Document Control Sheet

Client		Department of Communications, Energy and Natural Resources		
Project		Environmental Monitoring of Former Mining Areas of Silvermines and Avoca		
Project No:		95735		
Report		Evaluation of Dust Monitoring Programme for Silvermines Mining Area		
Document Reference:		95735/40/DG05		
Version	**Author**	**Checked**	**Reviewed**	**Date**
1	D Keating	L Gaston	R L Olsen	August 2013
2	D Keating	L Gaston R O'Carroll	R L Olsen	Sept 2013

Distribution	**Copy No.**

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Section 1
Introduction

The Department of Communications, Energy and Natural Resources (the Department) appointed CDM Smith Ireland Ltd (CDM Smith) to undertake a programme of environmental monitoring at the closed mine sites of Silvermines and Avoca for a three year period, commencing 2013.

A dust deposition monitoring programme was established by North Tipperary County Council in March 1999 around the perimeter of the Gortmore tailings management facility (TMF), near Silvermines, in response to local concerns regarding the potential for dust blows from the TMF. The primary objective of the dust deposition study was to assess the concentration of heavy metals in dust being deposition from the TMF.

Between 2004 and the end of 2010, analyses were conducted on approximately a monthly basis by the EPA for 18 sampling sites (including a control site). From the start of 2011, the number of sampling sites was reduced to 10 and analyses were conducted approximately every two months. From September 2011, the number of sites was reduced to six (including the control) with analysis occurring every two months.

As part of the scope of work of the environmental monitoring programme, the Department requested CDM Smith to undertake an evaluation of the data collected over the past six years to determine if future dust monitoring is still necessary. In the event that additional monitoring was determined to be necessary, appropriate dust monitoring sites were to be identified.

Section 2
Methodology

2.1 Sampling Programme

This assessment report evaluates dust concentration data monitored at the following points shown in Figure 1:

- North, North 150 m, North 300 m;
- South, South 150 m, South 300 m;
- East, Eastern Boundary, East 150 m, East 300 m;
- West, Western Boundary, West 150 m, West 300 m;
- Farm 300 m, Farm 600 m;
- Silvermines School; and
- Control point located at Ballinamoe, Newtown, Co. Tipperary.

The current monitoring programme (as of 26 September 2011) comprises samples taken from the following reduced number of monitoring points:

- West;
- East - Boundary, 150m;
- North;
- Silvermines School; and
- Control point located at Ballinamoe, Newtown, Co. Tipperary.

Samples were collected in Kilner jars (glass jars with 8.8 cm diameter openings with an internal height of 20 cm and a collection area of 0.00608 m^2). The jars were located and exposed for the sampling period. Each sample is then filtered through a 1.12 mm sieve (to remove insect parts, leaves etc.) and the liquid collected in a beaker. The liquid is then transferred back to the jar and the volume adjusted to 150ml. The sample is then evaporated and weighed, and the total solids calculated. Digested samples are then analysed for trace metals using inductively coupled plasma/mass spectrometry.

This assessment focuses on the data collected after 15 December 2008 when a highly productive and vigorous grass sward had developed over all of the capped areas for the management and curtailment of dust blows. Data collected prior to the grass growth will not be representative of current conditions.

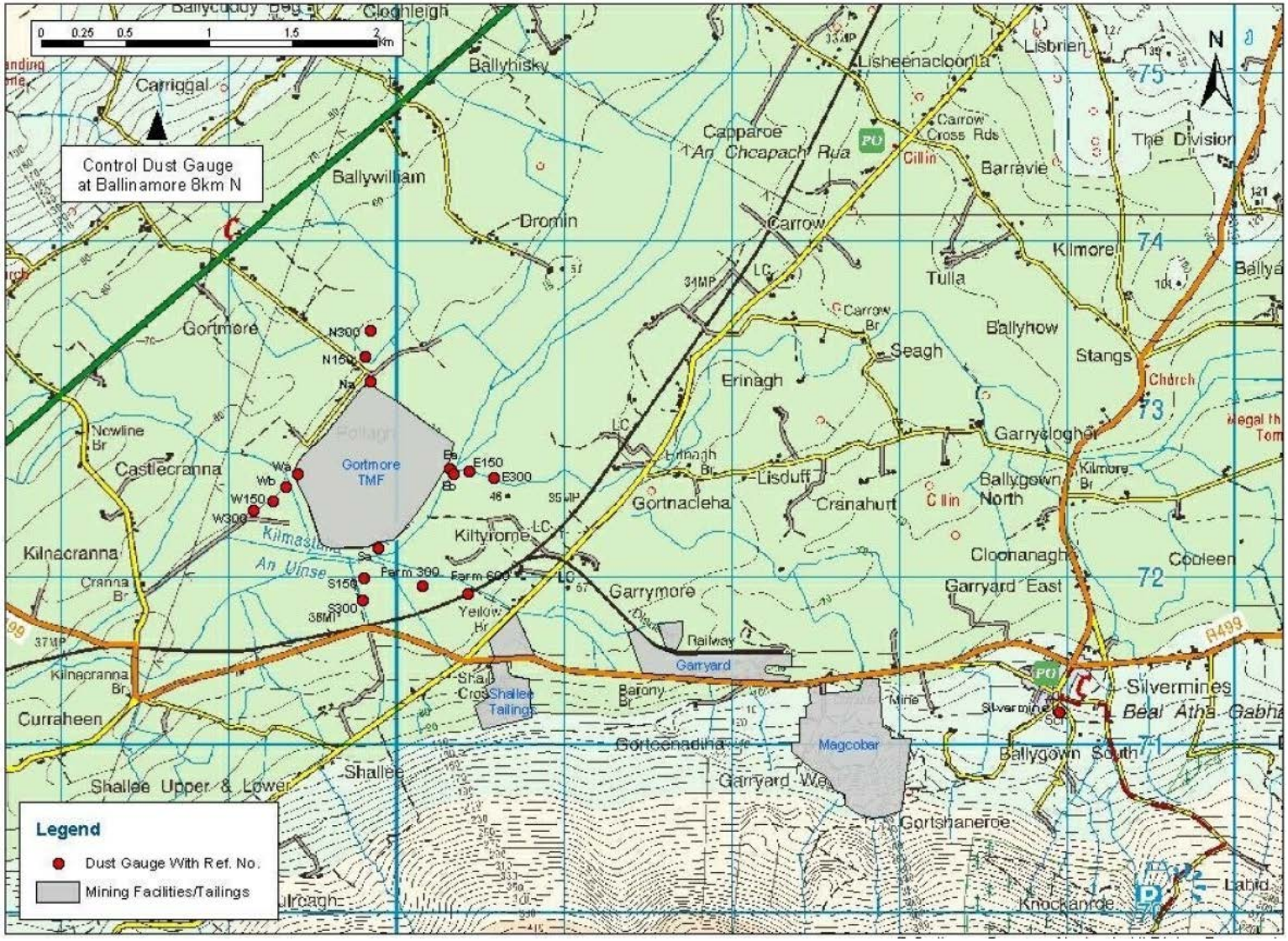

Figure 1: Locations of Sampling Points (Source EPA, 2004)

This report addresses the data made available by the EPA for the sampling periods shown in Table 1.

Table 1: Sampling Periods contained in EPA data

Sampling Period Dates	Number of Days in Sampling Period
15 December 2008 to 30 January 2009	50 days
30 January to 17 April 2009	77 days
17 April to 28 May 2009	42 days
26 June to 24 July 2009	29 days
24 July to 23 August 2009	29 days
23 August to 22 September 2009	30 days
22 September to 19 October 2009	27 days
19 October to 16 November 2009	28 days
16 November to 14 December 2009	28 days
14 December 2009 to 16 February 2010	64 days
16 February to 15 March 2010	27 days
15 March to 12 April 10	28 days
13 December 2010 to 7 March 2011	56 days
7 March to 23 May 2011	77 days
23 May to 25 July 2011	63 days
25 July to 1 October 2011	68 days
26 September to 28 November 2011	63 days
28 November 2011 to 27 January 2012	60 days

No data were available for the time period between 12 April 2010 and 13 December 2010.

For the samples dated 25 July to 26 September 2011 only the samples from the North , East Boundary, East 150 m, West, School and Control sites were collected on the 26 September. The remaining samples: North 150 m, East, East 300 m and West 150 m were not collected until 1st October. The text of this report and EPA report contained in the Appendix D list the end of sampling for both sets of samples as 1 October. The next set of results is for 26 September to 28 November and relates to the reduced sample regime with samples taken at the North, East Boundary, East 150 m, West, School and Control sites.

2.2 Air Quality Standards

2.2.1 CAFE Directive

Ambient air quality standards are set out under European Directive 2008/50/EC on ambient air quality and cleaner air for Europe, also known as the CAFE Directive, published in May 2008. The CAFE Directive replaces the Air Quality Framework Directive (96/62/EC) and the first three daughter Directives. The CAFE Directive was transposed into Irish legislation by the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011). S.I. No. 180 of 2011 replaces the Air Quality Standards Regulations 2002 (S.I. No. 271 of 2002), the Ozone in Ambient Air Regulations 2004 (S.I. No. 53 of 2004) and S.I. No. 33 of 1999. The 4th Daughter Directive was transposed by the Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations 2009 (S.I. No. 58 of 2009). Limit values for Arsenic (As), Cadmium (Cd), Nickel (Ni) and Lead (Pb) are provided in Table 2.

As Arsenic (As), Cadmium (Cd), Nickel (Ni) and Lead (Pb) are the key metals focused on the in Ambient Air Regulations; these metals also formed the focus of this assessment report.

Table 2: Air Quality limit and threshold values for Annual Average As, Cd, Ni and Pb as set out in the 4th Daughter Directive and S.I. 58 of 2009

Pollutant	EU Limit Value* (ng/m^3)	Upper Assessment Threshold Value** (ng/m^3)	Lower Assessment Threshold Value*** (ng/m^3)
Arsenic	6	3.6	2.4
Cadmium	5	3	2
Nickel	20	14	10
Lead	500	350	250

* For the total content in the PM10 fraction averaged over a calendar year.

** 'Upper assessment threshold' means a level below which a combination of measurements and modelling techniques may be used to assess ambient air quality, in accordance with Article 6(3) of Directive 96/62/EC.

*** 'Lower assessment threshold' means a level below which the sole use of modelling or objective estimation techniques shall be possible to assess ambient air quality, in accordance with Article 6(4) of Directive 96/62/EC.

2.2.2 TA Luft Guidance

While ambient air quality standards are set out under the CAFÉ Directive, there are no EU Air Quality Standards in existing or pending EU Directives for dust deposition and associated heavy metal concentration. However, in 1989, the Department of Environment (now Department of Environment, Community & Local Government) recommended that local authorities adopt as a source of reference the German air pollution control regulation entitled "Technical Instructions on Air Quality Control" (*Technische Anleitung zur Reinhaltung der Luft*) commonly referred to as the TA Luft[1] . Limit values were detailed in the TA Luft which set standards for protection against significant nuisances due to dust deposition and standards for concentration of heavy metals in dust deposition. Prior to October 2002, the standard limit for annual average concentration for lead was 250 $\mu g/m^2$/day, for cadmium was 5 $\mu g/m^2$/day and for thallium was 10 $\mu g/m^2$/day in deposited dust.

The TA Luft was most recently revised in October 2002. The standard for dust deposition remained at 350 mg/m^2/day; however, new limit concentrations were set for lead, cadmium and thallium annual average concentrations. In addition, the new TA Luft specifies limit concentrations for arsenic, nickel and mercury. The current TA Luft limits for dust deposition and for concentration of heavy metals in deposited dust is given in Table 3.

[1] Department of Environment. 1989. Air Pollution Act, 1987- Licensing of Industrial Plant: Circular letter AP 1/89. Department of Environment. Dublin.

