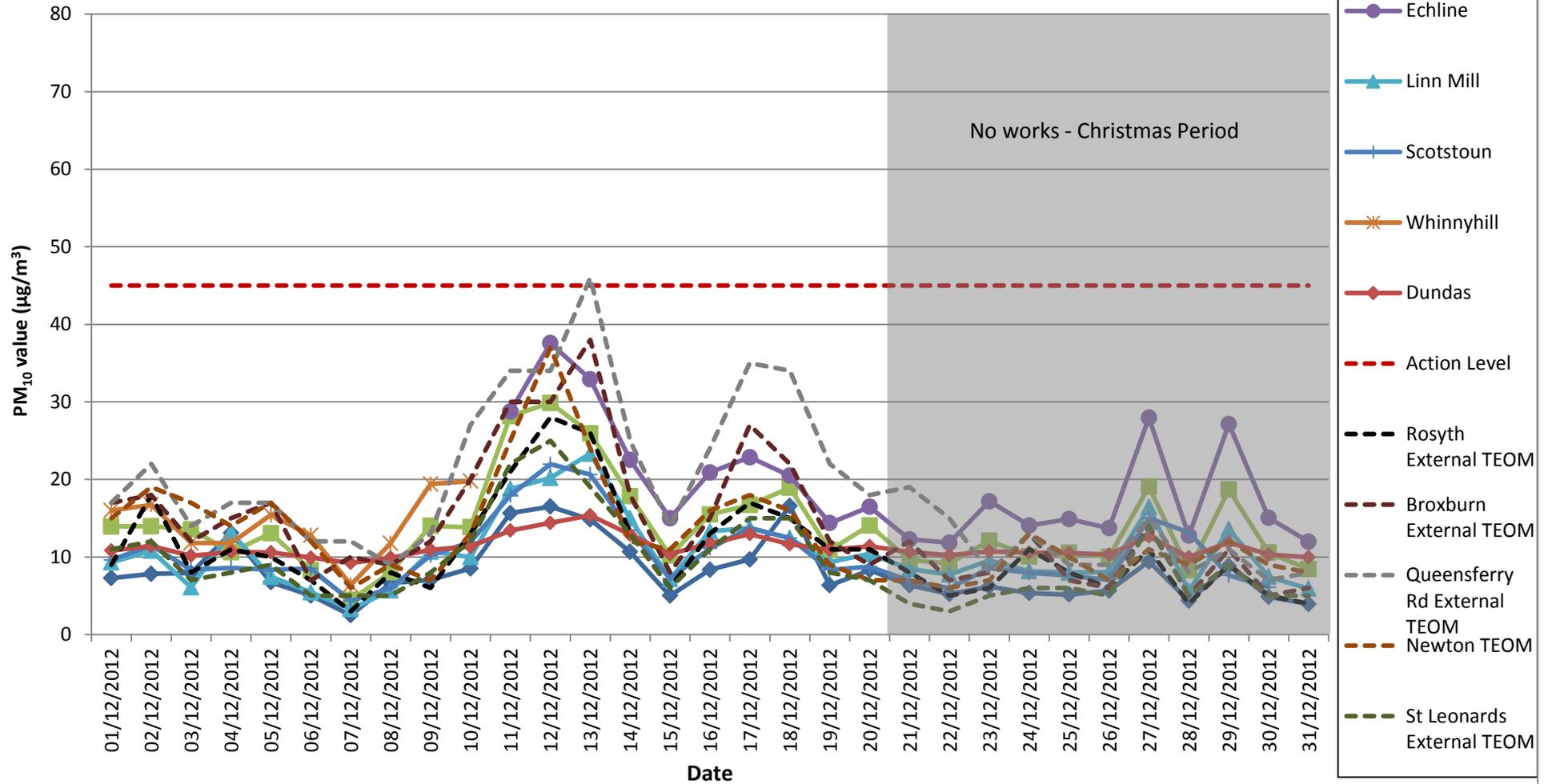
APPENDIX A: LIGHT SCATTER METER RESULTS

Air Quality Monitoring Particulate Matter (PM10) Results for all Monitoring Locations December 2012



Note: The greyed out area of the graphs represents the Christmas period over which no works were undertaken (21/12/12 to 07/01/12). Due to a pump error with the Echline meter, there is no data for this location between 01/12/12 and 10/12/12. Whilst the Echline meter was away for servicing, the Whinny Hill meter was stationed at Echline as a temporary measure. Visual inspections were increased at Whinny Hill during the period for which data is missing for this location (10/12/12 to 20/12/12).

Air Quality Monitoring Particulate Matter (PM10) Results for all Monitoring Locations December 2012



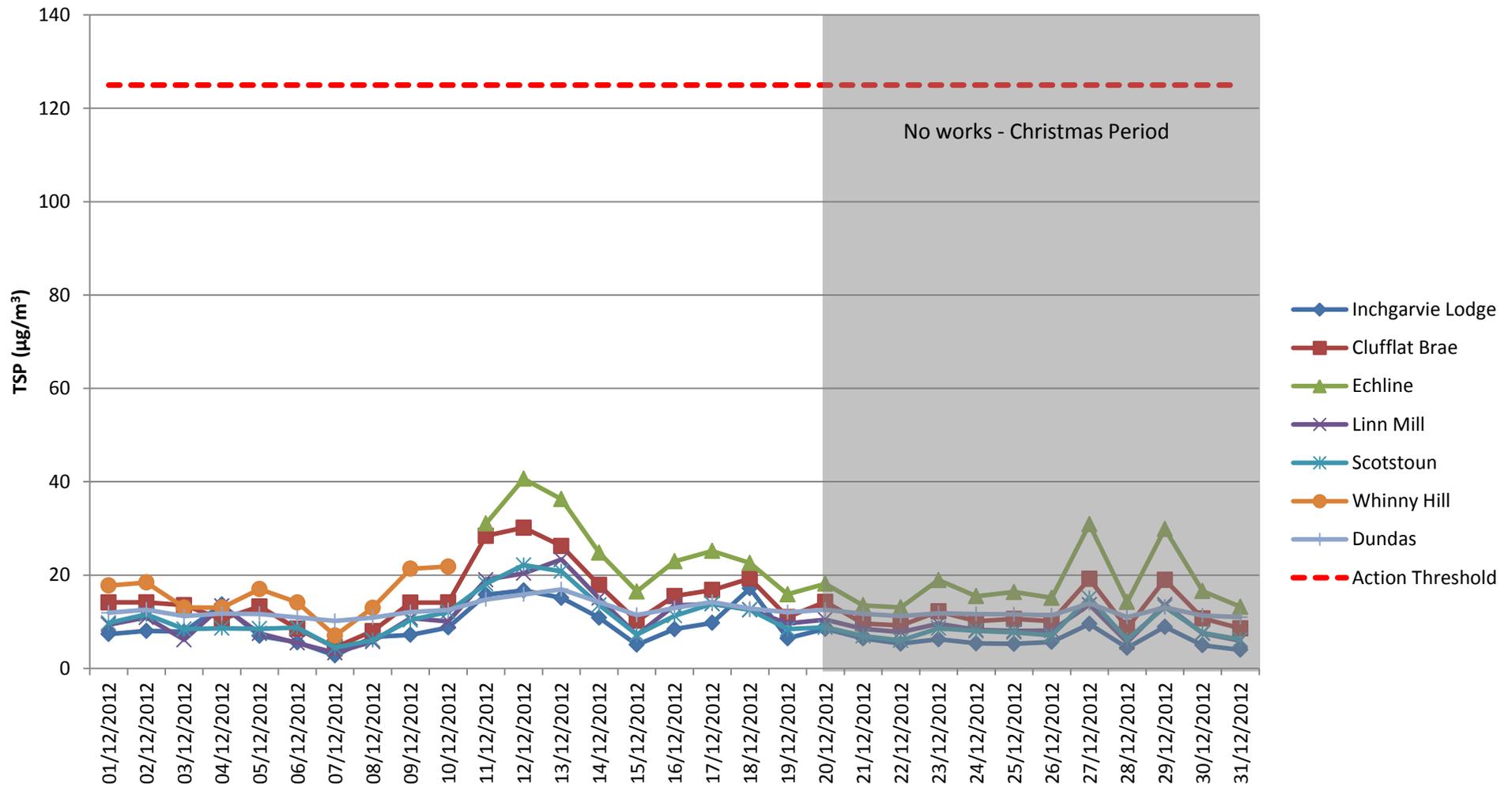
Note: The greyed out area of the graphs represents the Christmas period over which no works were undertaken (21/12/12 to 07/01/12). Due to a pump error with the Echline meter, there is no data for this location between 01/12/12 and 10/12/12. Whilst the Echline meter was away for servicing, the Whinny Hill meter was stationed at Echline as a temporary measure. Visual inspections were increased at Whinny Hill during the period for which data is missing for this location (10/12/12 to 20/12/12).