Table 3: TA Luft limits for heavy metals

Substance/Group of Substances	µg/m^3/day
Arsenic and its inorganic compounds	4
Lead and its inorganic compounds	100
Cadmium and its inorganic compounds	2
Nickel and its inorganic compounds	15

Section 3

Air Quality Assessment

The available monitoring results from 15 December 2008 to 27 January 2012 are contained in the report appendices. Arsenic, Nickel, Cadmium and Lead concentrations are set out in Table 4 to Table 11.

Data were unavailable between 28 May 2009 and 26 June 2009 and 12 April 2010 and 13 December 2010. Information on data gaps at individual monitoring locations (typically due to broken sample jars) is provided in the Appendices.

3.1 Arsenic

Table 3 provides the reported arsenic concentrations from 15 December 2008 to 27 January 2012, excluding 28 May 2009 to 26 June 2009 and 12 April 2010 to 13 December 2010, for which no data were available.

Table 5 compares the annual average arsenic concentrations to the limit of 4 µg/m^3 set out in the TA Luft guidance. Where a concentration is defined as less than the detection limit, the detection limit value is used in the calculation of the rolling average. Rolling averages were not calculated for 2010 as data were available for less than half the year, with no results available between 12 April 2010 and 13 December 2010.

The monthly average concentration was noted as being higher than the annual limit of 4 µg/m^3/day for the following samples:

- 26 June to 24 July 2009 – East (6.81 µg/m^3/day);
- 24 July to 23 August 2009 – North (14.18 µg/m^3/day);
- 22 September to 19 October 2009 – North, North 300 m, Eastern Boundary (12.18 µg/m^3/day, 6.7 µg/m^3/day, 6.09 µg/m^3/day, respectively);
- 15 March to 12 April 2010 – Farm (6.46 µg/m^3/day); and
- 25 July to 1 October 2011 - Eastern Boundary (25 µg/m^3/day). Concentrations measured at this monitoring point appeared anomalously high for all analytes. Dirt and biological matter were noted in the sampling jar and therefore results may not be representative of average concentrations at this location.

Annual averages exceeded the limit value at the North monitoring point for 2009 (5.12 µg/m^3/day – 30 January to 14 December) and the Eastern Boundary in 2011 (5.4 µg/m^3/day – 13 December 2010 to28 November 2011).

The majority of measured concentrations both on an annual and sample-by-sample basis were well below the limit of 4 µg/m^3/day.

Table 4: Arsenic Concentrations 15 December 2008 to 27 January 2012

Arsenic (µg/m^3/day)	N	N	N	S	S	S	E	E	E	E	W	W	W	W	Farm	Farm	S-mines	Control
Date		150 m	300 m		150 m	300 m		Bndry	150 m	300 m		Bndry	150 m	300 m	300 m	600 m	School	
15 Dec 2008 to 30 Jan 2009	3.22	<0.16	<0.16	<0.16	<0.16	<0.16	0.53	<0.16	No data	<0.16	2.99	<0.16	<0.16	<0.16	1.78	<0.16	<0.16	<0.16
30 Jan to 17 Apr 2009	No data	<0.11	<0.11	No data	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	0.73	<0.11	0.34	0.66	<0.11	0.21	<0.11	<0.11
17 Apr to 28 May 2009	0.51	66.57	<0.2	<0.2	<0.2	<0.2	0.55	<0.2	<0.2	<0.2	2.35	0.31	2.00	<0.2	0.94	<0.2	No data	<0.2
26 June to 24 July 2009	1.30	0.51	0.57	0.57	0.40	0.45	6.81	0.74	1.70	0.68	0.00	0.45	0.62	0.51	0.45	0.51	0.57	1.30
24 July to 23 Aug 2009	14.18	1.59	3.23	1.47	1.13	1.13	No data	1.87	1.08	1.25	2.67	1.47	1.13	1.36	1.13	1.36	1.36	1.08
23 Aug to 22 Sept 2009	No data	<0.3	No data	<0.3	<0.3	No data	3.73	3.18	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	No data	<0.3	<0.3	<0.3
22 Sept to 19 Oct 2009	12.18	<0.3	6.70	<0.3	<0.3	<0.3	0.30	6.09	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
19 Oct to 16 Nov 2009	2.41	0.47	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	3.41	0.47	<0.3	0.65	0.65	<0.3	0.29	<0.3
16 Nov to 14 Dec 2009	2.06	<0.3	0.82	<0.3	<0.3	<0.3	<0.3	<0.3	No data	No data		<0.3	<0.3	<0.3	No data	<0.3	<0.3	<0.3
14 Dec 2009 to 16 Feb 2010	No data	No data	<0.1	0.31	<0.1	0.15	0.59	<0.1	No data	No data	1.00	0.31	0.15	<0.1	No data	0.00	<0.1	0.00
16 Feb to 15 Mar 2010	No data	<0.3	<0.3	0.43	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	2.19	0.91	<0.3	<0.3	1.52	3.47	No data	<0.3
15 Mar to 12 Apr 2010	No data	0.35	<0.3	<0.3	<0.3	<0.3	<0.3	0.47	<0.3	0.29	1.76	0.47	0.29	0.59	6.46	0.94	<0.3	0.29
13 Dec 2010 to 7 Mar 2011	0.30	No data	<0.1	0.20	No data	<0.1	0.30	<0.1	0.60	<0.1	3.50	<0.1	No data	No data	No data	0.80	No data	<0.1
7 March to 23 May 2011	0.50	0.20	No data	No data	No data	No data	<0.1	0.20	0.40	0.20	1.60	No data	0.10	No data	No data	No data	0.10	0.10
23 May to 25 July 2011	No data	<0.1	No data	No data	No data	No data	0.20	0.20	0.40	0.10	1.60	No data	0.20	No data	No data	No data	0.20	0.20
25 July to 1 Oct 2011	0.34	0.24	No data	No data	No data	No data	No data	25.00*	0.57	0.17	1.57	0.46	No data	No data	No data	No data	0.42	0.13
26 Sept to 28 Nov 2011	0.20	No data	No data	No data	No data	No data	No data	No data	<0.1	No data	1.40	No data	No data	No data	No data	No data	0.30	<0.1
28 Nov·2011 to 27 Jan 2012	<0.1	No data	No data	No data	No data	No data	No data	0.50	<0.1	No data	1.10	No data	No data	No data	No data	No data	<0.1	<0.1

*25 July to 1 Oct 2011 East boundary - Clear colour with dirt and biological species present

Notes:
1) No data entries correspond to broken sample jars in the field. Further information is available in the appendices.
2) From 23 May 2011, the numbers of sampling locations were reduced to North, East boundary, East 150m, West, Silvermines School and the control.
3) Sampling Date 25 July- 26 Sept. was for the following samples: North, East Boundary, East 150, West, School and Control. The remaining samples: North 150, East, East 300 and West 150 were not collected until 1 Oct, so sampling dates for these were 25 July-1 Oct 2011. The table lists the end of sampling for both sets of samples as 1st Oct. The next set of results is for 26 Sept 2011 to 28 Nov. - it relates to the reduced sample no. of North, East Boundary, East 150, West, School and Control.

Table 5: Arsenic Annual Averages (2009 to 2011)

Arsenic (µg/m^3/day)	N	N	N	S	S	S	E	E	E	E	W	W	W	W	Farm	Farm	S-mines	Control
Year		150 m	300 m		150 m	300 m		Bndry	150 m	300 m		Bndry	150 m	300 m	300	600	School	
2009 30 Jan 09 - 14 Dec 09	5.12	0.47	1.51	0.45	0.36	0.37	0.83	1.44	0.57	0.41	1.82	0.43	0.61	0.49	0.77	0.41	0.42	0.45
2010 **14 Dec 09 - 12 Apr 10**	Insufficient data																	
2011 **13 Dec 2010 - 28 Nov·2011**	0.34	Insufficient data						5.40	0.36	0.14	1.80	Insufficient data					0.22	0.12

Notes:

Limit Value 4 µg/m^3/day

3.2 Nickel

Table 5 provides the reported nickel concentrations from 15 December 2008 to 27 January 2012, excluding 28 May 2009 to 26 June 2009 and 12 April 2010 to 13 December 2010, for which no data were available.

Table 7 compares the annual average nickel concentrations to the limit of 15 µg/m^3 set out in the TA Luft guidance. Where a concentration is defined as less than the detection limit, the detection limit value is used in the calculation of the rolling average. Rolling averages were not calculated for 2010 as data were available for less than half the year, with no results available between 12 April 2010 and 13 December 2010.

The monthly average concentration was noted as being higher than the annual limit of 15 µg/m^3/day for the following samples:

- 24 July to 23 August 2009 – North (73.73 µg/m^3/day);
- 22 September to 19 October 2009 – North, North 300 m, Eastern Boundary (16.45 µg/m^3/day, 18.27 µg/m^3/day and 18.88 µg/m^3/day respectively); and
- 25 July to 1 October 2011 – Eastern Boundary (47.00 µg/m^3/day).

Dirt and biological matter were noted in the sampling jar for 25 July to 1 October 2011 - Eastern Boundary and therefore results may not be representative of average concentrations at that location.

No annual exceedances were recorded.

The majority of measured concentrations both on an annual and sample-by-sample basis were well below the limit of 15 µg/m^3/day.

Table 6: Nickel Concentrations 15 December 2008 to 27 January 2012

Nickel (µg/m^3/day)	N	N	N	S	S	S	E	E	E	E	W	W	W	W	Farm	Farm	S-mines	Control
Date		150 m	300 m		150 m	300 m		Bndry	150 m	300 m		Bndry	150 m	300 m	300	600	School	
15 Dec 2008 to 30 Jan 2009	2.86	0.49	0.20	0.72	0.86	0.56	1.05	1.05	No data	0.95	0.69	<0.16	<0.16	0.95	1.18	0.79	0.89	<0.16
30 Jan to 17 Apr 2009	No data	0.49	0.58	No data	0.68	0.30	1.24	0.60	0.68	1.56	0.26	0.70	1.67	1.69	0.15	0.45	0.96	0.13
17 Apr to 28 May 2009	0.67	3.92	0.55	0.59	0.70	0.55	0.27	0.67	0.39	0.59	0.55	0.55	0.82	0.55	1.37	0.39	No data	0.59
26 June to 24 July 2009	3.80	0.85	1.13	1.25	0.45	0.91	1.30	0.96	2.33	1.47	No data	0.96	1.02	1.08	0.57	1.30	0.85	6.24
24 July to 23 Aug 2009	73.73	4.71	1.70	1.99	1.76	1.53	No data	2.55	1.36	1.81	1.70	1.93	1.30	1.53	1.47	1.70	1.42	2.50
23 Aug to 22 Sept 2009	No data	<0.3	0.00	<0.3	<0.3	No data	6.03	2.19	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.00	<0.3	<0.3	<0.3
22 Sept to 19 Oct 2009	16.45	1.34	18.27	<0.3	13.40	<0.3	0.43	18.88	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.30
19 Oct to 16 Nov 2009	2.06	0.65	0.35	1.70	1.00	1.23	0.53	0.59	1.29	1.41	0.53	<0.3	0.47	1.12	0.94	1.94	0.65	0.47
16 Nov to 14 Dec 2009	1.88	<0.3	0.70	0.82	<0.3	<0.3	<0.3	<0.3	No data	No data	No data	1.12	2.17	<0.3	No data	0.88	0.47	<0.3
14 Dec 2009 **to 16 Feb** 2010	No data	No data	0.31	0.33	0.33	0.46	0.49	0.49	No data	No data	0.41	0.49	0.67	0.75	No data	No data	0.28	No data
16 Feb to 15 Mar 2010	No data	0.49	0.61	1.28	0.55	0.55	1.28	0.79	0.49	0.85	0.67	3.29	0.61	0.61	1.40	4.08	No data	6.70
15 Mar to 12 Apr 2010	No data	0.70	0.65	0.88	0.41	1.12	0.82	0.94	0.82	0.65	0.53	0.88	0.76	0.53	4.99	1.17	0.41	0.94
13 Dec 2010 to 7 Mar 2011	1.00	No data	0.70	0.80	No data	0.60	0.80	0.90	1.00	0.50	0.60	0.80	No data	No data	No data	1.00	No data	0.60
7 Mar to 23 May 2011	0.90	0.50	No data	No data	No data	No data	0.60	0.60	0.60	1.10	0.80	No data	0.50	No data	No data	No data	1.00	0.40
23 May to 25 July 2011	No data	0.50	No data	No data	No data	No data	0.50	0.70	1.50	0.50	0.60	No data	0.60	No data	No data	No data	0.70	0.50
25 July to 1 Oct 2011	1.38	0.70	No data	No data	No data	No data	No data	47.00	1.12	0.77	1.04	0.56	No data	No data	No data	No data	0.84	0.42
26 Sept to 28 Nov 2011	0.60	No data	No data	No data	No data	No data	No data	No data	0.50	No data	0.40	No data	No data	No data	No data	No data	0.50	0.70
28 Nov·2011 to 27 Jan 2012	0.60	No data	No data	No data	No data	No data	No data	0.90	0.70	No data	0.50	No data	No data	No data	No data	No data	0.40	0.30