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APPENDIX B: TOTAL SUSPENDED PARTICLES

Total Suspended Particles (TSP) Results December 2012



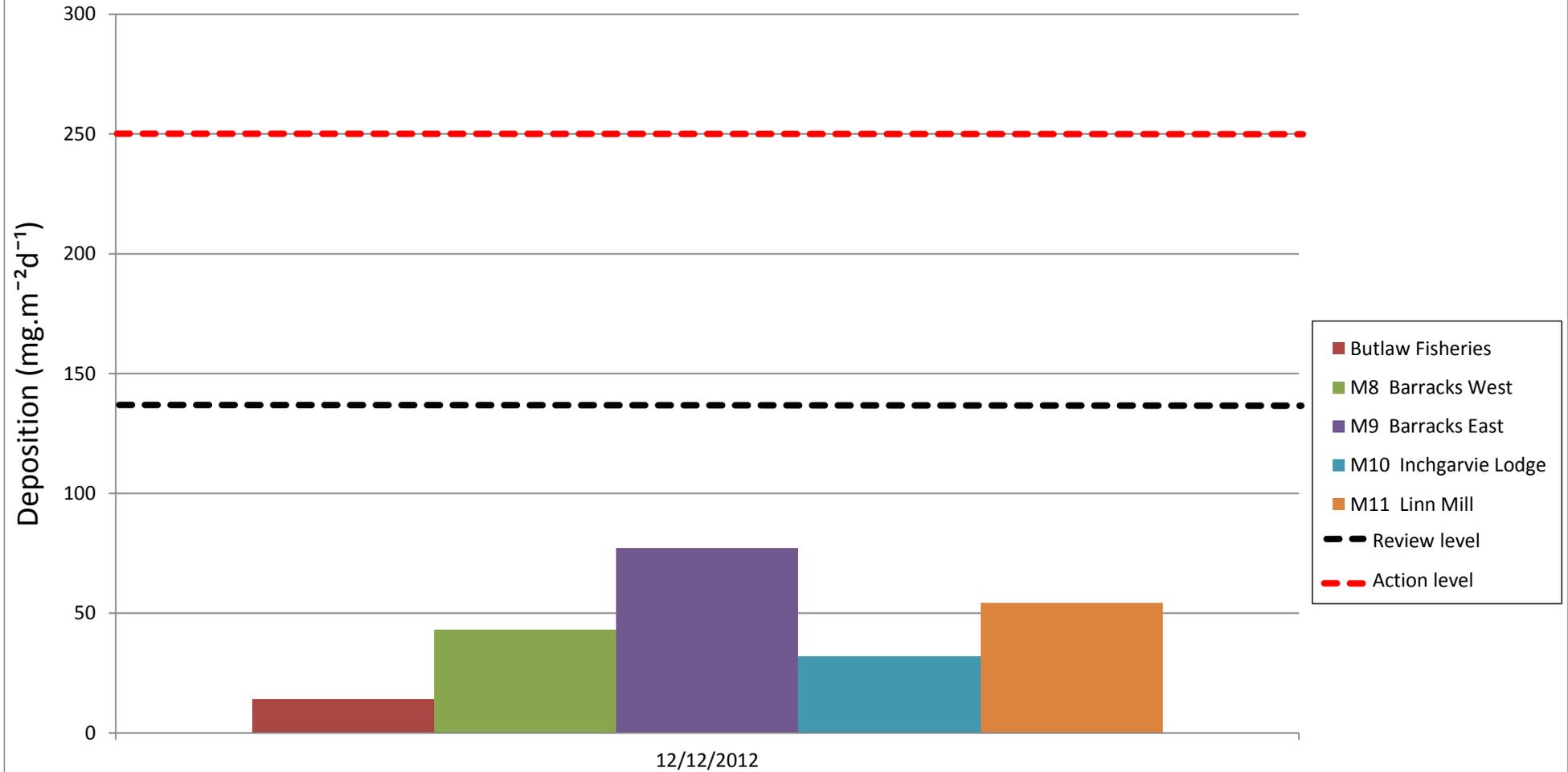
Note: The greyed out area of the graphs represents the Christmas period over which no works were undertaken (21/12/12 to 07/01/12). Due to a pump error with the Echline meter, there is no data for this location between 01/12/12 and 10/12/12. Whilst the Echline meter was away for servicing, the Whinny Hill meter was stationed at Echline as a temporary measure. Visual inspections were increased at Whinny Hill during the period for which data is missing for this location (10/12/12 to 20/12/12).



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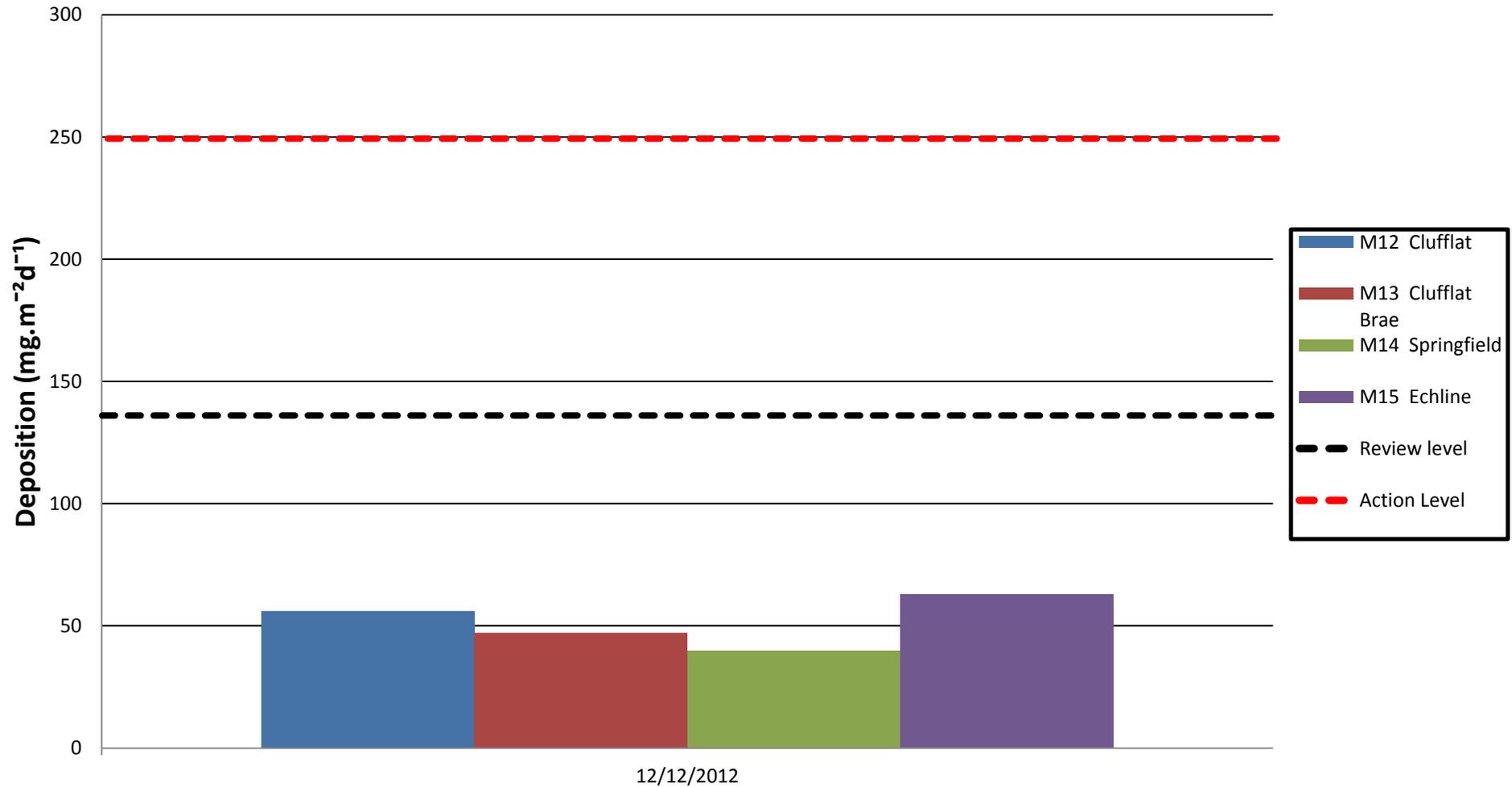
APPENDIX C: FRISBEE GAUGE RESULTS