Notes:
1) No data entries correspond to broken sample jars in the field. Further information is available in the appendices.
2) From 23 May 2011, the numbers of sampling locations were reduced to North, East boundary, East 150m, West, Silvermines School and the control.
3) Sampling Date 25 July- 26 Sept. was for the following samples: North, East Boundary, East 150, West, School and Control. The remaining samples: North 150, East, East 300 and West 150 were not collected until 1 Oct, so sampling dates for these were 25 July-1 Oct 2011. The table lists the end of sampling for both sets of samples as 1st Oct. The next set of results is for 26 Sept 2011 to 28 Nov. - it relates to the reduced sample no. of North, East Boundary, East 150, West, School and Control.

Table 7: Nickel Annual Averages (2009 to 2011)

Nickel (µg/m^3/day)	N	N	N	S	S	S	E	E	E	E	W	W	W	W	Farm	Farm	S-mines	Control
Year		**150 m**	**300 m**		**150 m**	**300 m**		**Bndry**	**150 m**	**300 m**		**Bndry**	**150 m**	**300 m**	**300**	**600**	**School**	
2009 30 Jan 2009 - 14 Dec 2009	14.49	1.45	2.94	0.96	2.16	0.71	1.39	3.09	0.95	1.05	0.62	0.70	0.91	0.87	0.86	0.90	0.65	1.22
2010 **14 Dec** 20**09 - 12 Apr** 20**10**	Insufficient Data																	
2011 **13 Dec 2010 - 28 Nov·2011**	0.90	0.57	Insufficient data					10.02	0.90	0.72	0.66	Insufficient data					0.69	0.49

Notes:

Limit Value 15 µg/m^3/day

3.3 Cadmium

Table 7 provides the reported nickel concentrations from 15 December 2008 to 27 January 2012, excluding 28 May 2009 to 26 June 2009 and 12 April 2010 to 13th December 2010, for which no data were available.

Table 9 compares the annual average nickel concentrations to the limit of 2 µg/m^3 set out in the TA Luft guidance. Where a concentration is defined as less than the detection limit, the detection limit value is used in the calculation of the rolling average. Rolling averages were not calculated for 2010 as data were available for less than half the year, with no results available between 12 April 2010 and 13 December 2010.

The monthly average concentration was noted as being higher than the annual limit of 2 µg/m^3/day for the following samples:

- 15 December 2008 to 30 January 2009 - East and Farm 300 m (2.53 µg/m^3/day and 8.88 µg/m^3/day, respectively);
- 17 April to 28 May 2009 – North 150 m and West 150 m (2.66 µg/m^3/day and 2.27 µg/m^3/day, respectively);
- 26 June to 24 July 2009 – Control (4.82 µg/m^3/day);
- 25 July to 1 October 2011 - Eastern Boundary (7.57 µg/m^3/day); and
- 28 November·2011 to 27 January 2012- Eastern Boundary (3.80 µg/m^3/day).

Dirt and biological matter were noted in the sampling jar for 25 July to 1 October 2011 - Eastern Boundary and therefore results may not be representative of average concentrations at that location.

Annual averages exceeded the limit value at the Eastern boundary point for 2011 (2.35 µg/m^3/day) based on the available data recorded between 13 December 2010 to 7 March 2011 and 28 November·2011 to 27 January 2012. All other annual averages were well below the limit value of 2 µg/m^3/day.

Table 8: Cadmium Concentrations 15 December 2008 to 27 January 2012

Cadmium (µg/m^3/day)	N	N	N	S	S	S	E	E	E	E	W	W	W	W	Farm	Farm	S-mines	Control
Date		**150 m**	**300 m**		**150 m**	**300 m**		**Bndry**	**150 m**	**300 m**		**Bndry**	**150 m**	**300 m**	**300 m**	**600 m**	**School**	
15 Dec 2008 to 30 Jan 2009	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	2.53	<0.16	No data	<0.16	<0.16	<0.16	<0.16	<0.16	8.88	<0.16	<0.16	<0.16
30 Jan to 17 Apr 2009	No data	<0.11	<0.11	No data	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	0.23	<0.11
17 Apr to 28 May 2009	<0.2	2.66	<0.2	<0.2	<0.2	<0.2	0.90	<0.2	<0.2	<0.2	<0.2	<0.2	2.27	<0.2	0.31	<0.2	No data	<0.2
26 June to 24 July 2009	0.96	0.96	1.19	1.02	0.91	0.96	1.02	0.96	1.47	1.64	0.00	1.25	0.96	0.96	0.96	0.96	1.36	4.82
24 July to 23 Aug 2009	1.25	0.91	0.91	1.08	0.85	0.91	0.00	1.02	0.85	0.96	0.91	0.91	0.91	0.91	0.96	0.91	1.08	1.02
23 Aug to 22 Sept 2009	No data	<0.3	No data	<0.3	<0.3	No data	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	No data	<0.3	<0.3	<0.3
22 Sept to 19 Oct 2009	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	1.10	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
19 Oct to 16 Nov 2009	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
16 Nov to 14 Dec 2009	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	No data	No data	No data	<0.3	<0.3	<0.3	No data	<0.3	<0.3	<0.3
14 Dec 2009 **to 16 Feb** 2010	No data	No data	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	No data	No data	<0.1	<0.1	<0.1	<0.1	No data	0.00	<0.1	No data
16 Feb to 15 Mar 2010	No data	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.43	1.40	No data	<0.3
15 Mar to 12 Apr 2010	No data	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	1.59	<0.3	<0.3	<0.3
13 Dec 2010 to 7 Mar 2011	<0.1	No data	<0.1	0.20	No data	<0.1	<0.1	<0.1	0.30	<0.1	0.20	<0.1	No data	No data	No data	0.20	No data	<0.1
7 Mar to 23 May 2011	0.20	<0.1	No data	No data	No data	No data	0.10	<0.1	0.10	0.20	<0.1	No data	No data	No data	No data	No data	<0.1	<0.1
23 May to 25 July 2011	No data	<0.1	No data	No data	No data	No data	0.10	0.20	0.90	<0.1	<0.1	No data	<0.1	No data	No data	No data	<0.1	<0.1
25 July to 1 Oct 2011	0.73	<0.12	No data	No data	No data	No data	No data	7.57	0.16	0.22	1.02	No data	<0.12	No data	No data	No data	0.16	<0.13
26 Sept to 28 Nov 2011	0.20	No data	No data	No data	No data	No data	No data	No data	<0.1	No data	<0.1	No data	No data	No data	No data	No data	<0.1	<0.1
28 Nov·2011 to 27 Jan 2012	<0.1	No data	No data	No data	No data	No data	No data	3.80	<0.1	No data	<0.1	No data	No data	No data	No data	No data	<0.1	<0.1

Notes:
1) No data entries correspond to broken sample jars in the field. Further information is available in the appendices.
2) From 23 May 2011, the numbers of sampling locations were reduced to North, East boundary, East 150m, West, Silvermines School and the control.
3) Sampling Date 25 July- 26 Sept. was for the following samples: North, East Boundary, East 150, West, School and Control. The remaining samples: North 150, East, East 300 and West 150 were not collected until 1 Oct, so sampling dates for these were 25 July-1 Oct 2011. The table lists the end of sampling for both sets of samples as 1st Oct. The next set of results is for 26 Sept to 28 Nov.- it relates to the reduced sample no. of North, East Boundary, East 150, West, School and Control.

Table 9: Cadmium Annual Averages (2009 to 2011)

Cadmium (µg/m^3/day)	**N**	**N**	**N**	**S**	**S**	**S**	**E**	**E**	**E**	**E**	**W**	**W**	**W**	**W**	**Farm**	**Farm**	**S-mines**	**Control**
Year		**150 m**	**300 m**		**150 m**	**300 m**		**Bndry**	**150 m**	**300 m**		**Bndry**	**150 m**	**300 m**	**300**	**600**	**School**	
2009 30 Jan 2009 - 14 Dec 2009	0.53	0.67	0.43	0.46	0.38	0.41	0.72	0.49	0.51	0.50	0.28	0.43	0.62	0.39	1.48	0.39	0.50	0.83
2010 **14 Dec** 20**09 - 12 Apr** 20**10**	Insufficient data																	
2011 **13 Dec 2010 - 28 Nov·2011**	0.27	0.11	Insufficient data				0.10	2.35	0.28	0.16	0.27	Insufficient data					0.11	0.11

Notes:

Limit Value 2 µg/m^3/day

3.4 Lead

Table 9 provides the reported lead concentrations from 15 December 2008 to 27 January 2012, excluding 28 May 2009 to 26 June 2009 and 12 April 2010 to 13 December 2010, for which no data were available.

Table 11 compares the annual average lead concentrations to the limit of 100 µg/m^3 set out in the TA Luft guidance. Where a concentration is defined as less than the detection limit, the detection limit value is used in the calculation of the rolling average. Rolling averages were not calculated for 2010 as data were available for less than half the year, with no results available between 12 April 2010 and 13 December 2010.

The monthly average concentration was noted as being higher than the annual limit of 100 µg/m^3/day for the following samples:

- 17 April to 28 May 2009 – North 150 m (313.28 µg/m^3/day);
- 22 September to 19 October 2009 – North, Eastern Boundary (127.92 µg/m^3/day and 201.02 µg/m^3/day);
- 14 December 2009 to 16 February 2010 - All monitoring points with the exception of North 300 m and South 150 m. Recorded concentrations ranged between 100.23 µg/m^3/day and 359.79 µg/m^3/day;
- 16 February to 15 March 2010 – Farm 600 m (176.66 µg/m^3/day); and
- 15 March to 12 April 2010 – Farm 300 m (264.33 µg/m^3/day).

Higher than average concentrations were recorded at all points during 14 December 2009 to 16 February 2010. It was not possible to analyse a control sample, as the control sample bottle was broken in the field. Therefore, some degree of doubt exists over the accuracy of these results.

An anomalously high concentration of 1358 µg/m^3/day was recorded for 25 July to 1 October at the Eastern Boundary. Dirt and biological matter were noted in the sampling jar at the eastern boundary in 2012, and therefore the recorded concentrations may not be representative of typical concentrations at this location. When the annual average is recalculated excluding the anomalously high concentration the average concentration is 5.20 µg/m^3/day, which is well below the limit value of 100 µg/m^3/day. Annual average concentrations at all other monitoring points were well below the limit value of 100 µg/m^3/day.