Frisbee Dust Deposition Results: Group 1
Locations: M7 Butlaw Fisheries, M8 Barracks West, M9 Barracks East,
M10 Inchgarvie Lodge and M11 Linn Mill



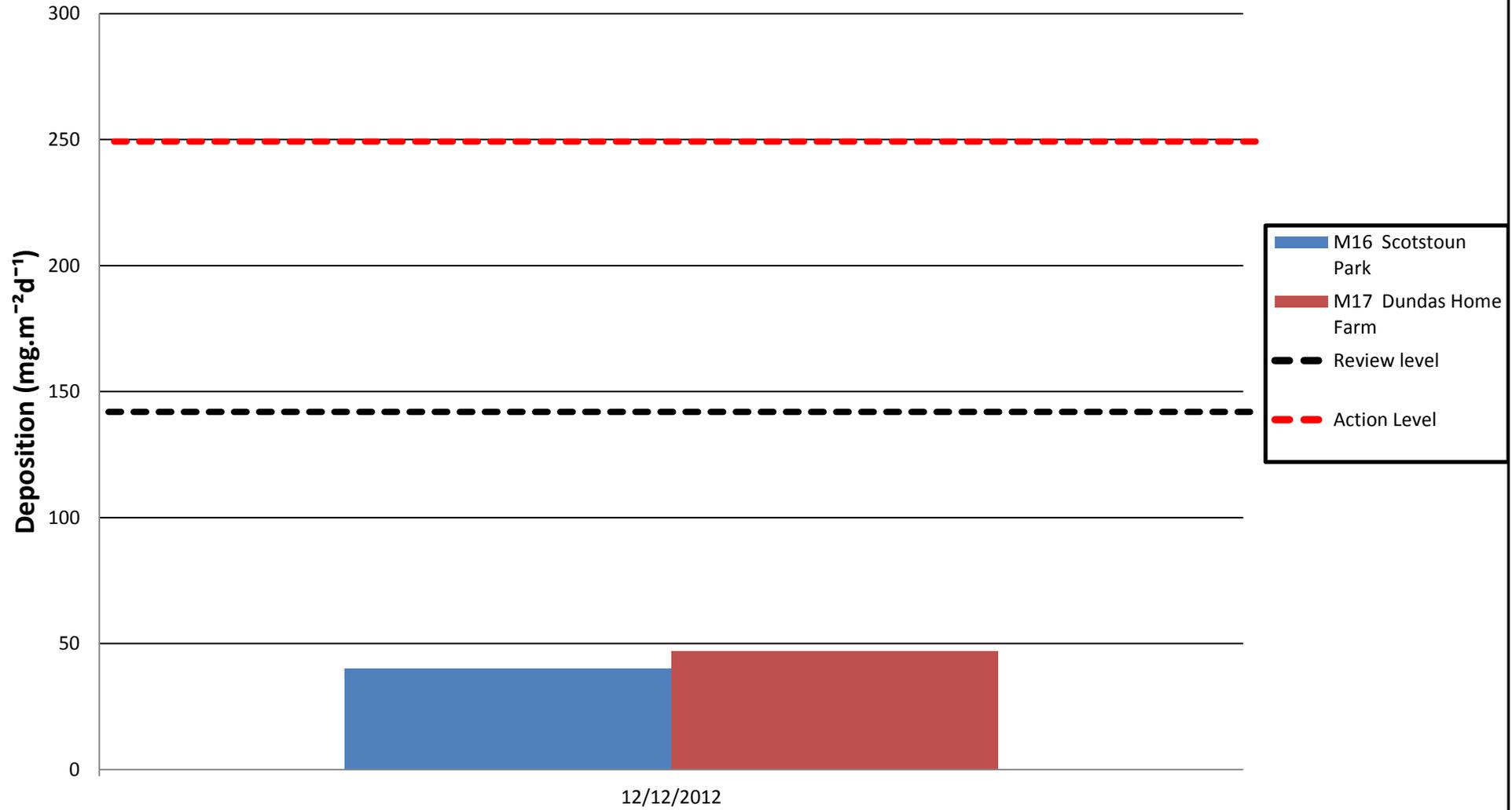
Frisbee Dust Deposition Results: Group 2