Table 10: Lead Concentrations 15 December 2008 to 27 January 2012

Lead (µg/m^3/day)	N	N	N	S	S	S	E	E	E	E	W	W	W	W	Farm	Farm	S-mines	Control
Date		150 m	300 m		150 m	300 m		Bndry	150 m	300 m		Bndry	150 m	300 m	300 m	600 m	School	
15 Dec 2008 to 30 Jan 2009	24.01	1.18	1.05	5.92	1.48	1.97	11.51	1.22	No data	2.07	21.71	0.59	0.56	1.41	52.63	4.28	4.28	0.56
30 Jan to 17 Apr 2009	No data	2.56	0.68	No data	0.85	2.35	2.99	1.60	4.06	4.27	3.63	0.62	7.69	10.04	2.14	4.49	2.78	0.36
17 Apr to 28 May 2009	2.04	313.28	2.23	0.39	4.70	1.33	3.92	1.68	2.90	6.27	13.31	1.33	10.57	0.90	4.70	2.23	0.00	0.67
26 June to 24 July 2009	10.78	2.27	2.67	1.99	0.85	4.48	24.95	2.61	90.74	3.97	0.00	1.36	1.59	2.10	1.59	4.54	4.42	17.58
24 July to 23 Aug 2009	85.07	7.94	2.61	10.21	2.72	4.54	No data	31.19	2.10	4.25	12.48	13.61	2.89	6.24	4.76	5.33	4.08	2.27
23 Aug to 22 Sept 2009	No data	1.48	No data	1.37	<0.3	No data	71.27	71.27	3.51	<0.3	3.02	<0.3	<0.3	<0.3	0.00	<0.3	29.61	<0.3
22 Sept to 19 Oct 2009	127.92	9.75	60.92	4.51	<0.3	<0.3	18.88	201.02	6.70	2.68	5.36	No data	1.16	No data	1.04	1.04	1.95	2.38
19 Oct to 16 Nov 2009	25.26	2.06	1.06	3.41	0.41	2.17	1.82	0.76	1.00	No data	14.69	1.00	1.23	3.82	21.73	1.06	0.29	0.65
16 Nov to 14 Dec 2009	25.26	1.35	12.34	4.52	0.70	No data	3.11	1.12	No data	No data	No data	<0.3	5.35	No data	No data	4.76	5.11	<0.3
14 Dec 2009 **to 16 Feb** 2010	No data	No data	87.38	102.80	92.52	100.23	359.79	334.09	No data	No data	233.86	187.60	182.46	251.85	No data	No data	308.39	No data
16 Feb to 15 Mar 2010	No data	0.91	1.16	20.71	5.00	0.85	2.31	5.85	2.62	1.89	12.18	5.60	0.97	2.01	67.01	176.66	No data	15.84
15 Mar to 12 Apr 2010	No data	2.88	1.76	3.88	2.64	1.47	2.58	3.76	4.41	5.87	9.40	2.82	2.58	2.94	264.33	42.88	7.05	7.05
13 Dec 2010 to 7 Mar 2011	2.60	No data	1.50	2.80	No data	3.20	1.40	1.50	21.00	1.10	15.00	1.10	No data	No data	No data	15.00	No data	0.80
7 Mar to 23 May 2011	3.40	1.30	No data	No data	No data	No data	0.80	6.40	7.70	2.80	6.00	No data	1.00	No data	No data	No data	1.30	1.30
23 May to 25 July 2011	No data	1.30	No data	No data	No data	No data	1.00	0.90	5.70	2.00	7.00	No data	2.60	No data	No data	No data	3.90	1.90
25 July to 1 Oct 2011	4.96	1.23	No data	No data	No data	No data	No data	1358[3]	13.00	1.45	3.39	No data	2.13	No data	No data	No data	8.09	1.28
26 Sept to 28 Nov 2011	0.80	No data	No data	No data	No data	No data	No data	No data	2.00	No data	4.70	No data	No data	No data	No data	No data	3.90	0.60
28 Nov·2011 to 27 Jan 2012	1.60	No data	No data	No data	No data	No data	No data	12.00	1.60	No data	7.40	No data	No data	No data	No data	No data	4.40	1.20

Notes:
1) No data entries correspond to broken sample jars in the field. Further information is available in the appendices.
2) From 23 May 2011, the numbers of sampling locations were reduced to North, East boundary, East 150m, West, Silvermines School and the control.
3) Sampling Date 25 July- 26 Sept. was for the following samples: North, East Boundary, East 150, West, School and Control. The remaining samples: North 150, East, East 300 and West 150 were not collected until 1 Oct, so sampling dates for these were 25 July-1 Oct 2011. The table lists the end of sampling for both sets of samples as 1 Oct. The next set of results is for 26 Sept to 28 Nov. - it relates to the reduced sample no. of North, East Boundary, East 150, West, School and Control.

[3] 25 July to 1 October- Eastern Boundary returned an anomalously high concentration of 1358 µg/m3/day. The sample was reported as a clear colour with dirt and biological species present and as such may not be representative of typical conditions at that monitoring point.

Table 11: Lead Annual Averages (2009 to 2011)

Lead (µg/m^3/day)	N	N	N	S	S	S	E	E	E	E	W	W	W	W	Farm	Farm	S-mines	Control
Year		**150 m**	**300 m**		**150 m**	**300 m**		**Bndry**	**150 m**	**300 m**		**Bndry**	**150 m**	**300 m**	**300**	**600**	**School**	
2009 30 Jan 2009 - 14 Dec 2009	42.91	37.99	10.44	4.04	1.37	2.19	17.31	34.72	15.86	3.03	9.27	2.16	3.48	2.85	12.66	3.11	6.56	2.78
2010 **14 Dec 2009 - 12 Apr 2010**	Insufficient data																	
2011 **13 Dec 2010 - 28 Nov·2011**	2.67	1.28	Insufficient data					275.76	8.50	1.84	7.25	Insufficient data	1.91	Insufficient data			4.32	1.18

Notes:

Limit Value 100 µg/m^3/day

Section 4
Conclusions and Recommendations

The following conclusions may be drawn from the assessment of the available monitoring results from 15 December 2008 to 27 January 2012.

- The majority of concentrations monitored were well below the air quality legislative limits. Anomalously high concentrations were recorded at the Eastern Boundary monitoring location between 25 July to 1 October 2011. Dirt and biological species were noted in the sample jar and the results may not be representative. Excluding this result, the following exceedances of the TA Luft annual average standards were noted:
  - Arsenic – 2009 – 1 exceedance of 22 calculated annual averages (30 January to 14 December 2009, 5.12 µg/m^3/day);
  - Nickel – No annual exceedances calculated;
  - Cadmium – No annual exceedances calculated; and
  - Lead – No annual exceedances calculated.
- There is no evidence that the sampling station direction relative to the tailings facility influences the metal content in the deposited dust. The prevailing South-Westerly wind might be expected to generate elevated dust concentrations in the gauges situated to the North and east of the facility. There is no evidence to date that wind direction influences dust deposition rates.
- There is no evidence that distance from the tailings facility influences the metal content in the deposited dust. Higher concentrations are not consistently recorded closer to the facility.
- Based on the results of the monitoring programme, the TMF at Gortmore does not negatively affect the compliance of the points monitored according to the TA Luft guidance.
- Particles of dust were previously transported from exposed (non-vegetated) areas of the TMF and were deposited on surrounding areas. This typically occurred during periods of dry weather and under the action of moderate to strong winds. Evidence that these dust movements occur is found in various reports on dust blows during the period 1984 to 1987[4]. In a report assessing the concentrations measured between March 1999 and December 2004 (EPA, 2006)[5], it was noted that TA Luft limits were exceeded for lead, cadmium, nickel and arsenic approximately 15% of the time; however, there appeared to be a downward trend since 2002. The planting of a highly productive and vigorous grass sward in 2008 over all of the capped areas appears to be successful in the management and curtailment of dust blows and the deposition of heavy metals, as only one annual exceedance (arsenic in 2009) was measured.
- It is believed that no further dust monitoring is required given the consistent downward trend in concentrations of arsenic, nickel, cadmium and lead concentrations in deposited dust and significant reduction in exceedances of the TA Luft guidance limits in recent years.

[4] Report of the Investigation into the Presence and Influence of Lead in the Silvermines area of County Tipperary, Inter-Agency Group, Department of Agriculture, Food & Rural Development, June 2000

[5] Draft Report on the Dust Deposition Monitoring Programme for Silvermines Area, County Tipperary, EPA, 2006

Appendix A

Monitoring Results 2008

epa
Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

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A Report to:

a/ Tipperary N County Council.
Attn. Mr. Frank O'Halloran, Senior Engineer.

b/ Environmental Protection Agency.
Attn. Office of Environmental Enforcement

Date of Report 8th Sep 2008

Seventeen Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.

along with a sample of rainwater run-off from the Tailings Pond

Analyses for Trace Metals and Total Dust Deposition

Sampling Period: **3rd Dec 2007 to 18th Jan 2008 (46 days)**

Samples taken by: **Robert Imbusch, Tipperary N Co. Co.**
Received in the laboratory on **3rd March 2008**

The dust samples were collected in Kilner jars (glass jars with 8.8 cm diameter openings and internal height = 20cm, collection area = 0.00608 m^2). The jars were located and exposed for the sampling period. A description and the appearance of each sample, including the depth of water in each jar (rain minus evaporation) is given in the table below.

Analysis Procedure for the Dust Samples:

The objective of the analysis procedure is:
(a) to measure the metals deposited in the dust (as **µg/m^2/day**) and
(b) to measure the total dust deposition (as **mg/m^2/day** - excluding any insects or leaves, etc.).

1. **Removal of insects, leaves etc.** The sample jars may contain rainwater along with algae, dust, dead insects, leaves, etc. (the appearance of each sample is reported below). Therefore each sample as received is filtered through a 1.12 mm sieve (to remove insect parts and leaves, etc.) and the liquid is collected in a beaker. The liquid (after sieving) is transferred back into the collection jar. A wash bottle with distilled water is used to assist with the sieving process.
2. **Note:** If the sample as received is dry – then add 150 ml of deionised water to the jar and swirl around in order to dislodge dust and debris (leaves, insects, moulds, etc.) – before continuing with the filtration process and analysis as described.

3. **Determination of Total Dust Deposition (Total Solids mg/m^2/day):** The volume of the sample is adjusted to approx. 150 ml - by evaporation or by adding distilled water as appropriate - evaporation is by heating the open Kilner jar containing the sample on a low temperature hotplate (sample at approx. 80°C) - heat and cool the glass Kilner jars slowly in order to avoid cracking. Transfer the sample to a 250 ml beaker that has been washed, dried and pre-weighed. Dry the beaker+sample overnight in the oven set at 180°C – cool in the desiccator and weigh. Calculate the total solids as mg/m^2/day.

4. **Digestion Procedure for Trace Metals:** Add 100 ml of 10% HNO_3 to each beaker (containing the dried sample) and cover the beaker with a clock glass. Place the beaker on the hotplate for 1 hour at 100°C followed by 1½ hours at approx. 122°C. Cool and make the volume back up to 100 ml. The digested samples are analysed for trace metals analysis by ICP/MS (Inductively Coupled Plasma/Mass Spectrometry) at the Dublin EPA Laboratory.

5. The laboratory results (as either µg/l or mg/l) are used to calculate the metals deposition in the dust samples and these are expressed as **µg/m^2/day** – results are given in the attached table.