Locations: M12 Clufflat, M13 Clufflat Brae, M14 Springfield and M15 Echline



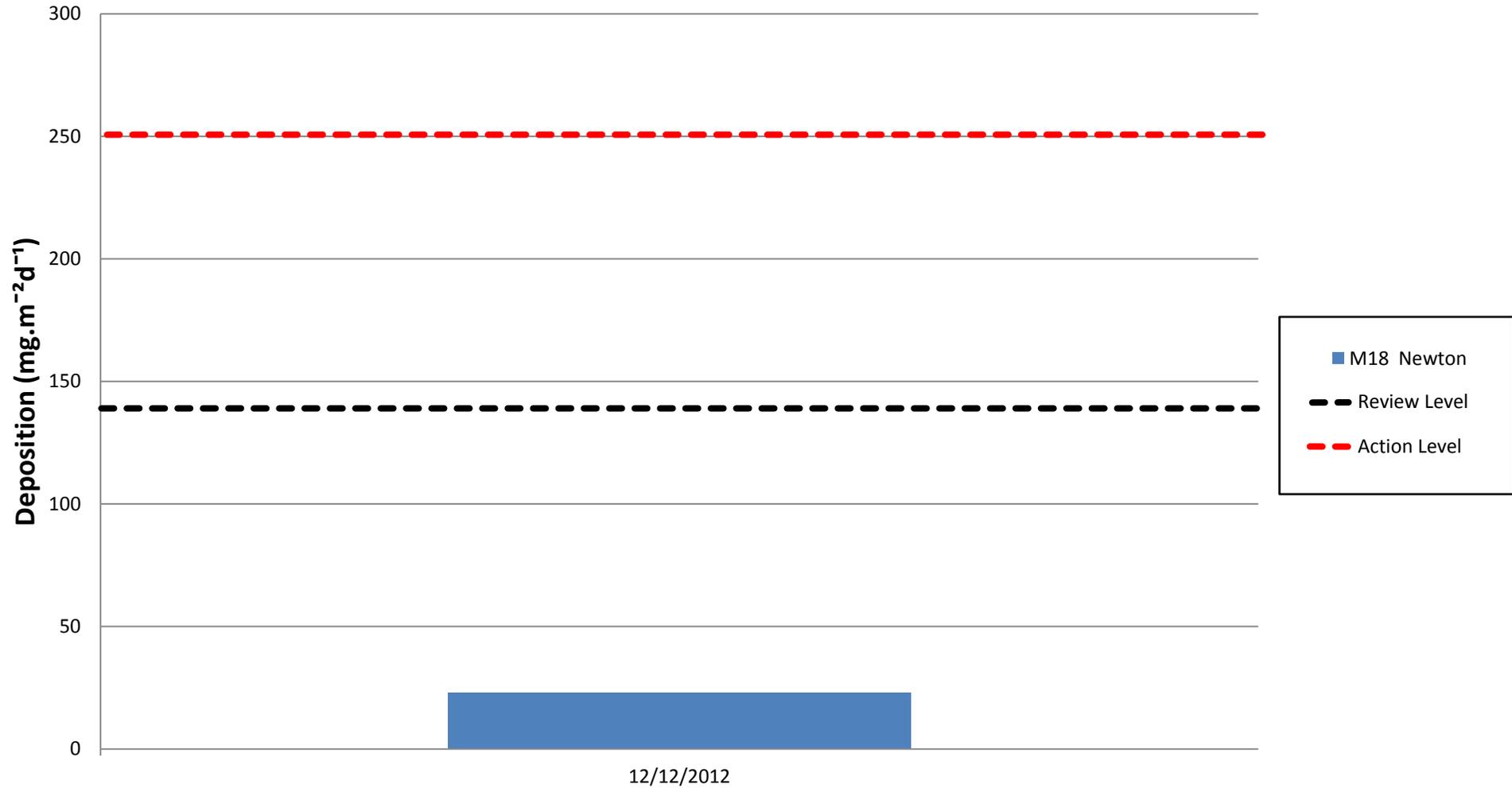
Frisbee Dust Deposition Results: Group 3

Locations: M16 Scotstoun Park and M17 Dundas Home Farm



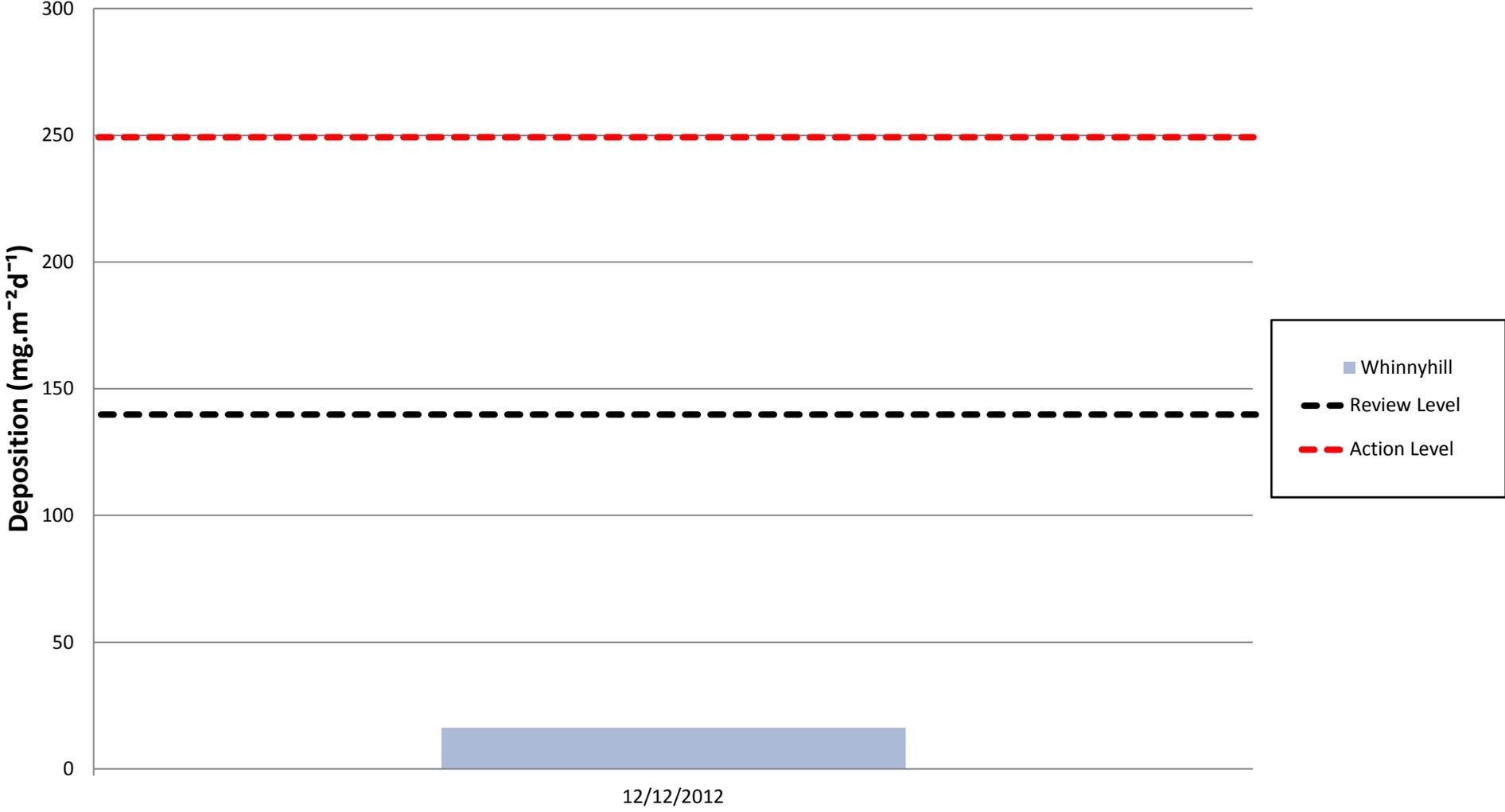
Frisbee Dust Deposition Results: Group 4