Dust Samples - Description and Appearance

Kilkenny Lab Number	Sample Description	Appearance	Water cm (rain–evaporation)
1322	North	Clear, colourless liquid. Large amount of dust like particulate matter present.	>1.9
1323	North 150m	Clear, colourless liquid. Large amount of dust like particulate matter present.	>1.9
1324	North 300m	Clear, colourless liquid. Small bud from a tree surrounded by mould like growth and small amount of particulate matter present.	1.45
1325	South	Clear, colourless liquid. Large amount of dust like particulate matter present.	1.54
1326	South 150m	Clear, colourless liquid. Small amount of dust like particulate matter present.	1.81
1327	South 300m	Clear, colourless liquid. Small amount of dust like particulate matter present	1.66
1328	East	Clear, colourless liquid. Large amount of dust like particulate matter present	1.49
1329	East Boundary	Clear, colourless liquid. Large amount of dust like particulate matter present	1.5
1330	East 150 m	Clear slightly yellow coloured liquid. Medium amount of dust like particulate matter present.	1.67
1331	East 300m	Clear, colourless liquid. Medium amount of dust like particulate matter present	1.42
1332	West	Clear, colourless liquid. Small amount of vegetative matter present	1.82
1333	West Boundary	Clear, colourless liquid. Very small amount of vegetative matter present	1.51
1334	West 150m	Clear, colourless liquid. One dead insect surrounded by mould like growth as well as a small amount of particulate matter (dust) present.	1.63
1335	West 300m	Clear, colourless liquid. Small amount of vegetative matter present	1.59
1336	Farm 300 (formerly PJ Ryan 1)	Clear, colourless liquid. Small amount of dust like particulate matter present	1.46
1337	Farm 600 (formerly PJ Ryan 2)	Clear, colourless liquid. Medium amount of dust like particulate matter present	1.71
1338	Silvermines School	Clear, colourless liquid. Small amount of vegetative matter and associated muld like growth present.	1.78
1339	Control	Clear, colourless liquid. Very small amount of vegetative matter present	1.71

The results of analyses are given in the attached table.

Analysis Procedure for the Tailings Pond Rainwater Runoff

The sample as received is acidified in 0.5%HNO3 and analysed by ICP/MS – the results are reported as µg/l or mg/l as appropriate (see results sheet).

Signed : M Neill

Michael Neill, Regional Chemist/Manager

Seventeen Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.

- along with a sample of rainwater run-off from the tailings Pond

Sampling Period: 3 Dec 2007 to 18 Jan 2008 (46 days)

Results of Analyses µg per m2 per day.

Laboratory Number		1322	1323	1324	1325	1326	1327	1328	1329	1330	1331	1332	1333	1334	1335	1336	1337	1338	1339	1341	
Sample Description		North	North	North	South	South	South	East	East	East	East	West	West	West	West	Farm	Farm	S-mines	Control	Tailings Pond	
			150 m	300 m		150 m	300 m		Boundary	150 m	300 m		Boundary	150 m	300 m	300	600	School		Units	Run-Off
Analyte	Units																				
Calcium	µg/m2/day Ca	10582	3740	2270	76087	44757	45396	86637	83760	25767	38043	3485	1822	1982	1503	39003	50192	2397.7	1535	mg/l	11.1
Magnesium	µg/m2/day Mg	4763	4444	3772	6809	11733	12020	7545	7481	9527	10774	3996	4668	3900	3804	11125	13171	4315.9	3740	mg/l	2.7
Sodium	µg/m2/day Na	33568	35486	36765	10710	37724	39322	12596	11988	36445	32609	35166	40601	34527	34207	34207	39003	37404	33887	mg/l	5.0
Potassium	µg/m2/day K	13043	2238	4508	5978	5723	5914	6394	6266	5531	5083	1598	1566	1662	1311	5307	6106	1598.5	1215	mg/l	1.0
Aluminium	µg/m2/day Al	941	1787	125	6010	565	786	5882	4188	519	1576	84	59	240	28	985	1419	67	61	µg/l	58
Antimony	µg/m2/day Sb	0.6	<0.3	<0.3	14.7	<0.3	<0.3	18.0	14.6	0.4	<0.3	0.4	<0.3	<0.3	<0.3	0.5	<0.3	<0.3	<0.3	µg/l	<1
Arsenic	µg/m2/day As	**5.5**	1.2	<0.3	**52.1**	1.2	1.2	**79.9**	**49.6**	0.8	1.9	**5.7**	0.4	0.4	<0.3	1.0	1.4	<0.3	<0.3	µg/l	<1
Barium	µg/m2/day Ba	206	80	16	2519	24	17	2986	1730	18	16	145	7.2	7.9	2.8	14	17	24	2.6	µg/l	<6
Beryllium	µg/m2/day Be	<0.3	<0.3	<0.3	0.4	<0.3	<0.3	0.6	0.4	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	µg/l	<1
Boron	µg/m2/day B	64	53	68	168	202	243	219	241	251	300	42	41	42	11	323	362	43	38	µg/l	<10
Cadmium	µg/m2/day Cd	**12**	0.4	<0.3	**9.0**	<0.3	<0.3	**15.6**	**8.5**	<0.3	<0.3	<0.3	<0.3	0.4	<0.3	<0.3	<0.3	<0.3	<0.3	µg/l	<1
Chromium	µg/m2/day Cr	1.9	2.7	0.4	5.7	1.2	1.5	7.6	5.3	0.9	2.7	<0.3	<0.3	0.6	<0.3	1.6	2.3	0.3	<0.3	µg/l	<1
Cobalt	µg/m2/day Co	1.5	1.9	<0.3	4.9	0.7	0.8	7.2	4.5	0.4	1.3	<0.3	<0.3	0.4	<0.3	0.7	1.1	0.5	<0.3	µg/l	<1
Copper	µg/m2/day Cu	34	17	12	62	14	12	61	43	8.9	11	34	19	13	9.0	15	15	6.3	7.8	µg/l	<1
Iron	µg/m2/day Fe	3087	2637	379	**25064**	1118	1199	**27398**	**17104**	652	2548	908	254	895	231	1122	2084	485	307	µg/l	68
Lead	µg/m2/day Pb	100	12	1.3	**3740**	7.2	2.3	**3996**	**2321**	2.9	3.3	24	1.8	1.4	0.5	1.3	2.0	1.2	0.4	µg/l	1.6
Manganese	µg/m2/day Mn	154	356	35	288	66	87	465	285	36	108	14	6	31	7	66	98	13	12	µg/l	<10
Mercury	µg/m2/day Hg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	µg/l	<0.5
Molybdenum	µg/m2/day Mo	0.6	<0.3	<0.3	2.2	<0.3	<0.3	2.5	1.7	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	µg/l	<1
Nickel	µg/m2/day Ni	5.9	6.6	1.0	**49.2**	4.0	4.3	**66.2**	**45.4**	2.5	5.3	1.9	0.7	2.3	1.0	2.8	7.1	1.2	1.8	µg/l	<1
Selenium	µg/m2/day Se	2.6	0.8	0.6	0.9	0.7	0.9	1.1	0.8	0.5	0.6	0.6	0.6	0.6	0.6	0.5	0.7	0.7	0.5	µg/l	<1
Silver	µg/m2/day Ag	1.4	<0.3	<0.3	2.8	<0.3	<0.3	4.3	3.0	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	µg/l	<1
Thallium	µg/m2/day Tl	0.7	<0.3	<0.3	**8.1**	<0.3	<0.3	**10.7**	**7.9**	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	µg/l	<1
Thorium	µg/m2/day Th																			µg/l	<1
Tin	µg/m2/day Sn	<0.6	<0.6	0.7	0.7	<0.6	<0.6	1.1	2.5	<0.6	<0.6	0.7	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	µg/l	<2
Uranium	µg/m2/day U	<0.3	<0.3	<0.3	0.4	<0.3	<0.3	0.6	0.7	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	µg/l	<1
Vanadium	µg/m2/day V	2.0	2.2	0.6	4.5	1.2	1.2	6.0	4.3	0.8	2.5	0.5	0.4	0.7	-0.3	1.4	2.0	0.5	0.3	µg/l	<1
Zinc	µg/m2/day Zn	2029	2359	593	**8120**	1074	1119	**9047**	**5371**	902	582	1365	1020	2107	965	569	1618	886	1240	µg/l	13.2
Dustfall																					
Total Solids mg/m2/day		388	323	166	672	427	453	968	676	316	460	144	116	145	110	382	507	119	104		

Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

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A Report to:

Tipperary N County Council.
Attn. Mr. Frank O'Halloran, Senior Engineer.

Date of Report 8th Sep 2008

Seventeen Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.

along with a sample of rainwater run-off from the Tailings Pond

Analyses for Trace Metals and Total Dust Deposition

Sampling Period: **18th Jan to 20th Feb 2008 (33 days)**

Samples taken by: **Robert Imbusch, Tipperary N Co. Co.**
Received in the laboratory on **14th May 2008**

The dust samples were collected in Kilner jars (glass jars with 8.8 cm diameter openings and internal height = 20cm, collection area = 0.00608 m^2). The jars were located and exposed for the sampling period. A description and the appearance of each sample, including the depth of water in each jar (rain minus evaporation) is given in the table below.

Analysis Procedure for the Dust Samples:

The objective of the analysis procedure is:
(a) to measure the metals deposited in the dust (as **µg/m^2/day**) and
(b) to measure the total dust deposition (as **mg/m^2/day** - excluding any insects or leaves, etc.).

1. **Removal of insects, leaves etc.** The sample jars may contain rainwater along with algae, dust, dead insects, leaves, etc. (the appearance of each sample is reported below). Therefore each sample as received is filtered through a 1.12 mm sieve (to remove insect parts and leaves, etc.) and the liquid is collected in a beaker. The liquid (after sieving) is transferred back into the collection jar. A wash bottle with distilled water is used to assist with the sieving process.
2. **Note:** If the sample as received is dry – then add 150 ml of deionised water to the jar and swirl around in order to dislodge dust and debris (leaves, insects, moulds, etc.) – before continuing with the filtration process and analysis as described.

3. **Determination of Total Dust Deposition (Total Solids mg/m^2/day)**: The volume of the sample is adjusted to approx. 150 ml - by evaporation or by adding distilled water as appropriate - evaporation is by heating the open Kilner jar containing the sample on a low temperature hotplate (sample at approx. 80°C) - heat and cool the glass Kilner jars slowly in order to avoid cracking. Transfer the sample to a 250 ml beaker that has been washed, dried and pre-weighed. Dry the beaker+sample overnight in the oven set at 180°C – cool in the desiccator and weigh. Calculate the total solids as mg/m^2/day.

4. **Digestion Procedure for Trace Metals**: Add 100 ml of 10% HNO_3 to each beaker (containing the dried sample) and cover the beaker with a clock glass. Place the beaker on the hotplate for 1 hour at 100°C followed by 1½ hours at approx. 122°C. Cool and make the volume back up to 100 ml. The digested samples are analysed for trace metals analysis by ICP/MS (Inductively Coupled Plasma/Mass Spectrometry) at the Dublin EPA Laboratory.

5. The laboratory results (as either µg/l or mg/l) are used to calculate the metals deposition in the dust samples and these are expressed as **µg/m^2/day** – results are given in the attached table.

Dust Samples - Description and Appearance

Kilkenny Lab Number	Sample Description	Appearance	Water cm (rain–evaporation)
2524	North	Clear, colourless liquid. 2-3 large dead insects plus associated algal growths.	6.5
2525	North 150m	Clear, colourless liquid. Very small amount of particulate matter present.	5.6
2526	North 300m	Clear, colourless liquid. Very small amount of particulate matter present.	6.9
2527	South	No jar. Sample broke due to heavy frost.	--
2528	South 150m	No jar. Sample broke due to heavy frost.	--
2529	South 300m	Clear, colourless liquid. Small amount of dust like particulate matter present.	16.2
2530	East	Clear, colourless liquid. Small amount of vegetative matter present.	>19 (jar full)
2531	East Boundary	Clear, colourless liquid. Small amount of dust like particulate matter present	17.0
2532	East 150 m	Clear, colourless liquid. Very small amount of dust like particulate matter present.	9.9
2533	East 300m	Clear, colourless liquid. Small amount of vegetative matter including twigs present.	17.5
2534	West	Clear, colourless liquid. Very small amount of particulate matter present.	6.8
2535	West Boundary	Clear, colourless liquid. Very small amount of particulate matter present.	5.1
2536	West 150m	Clear, colourless liquid. One large dead insect and associated algal growth present.	5.4
2537	West 300m	Clear, colourless liquid. Small amount of particulate matter plus 1-2 dead insects present.	4.8
2538	Farm 300 (formerly PJ Ryan 1)	No jar. Sample broke due to heavy frost.	--
2539	Farm 600 (formerly PJ Ryan 2)	Clear, colourless liquid. Small amount of vegetative matter present.	9.5
2540	Silvermines School	Clear, colourless liquid. One large dead insect and associated algal growth present.	8.4
2541	Control	Clear, colourless liquid. Large amount of sand like matter present.	