Location: M18 Newton



Frisbee Dust Deposition Results: Group 5

Location: M1 Whinny Hill





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APPENDIX D: DAILY DUST LOG

Daily Dust Log - North - December 2012

DATE	LOCATION	WIND	WIND DIRECTION	GROUND SURFACE	VISIBLE DUST	DUST DUE TO WORKS (if applicable)	CAUSES OF DUST (if applicable)	OTHER COMMENTS	Actions (if applicable)
01/12/2012									
02/12/2012									
03/12/2012	N	LIGHT	W	DAMP	N				
04/12/2012	N	LIGHT	W	DAMP	N				
05/12/2012	N	LIGHT	W	DAMP	N				
06/12/2012	N	STRONG	SW	DAMP/WET	N				
07/12/2012	N	LIGHT	NW	DAMP	N				
08/12/2012									
09/12/2012									
10/12/2012	N	LIGHT	NW	DAMP	N			Additional inspections undertaken in Whinny Hill area due to temporary relocation of Whinny Hill light scatter to Echline. No visual signs of dust. Limited works (no drilling blasting) at Whinny Hill works area.	
11/12/2012	N	LIGHT	NW	DAMP	N			Additional inspections undertaken in Whinny Hill area due to temporary relocation of Whinny Hill light scatter to Echline. No visual signs of dust. Limited works (no drilling blasting) at Whinny Hill works area.	
12/12/2012	N	LIGHT	NE	DAMP	N			Additional inspections undertaken in Whinny Hill area due to temporary relocation of Whinny Hill light scatter to Echline. No visual signs of dust. Limited works (no drilling blasting) at Whinny Hill works area.	
13/12/2012	N	LIGHT	W	WET	N			Additional inspections undertaken in Whinny Hill area due to temporary relocation of Whinny Hill light scatter to Echline. No visual signs of dust. Limited works (no drilling blasting) at Whinny Hill works area.	
14/12/2012	N	LIGHT	SW	DAMP	N			Additional inspections undertaken in Whinny Hill area due to temporary relocation of Whinny Hill light scatter to Echline. No visual signs of dust. Limited works (no drilling blasting) at Whinny Hill works area.	
15/12/2012									
16/12/2012									
17/12/2012	N	STRONG	E	DAMP	N				
18/12/2012	N	STRONG	E	DAMP/WET	N				
19/12/2012	N	STRONG	NE	DAMP	N				

Daily Dust Log - South - December 2012

DATE	LOCATION	WIND	WIND DIRECTION	GROUND SURFACE	VISIBLE DUST	DUST DUE TO WORKS (if applicable)	CAUSES OF DUST (if applicable)	OTHER COMMENTS	Actions (if applicable)
01/12/2012	S								
02/12/2012	S								
03/12/2012	S	LIGHT	W	DAMP	N				
04/12/2012	S	LIGHT	W	DAMP	N				
05/12/2012	S	LIGHT	W	DAMP	N				
06/12/2012	S	STRONG	SW	DAMP/WET	N				
07/12/2012	S	LIGHT	NW	DAMP	N				
08/12/2012	S								
09/12/2012	S								
10/12/2012	S	LIGHT	NW	DAMP	N				
11/12/2012	S	LIGHT	NW	DAMP	N				
12/12/2012	S	LIGHT	NE	DAMP	N				
13/12/2012	S	LIGHT	W	WET	N				
14/12/2012	S	LIGHT	SW	DAMP	N				
15/12/2012	S								
16/12/2012	S								
17/12/2012	S	STRONG	E	DAMP	N				
18/12/2012	S	STRONG	E	DAMP/WET	N				
19/12/2012	S	STRONG	NE	DAMP	N				
20/12/2012	S	STRONG	E	DAMP/WET	N				
21/12/2012	S	LIGHT	NE	DAMP/WET	N			No works on site - Christmas stand down	
22/12/2012									
23/12/2012									
24/12/2012									
25/12/2012									
26/12/2012									
27/12/2012									
28/12/2012									
29/12/2012									
30/12/2012									
31/12/2012									

No works over Christmas period (22/12/12 to 07/01/13)



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APPENDIX E: SUMMARY OF ENVIRONMENTAL INSPECTIONS

Summary of Dust and Air Quality Section of Environmental Inspections Undertaken in December 2012

Date	Location	Dust Levels	Suppression/ Dampening down	Transportation of materials	Comments/Actions
04/12/2012	North - B981, FT05 and FT09	Satisfactory	Satisfactory	Satisfactory	
04/12/2012	North Abutment	Satisfactory	Satisfactory	Satisfactory	
04/12/2012	Ferrytoll Embankment	Satisfactory	Satisfactory	Satisfactory	
06/12/2012	Echline Field	Satisfactory	Satisfactory	Satisfactory	
06/12/2012	S6, S7 and S8	Satisfactory	Satisfactory	Satisfactory	
06/12/2012	Dolphington	Satisfactory	Satisfactory	Not Applicable	