The results of analyses are given in the attached table.

Analysis Procedure for the Tailings Pond Rainwater Runoff

The sample as received is acidified in 0.5%HNO3 and analysed by ICP/MS – the results are reported as µg/l or mg/l as appropriate (see results sheet).

Signed : M Neill

Michael Neill, Regional Chemist/Manager

Fourteen Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.

- along with a sample of rainwater run-off from the tailings Pond

Sampling Period: 18 Jan to 20 Feb 2008 (33 days)

Results of Analyses µg per m2 per day.

Laboratory Number		2524	2525	2526	2527	2528	2529	2530	2531	2532	2533	2534	2535	2536	2537	2538	2539	2540	2541	2542	
Sample Description		North	North	North	South	South	South	East	East	East	East	West	West	West	West	Farm	Farm	S-mines	Control	Tailings Pond	
			150 m	300 m		150 m	300 m		Boundary	150 m	300 m		Boundary	150 m	300 m	300	600	School		Units	Run-Off
Analyte	Units																				
Calcium	µg/m2/day Ca	3812	2109	1568	No sample - jar broken by heavy frost	No sample - jar broken by heavy frost	1883	4288	4358	3902	2755	4743	1718	2159	1828	No sample - jar broken by heavy frost	5004	2489	56098	mg/l	216
Magnesium	µg/m2/day Mg	2945	2364	1703			2945	7413	7112	7012	4618	7413	2760	2109	1938		6261	3211	11220	mg/l	110
Sodium	µg/m2/day Na	18182	19935	14325			25144	65615	62610	64613	40321	67618	24142	18482	15978		53594	23792	21137	mg/l	7.6
Potassium	µg/m2/day K	8815	1107	996.7			1337	2960	2955	2835	2104	4338	1312	1052	1077		2615	8465	10719	mg/l	2.7
Aluminium	µg/m2/day Al	127	110	100			51	154	151	174	135	180	53	147	145		237	131	531	µg/l	<25
Antimony	µg/m2/day Sb	<2.5	<2.5	<2.5			<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5		<2.5	<2.5	<2.5	µg/l	<5
Arsenic	µg/m2/day As	<2.5	<2.5	<2.5			<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5		<2.5	<2.5	<2.5	µg/l	<5
Barium	µg/m2/day Ba	40	<15	<15			<15	<15	24	<15	<15	18	<15	<15	<15		55	<15	<15	µg/l	<30
Beryllium	µg/m2/day Be	<2.5	<2.5	<2.5			<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5		<2.5	<2.5	<2.5	µg/l	<5
Boron	µg/m2/day B	49	64	<25			<2.5	30	87	56	44	68	<25	82	73		33	90	422	µg/l	<50
Cadmium	µg/m2/day Cd	<2.5	<2.5	<2.5			<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5		<2.5	<2.5	<2.5	µg/l	<5
Chromium	µg/m2/day Cr	<2.5	<2.5	<2.5			<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5		<2.5	<2.5	<2.5	µg/l	<5
Cobalt	µg/m2/day Co	<2.5	<2.5	3.5			<2.5	3.2	8.6	4.4	<2.5	2.8	<2.5	3.8	5.3		3.8	<2.5	<2.5	µg/l	<5
Copper	µg/m2/day Cu	126	111	133			39	113	41	24	110	118	61	175	179		98	104	102	µg/l	<5
Iron	µg/m2/day Fe	791	306	464			374	1282	464	411	541	877	511	516	586		1813	892	781	µg/l	170
Lead	µg/m2/day Pb	2.8	<2.5	<2.5			<2.5	<2.5	3.3	2.8	<2.5	4.9	<2.5	3.1	<2.5		50.6	3.6	<2.5	µg/l	<5
Manganese	µg/m2/day Mn	38	<25	<25			<25	52	<25	<25	<25	26	<25	<25	<25		<25	<25	33	µg/l	<50
Mercury	µg/m2/day Hg	<0.25	<0.25	<0.25			<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25		<0.25	<0.25	<0.25	µg/l	<0.5
Molybdenum	µg/m2/day Mo	<2.5	<2.5	<2.5			<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5		<2.5	<2.5	<2.5	µg/l	<5
Nickel	µg/m2/day Ni	2.6	<2.5	<2.5			<2.5	7.2	<2.5	2.9	<2.5	4.0	<2.5	2.5	<2.5		3.5	2.6	<2.5	µg/l	14.6
Selenium	µg/m2/day Se	<2.5	<2.5	<2.5			<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5		<2.5	<2.5	<2.5	µg/l	<5
Silver	µg/m2/day Ag	<2.5	<2.5	<2.5			<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5		<2.5	<2.5	<2.5	µg/l	<5
Thallium	µg/m2/day Tl	<2.5	<2.5	<2.5			<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5		<2.5	<2.5	<2.5	µg/l	<5
Thorium	µg/m2/day Th																			µg/l	
Tin	µg/m2/day Sn	<5.0	<5.0	<5.0			<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0		<5.0	<5.0	<5.0	µg/l	<10
Uranium	µg/m2/day U	<2.5	<2.5	<2.5			<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5		<2.5	<2.5	<2.5	µg/l	<5
Vanadium	µg/m2/day V	<2.5	<2.5	<2.5			<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5		<2.5	<2.5	<2.5	µg/l	<5
Zinc	µg/m2/day Zn	947	581	761			811	1190	1237	877	736	1165	816	1436	1196		458	465	335	µg/l	3020
Dustfall																					
Total Solids mg/m2/day		126	75	86			171	183	204	122	228	88	73	66	51		1980	99	363		

Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

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A Report to:

Tipperary N County Council.
Attn. Mr. Frank O'Halloran, Senior Engineer.

Date of Report 8th Sep 2008

Seventeen Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.

along with a sample of rainwater run-off from the Tailings Pond

Analyses for Trace Metals and Total Dust Deposition

Sampling Period: **20th March to 8th May 2008 (49 days)**

Samples taken by: **Robert Imbusch, Tipperary N Co. Co.**
Received in the laboratory on **14th July 2008**

The dust samples were collected in Kilner jars (glass jars with 8.8 cm diameter openings and internal height = 20cm, collection area = 0.00608 m^2). The jars were located and exposed for the sampling period. A description and the appearance of each sample, including the depth of water in each jar (rain minus evaporation) is given in the table below.

Analysis Procedure for the Dust Samples:

The objective of the analysis procedure is:
(a) to measure the metals deposited in the dust (as **µg/m^2/day**) and
(b) to measure the total dust deposition (as **mg/m^2/day** - excluding any insects or leaves, etc.).

1. **Removal of insects, leaves etc.** The sample jars may contain rainwater along with algae, dust, dead insects, leaves, etc. (the appearance of each sample is reported below). Therefore each sample as received is filtered through a 1.12 mm sieve (to remove insect parts and leaves, etc.) and the liquid is collected in a beaker. The liquid (after sieving) is transferred back into the collection jar. A wash bottle with distilled water is used to assist with the sieving process.
2. **Note:** If the sample as received is dry – then add 150 ml of deionised water to the jar and swirl around in order to dislodge dust and debris (leaves, insects, moulds, etc.) – before continuing with the filtration process and analysis as described.

3. **Determination of Total Dust Deposition (Total Solids mg/m^2/day)**: The volume of the sample is adjusted to approx. 150 ml - by evaporation or by adding distilled water as appropriate - evaporation is by heating the open Kilner jar containing the sample on a low temperature hotplate (sample at approx. 80°C) - heat and cool the glass Kilner jars slowly in order to avoid cracking. Transfer the sample to a 250 ml beaker that has been washed, dried and pre-weighed. Dry the beaker+sample overnight in the oven set at 180°C – cool in the desiccator and weigh. Calculate the total solids as mg/m^2/day.

4. **Digestion Procedure for Trace Metals**: Add 100 ml of 10% HNO_3 to each beaker (containing the dried sample) and cover the beaker with a clock glass. Place the beaker on the hotplate for 1 hour at 100°C followed by 1½ hours at approx. 122°C. Cool and make the volume back up to 100 ml. The digested samples are analysed for trace metals analysis by ICP/MS (Inductively Coupled Plasma/Mass Spectrometry) at the Dublin EPA Laboratory.

5. The laboratory results (as either µg/l or mg/l) are used to calculate the metals deposition in the dust samples and these are expressed as **µg/m^2/day** – results are given in the attached table.

Dust Samples - Description and Appearance

Kilkenny Lab Number	Sample Description	Appearance	Water cm (rain–evaporation)
3564	North	Murky green liquid. Unable to discern contents. Strong musty smell. **This sample had an unusual appearance – very green when compared with samples from nearby locations – see attached photograph.**	8.0
3565	North 150m	Clear, colourless liquid. Number of dead insect and insect parts present.	4.9
3566	North 300m	Clear, slightly greenish coloured liquid. Large amount of vegetative debris present.	7.6
3567	South	Clear, colourless liquid. Two dead insects, insect parts and associated algal growth present.	4.3
3568	South 150m	Clear, colourless liquid. Large amount of dust particles present.	3.6
3569	South 300m	Slightly murky brownish coloured liquid. Large amount of dust and vegetative matter.	3.2
3570	East	Clear, colourless liquid. Two dead insects and insect parts as well as a small amount of particulate matter present.	9.6
3571	East Boundary	Clear, slightly greenish coloured liquid. Large amount of dead insect parts and particulate matter present.	4.8
3572	East 150 m	Clear, colourless liquid. Two dead insects with associated algal growth and small amount of particulate matter present.	2.9
3573	East 300m	Clear, colourless liquid. Large number of dead insects, insect parts and associated algal growth present.	4.7
3574	West	Colourless, slightly murky liquid. Large number of dead insects, insect parts and associated algal growth present. **This sample contained a very large volume of water when compared with samples from nearby locations – see attached photograph**	15.0
3575	West Boundary	Clear, colourless liquid. Large amount of particulate matter present.	4.6
3576	West 150m	Clear, colourless liquid. Small amount of dead insects, insect parts and associated algal growth present.	6.4
3577	West 300m	Clear, slightly green coloured liquid. Small number of dead insects and insect parts present. Amount of green algae present.	4.8
3578	Farm 300 (formerly PJ Ryan 1)	Clear, slightly green coloured liquid. Small amount of dead insects, insect parts and associated algal growth present.	2.6
3579	Farm 600 (formerly PJ Ryan 2)	Clear, slightly green coloured liquid. Small amount of dead insects, insect parts and associated algal growth present.	5.7
3580	Silvermines School	Clear, colourless liquid. Large amount of dust like and vegetative debris present.	11.0
3581	Control	Clear, greenish coloured liquid. Large amount of dead insect and insect parts present. Large amount of algal growth present.	4.3

The results of analyses are given in the attached table.

Analysis Procedure for the Tailings Pond Rainwater Runoff

The sample as received is acidified in 0.5%HNO3 and analysed by ICP/MS – the results are reported as µg/l or mg/l as appropriate (see results sheet).

Signed : M Neill

Michael Neill, Regional Chemist/Manager

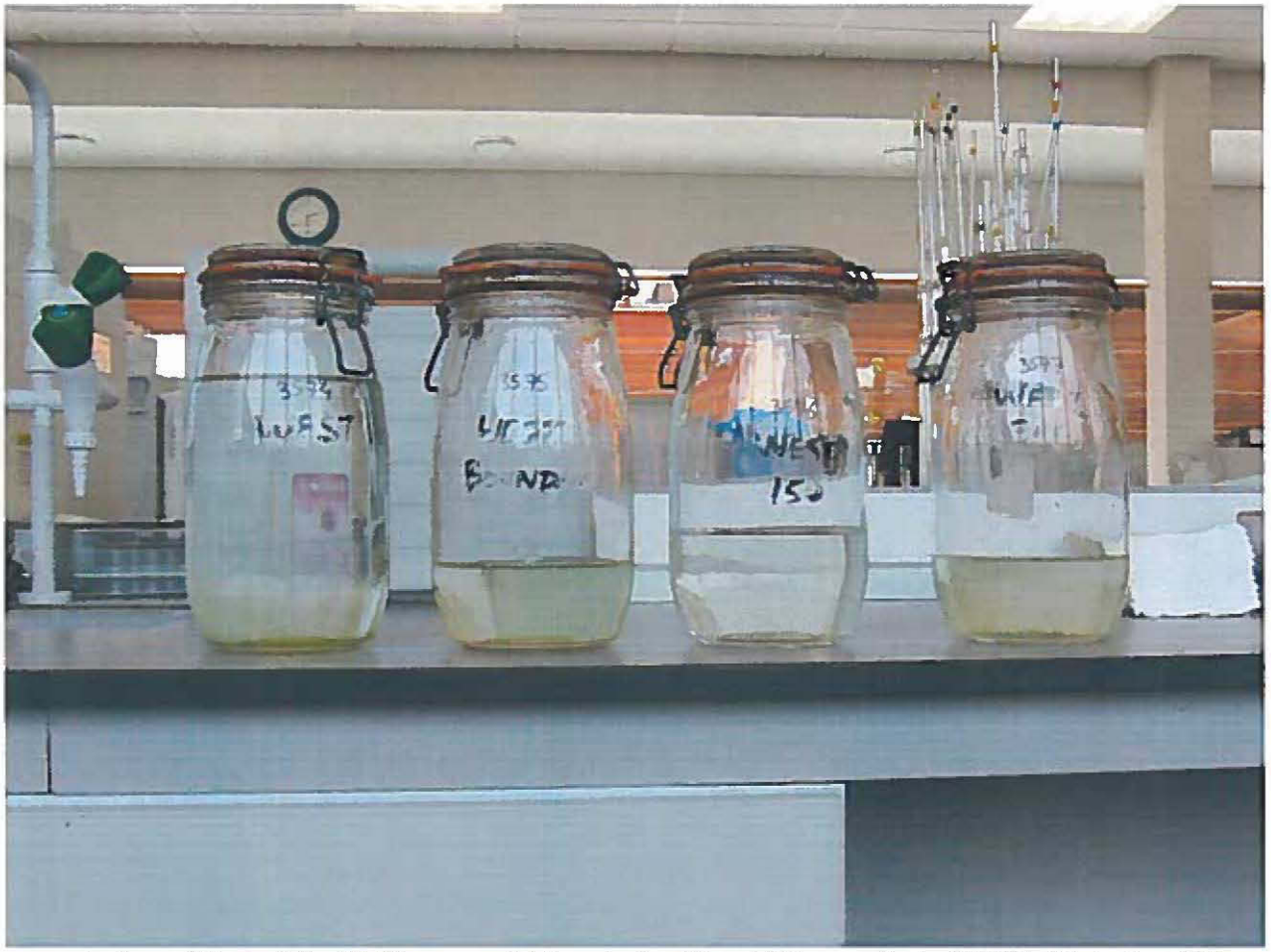
Seventeen Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.

- along with a sample of rainwater run-off from the tailings Pond

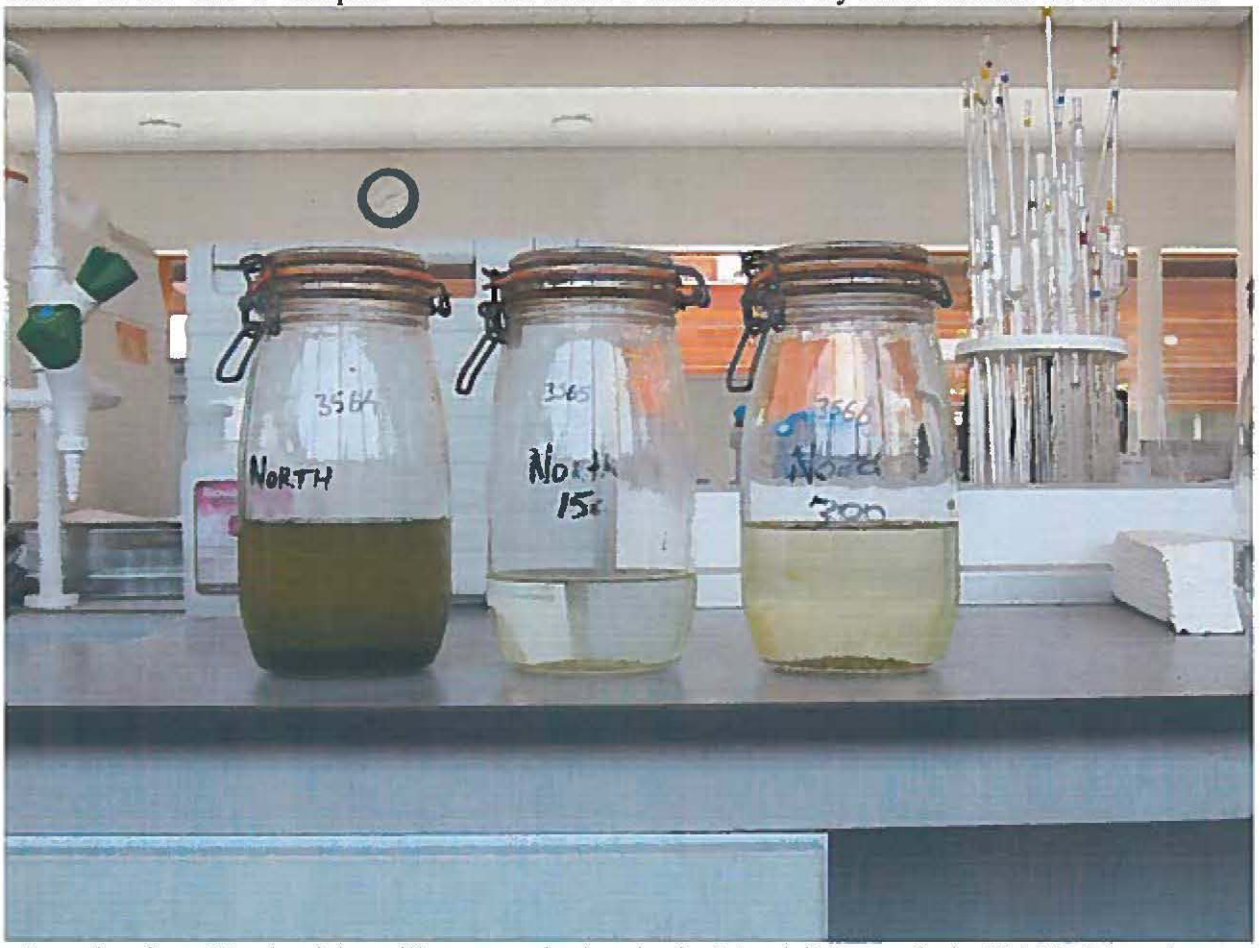
Sampling Period: 20 march to 8 May 2008 (49 days)

Results of Analyses µg per m2 per day.

Laboratory Number		3564	3565	3566	3567	3568	3569	3570	3571	3572	3573	3574	3575	3576	3577	3578	3579	3580	3581	3582	
Sample Description		North	North 150 m	North 300 m	South	South 150 m	South 300 m	East	East Boundary	East 150 m	East 300 m	West	West Boundary	West 150 m	West 300 m	Farm 300	Farm 600	S-mines School	Control	Tailings Pond Units	Tailings Pond Run-Off
Analyte	Units																				
Calcium	µg/m2/day Ca	48000	4166	4296	3048	50013	46992	5874	6344	2269	4028	4834	3759	2642	2239	1987	2860	9600	2138	mg/l	351
Magnesium	µg/m2/day Mg	13500	7317	5706	5505	11513	12789	6780	5673	3524	5538	6780	5773	5236	3692	3793	4632	7888	3524	mg/l	210
Sodium	µg/m2/day Na	71000	78209	48335	47999	10943	8929	70824	57398	29001	44979	66796	56055	51692	31216	32995	46657	56727	34237	mg/l	15.7
Potassium	µg/m2/day K	73000	4296	6713	3659	4263	5505	4330	17454	3310	6210	5303	3759	5505	2444	2145	2531	9902	2806	mg/l	5
Aluminium	µg/m2/day Al	2350	38	60	24	6728	6378	98	431	98	47	93	119	64	114	99	66	102	97	µg/l	<5
Antimony	µg/m2/day Sb	2.1	<0.34	<0.34	<0.34	1.3	1.8	<0.34	<0.34	<0.34	<0.34	0.9	1.4	<0.34	<0.34	<0.34	<0.34	3.5	<0.34	µg/l	<1
Arsenic	µg/m2/day As	23.9	0.8	0.7	0.6	10.2	18.9	1.0	1.2	0.4	0.8	15.3	18.5	0.9	0.5	0.5	0.7	3.8	0.5	µg/l	<1
Barium	µg/m2/day Ba	869	21	26	13	66	129	77	78	12	19	480	399	6.3	13	5.0	21	303	7	µg/l	8.9
Beryllium	µg/m2/day Be	<0.34	<0.34	<0.34	<0.34	0.39	0.60	<0.34	<0.34	<0.34	<0.34	<0.34	<0.34	<0.34	<0.34	<0.34	<0.34	<0.34	<0.34	µg/l	<1
Boron	µg/m2/day B	166	24	33	13	280	191	73	45	47	37	48	22	27	48	36	25	167	18	µg/l	21
Cadmium	µg/m2/day Cd	48	<0.34	<0.34	<0.34	<0.34	1.0	0.34	0.58	<0.34	0.41	<0.34	3.0	<0.34	<0.34	<0.34	<0.34	1.05	0	µg/l	5.9
Chromium	µg/m2/day Cr	11.0	0.6	<0.34	<0.34	21.0	38.3	<0.34	<0.34	<0.34	<0.34	<0.34	<0.34	<0.34	<0.34	<0.34	<0.34	<0.34	<0.34	µg/l	<1
Cobalt	µg/m2/day Co	12.6	11.6	5.0	1.6	12.9	19.8	0.6	2.1	3.5	2.6	4.3	3.0	37.6	15.0	11.7	5.7	6.8	0.8	µg/l	<1
Copper	µg/m2/day Cu	89	20	16	12	37	67	26	30	23	14	20	21	23	25	14	24	31	11	µg/l	13.1
Iron	µg/m2/day Fe	4976	270	215	376	23798	22103	561	1309	259	352	1238	2555	467	554	342	463	601	973	µg/l	334
Lead	µg/m2/day Pb	165	2.4	2.0	0.7	29	52	6.7	26	2.2	1.4	49	243	3.9	3.6	2.5	16	<0.34	2.2	µg/l	<1
Manganese	µg/m2/day Mn	393	19	27	11	990	1980	18	52	36	18	34	67	18	16	8	27	49	22	µg/l	116
Mercury	µg/m2/day Hg	0.53	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	µg/l	<0.5
Molybdenum	µg/m2/day Mo	2.2	<0.34	<0.34	<0.34	<0.34	0.5	<0.34	<0.34	<0.34	<0.34	<0.34	<0.34	<0.34	<0.34	<0.34	<0.34	<0.34	<0.34	µg/l	<1
Nickel	µg/m2/day Ni	27	1.6	<0.34	<0.34	43	70	<0.34	2.9	<0.34	<0.34	1.5	5.4	<0.34	<0.34	<0.34	0.9	1.3	0.7	µg/l	17.3
Selenium	µg/m2/day Se	16.0	1.5	1.3	1.1	0.7	1.1	1.3	1.1	0.7	0.9	1.4	1.3	0.9	0.6	0.7	1.2	1.3	1.0	µg/l	<1
Silver	µg/m2/day Ag		<0.34																	µg/l	
Thallium	µg/m2/day Tl	2.6	<0.34	<0.34	<0.34	<0.34	<0.34	<0.34	<0.34	<0.34	<0.34	0.99	1.27	<0.34	<0.34	<0.34	<0.34	<0.34	<0.34	µg/l	9.4
Thorium	µg/m2/day Th																			µg/l	
Tin	µg/m2/day Sn	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	0.79	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	µg/l	<2
Uranium	µg/m2/day U	0.76	<0.34	<0.34	<0.34	0.47	0.81	<0.34	<0.34	<0.34	<0.34	<0.34	<0.34	<0.34	<0.34	<0.34	<0.34	<0.34	<0.34	µg/l	1.5
Vanadium	µg/m2/day V	9.4	0.5	1.1	0.6	19.5	36.3	1.1	1.6	0.6	0.4	0.9	0.9	0.7	0.8	0.9	0.4	1.3	0.7	µg/l	<1
Zinc	µg/m2/day Zn	1175	660	143	349	873	1452	774	634	366	379	1206	735	1358	386	261	1260	403	792	µg/l	3320
Dustfall																					
Total Solids mg/m2/day		2163	221	227	145	1022	1782	211	295	118	172	274	224	161	149	119	164	245	155		



Four sample from West of the Tailings pond taken in the March/May period of 2008. Note the differences in volumes for the various samples – these are taken within a relatively short distance of each other.



Three Samples from North of the tailing s pond taken in the March/May period of 2008. Note the differences in appearance for the various samples – with very high algal growth in one of the samples – these are taken within a relatively short distance of each other.

Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

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A Report to:

Tipperary N County Council.
Attn. Mr. Michael Wolfe, Senior Engineer.

Date of Report 8th April 2009

Seventeen Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.

Analyses for Trace Metals and Total Dust Deposition

Sampling Period: **9th May to 10th June 2008 (32 days)**

Samples taken by: **Robert Imbusch, Tipperary N Co. Co.**
Received in the laboratory on 14th August 2008

The dust samples were collected in Kilner jars (glass jars with 8.8 cm diameter openings and internal height = 20cm, collection area = 0.00608 m^2). The jars were located and exposed for the sampling period. A description and the appearance of each sample, including the depth of water in each jar (rain minus evaporation) is given in the table below.

Analysis Procedure for the Dust Samples:

The objective of the analysis procedure is:
(a) to measure the metals deposited in the dust (as **µg/m^2/day**) and
(b) to measure the total dust deposition (as **mg/m^2/day** - excluding any insects or leaves, etc.).

1. **Removal of insects, leaves etc.** The sample jars may contain rainwater along with algae, dust, dead insects, leaves, etc. (the appearance of each sample is reported below). Therefore each sample as received is filtered through a 1.12 mm sieve (to remove insect parts and leaves, etc.) and the liquid is collected in a beaker. The liquid (after sieving) is transferred back into the collection jar. A wash bottle with distilled water is used to assist with the sieving process.
   Note: If the sample as received is dry – then add 150 ml of deionised water to the jar and swirl around in order to dislodge dust and debris (leaves, insects, moulds, etc.) – before continuing with the filtration process and analysis as described.

2. **Determination of Total Dust Deposition (Total Solids mg/m^2/day)**: The volume of the sample is adjusted to approx. 150 ml - by evaporation or by adding distilled water as appropriate - evaporation is by heating the open Kilner jar containing the sample on a low temperature hotplate (sample at approx. 80°C) - heat and cool the glass Kilner jars slowly in order to avoid cracking. Transfer the sample to a 250 ml beaker that has been washed, dried and pre-weighed. Dry the beaker+sample overnight in the oven set at 180°C – cool in the desiccator and weigh. Calculate the total solids as mg/m^2/day.

3. **Digestion Procedure for Trace Metals**: Add 100 ml of 10% HNO_3 to each beaker (containing the dried sample) and cover the beaker with a clock glass. Place the beaker on the

hotplate for 1 hour at 100°C followed by 1½ hours at approx. 122°C. Cool and make the volume back up to 100 ml. The digested samples are analysed for trace metals analysis by ICP/MS (Inductively Coupled Plasma/Mass Spectrometry) at the Dublin EPA Laboratory.

4. The laboratory results (as either µg/l or mg/l) are used to calculate the metals deposition in the dust samples and these are expressed as **µg/m^2/day** – results are given in the attached table.

Dust Samples - Description and Appearance

Kilkenny Lab Number	Sample Description	Appearance	Water cm (rain–evaporation)
4198	North	Dark green coloured opaque liquid. Very large amount of particulate matter absent.	1.3
4199	North 150m	No liquid present. Large amount of dust and dead insect matter present.	Dry.
4200	North 300m	Clear, brown coloured liquid. Number of leaves and particulate matter present.	0.6
4201	South	Clear, colourless liquid. Dead insect and associated algal growth present.	1.7
4202	South 150m	Clear, colourless liquid. Large amount of dust present. Dead insects, insect parts and associated algal growth present.	2.5
4203	South 300m	Clear, colourless liquid. Number of dead insects, insect parts and associated algal growth present.	2.4
4204	East	Clear, colourless liquid. Small amount of vegetative debris present.	1.4
4205	East Boundary	Clear colourless liquid. Small amount of particulate matter present.	1.9
4206	East 150 m	Clear, brown coloured liquid. Large amount of dust like particles present.	0.7
4207	East 300m	Clear, colourless liquid. Large amount of dust like particles present.	1.9
4208	West	Clear, colourless liquid. Small amount of dust like particles present	2.4
4209	West Boundary	Clear, colourless liquid. Small amount of dust present. Dead insect and associated algal growth present.	2.0
4210	West 150m	Clear, brownish coloured liquid. Large amount of dust like particles present.	2.1
4211	West 300m	Clear, brownish coloured liquid. Very large amount of dust like particles present.	1.9
4212	Farm 300 (formerly PJ Ryan 1)	Clear, colourless liquid. Dead insect and associated algal growth plus some particulate matter present.	1.8
4213	Farm 600 (formerly PJ Ryan 2)	Clear, colourless liquid. Dead insect and associated algal growth plus small amount of vegetative matter present.	1.2
4214	Silvermines School	Clear, colourless liquid. Dead insect, insect parts and dust like particulate matter present.	2.7
4215	Control	Clear, colourless liquid. Small amount of vegetative matter present.	1.3

The results of analyses are given in the attached table.

Signed : M Neill

Michael Neill, Regional Chemist/Manager

Seventeen Dust Samples (plus control) from the Vicinity c .e Mogul Tailings Pond at Silvermines, Co. Tipper

Sampling Period: 9th May to 10th June 2008 (32 days)

Results of Analyses µg per m2 per day.

Laboratory Number		4198	4199	4200	4201	4202	4203	4204	4205	4206	4207	4208	4209	4210	4211	4212	4213	4214	4215
Sample Description		**North**	**North 150 m**	**North 300 m**	**South**	**South 150 m**	**South 300 m**	**East**	**East Boundary**	**East 150 m**	**East 300 m**	**West**	**West Boundary**	**West 150 m**	**West 300 m**	**Farm 300**	**Farm 600**	**S-mines School**	**Control**
Analyte	**Units**																		
Calcium	µg/m2/day Ca	29800	32020	2760	1275	5654	3331	1331	1270	10125	10331	2549	1290	36955	88919	3850	1187	3516	8172
Magnesium	µg/m2/day Mg	4939	6425	714	<520	7607	3778	<520	<520	1270	2380	<520	<520	2575	11667	905	<520	550	1850
Sodium	µg/m2/day Na	8943	2220	3115	2205	98684	29605	2431	1614	4744	5345	1984	1475	9509	7453	2775	2041	2190	4636
Potassium	µg/m2/day K	43020	5705	6014	3007	5808	4415	1362	<520	6271	7607	1347	1013	16036	22512	6219	2025	2750	6116
Aluminium	µg/m2/day Al	1177	7350	219	108	251	295	71	69	1326	1244	223	129	1593	5520	119	186	242	632
Antimony	µg/m2/day Sb	2.4	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	1.1	<0.5	1.8	2.5	0.7	0.7	<0.5	<0.5	2.7	<0.5
Arsenic	µg/m2/day As	**21**	**5.1**	0.8	<0.5	0.8	2.4	<0.5	<0.5	**11.5**	**4.2**	**27**	**41**	**10**	**12**	0.5	0.6	3.3	2.5
Barium	µg/m2/day Ba	689	512	28	8	22	16	11	11	273	15	797	1316	423	249	8	13	253	10
Beryllium	µg/m2/day Be	<0.5	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Boron	µg/m2/day B	58	206	202	58	29	51	11	9	30	141	77	22	49	132	25	58	67	234
Cadmium	µg/m2/day Cd	**10.8**	0.6	<0.5	<0.5	1.9	<0.5	<0.5	<0.5	**21.8**	0.6	<0.5	<0.5	**4.1**	**6.8**	<0.5	<0.5	0.7	<0.5
Chromium	µg/m2/day Cr	4.7	22.8	0.7	0.7	1.6	1.5	<0.5	0.6	4.6	3.9	0.8	<0.5	4.1	19.7	<0.5	<0.5	0.6	1.9
Cobalt	µg/m2/day Co	2.6	12.8	<0.5	<0.5	0.5	0.5	<0.5	<0.5	4.5	2.4	<0.5	<0.5	2.5	10.1	<0.5	<0.5	1.3	1.4
Copper	µg/m2/day Cu	122	30	17	20	27	15	9	11	50	18	12	13	60	102	39	23	42	13
Iron	µg/m2/day Fe	8275	16499	535	977	1090	1650	293	1573	5808	5088	4461	5500	5191	20662	316	545	704	3151
Lead	µg/m2/day Pb	**354**	47	12	5	16	12	7	5	<0.5	24	<0.5	<0.5	77	85	4	10	<0.5	5
Manganese	µg/m2/day Mn	219	550	57	17	90	41	34	11	735	341	52	26	317	2313	19	16	46	268
Mercury	µg/m2/day Hg	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26
Molybdenum	µg/m2/day Mo	1.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.8	1.6	<0.5	<0.5	<0.5	<0.5
Nickel	µg/m2/day Ni	**20**	**66**	1.2	1.6	3.5	3.2	0.6	1.5	**23**	**16**	10	13	14	**62**	1.2	1.0	1.6	8.4
Selenium	µg/m2/day Se	1.9	1.7	<0.5	<0.5	1.5	0.8	<0.5	<0.5	1.9	<0.5	<0.5	<0.5	1.4	2.5	<0.5	<0.5	<0.5	<0.5
Silver	µg/m2/day Ag																		
Thallium	µg/m2/day Tl	**4.0**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**2.5**	**3.3**	0.7	<0.5	<0.5	<0.5	<0.5	<0.5
Thorium	µg/m2/day Th																		
Tin	µg/m2/day Sn	<1.0	<1.0	<1.0	<1.0	1.6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Uranium	µg/m2/day U	<0.5	0.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Vanadium	µg/m2/day V	2.9	15.6	0.5	0.5	2.5	1.5	<0.5	<0.5	4.5	4.1	1.0	0.7	2.8	12.2	<0.5	0.6	0.7	2.0
Zinc	µg/m2/day Zn	596	327	409	194	961	273	171	139	863	163	224	131	756	699	181	160	274	162
Dustfall																			
Total Solids mg/m2/day		**1374**	**2671**	105	32	403	186	39	30	301	261	54	46	482	**1906**	69	57	77	137

Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

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A Report to:

Tipperary N County Council.
Attn. Mr. Michael Wolfe, Senior Engineer.

Date of Report 8th April 2009

Fifteen Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.

along with a sample of rainwater run-off from the Tailings Pond

Analyses for Trace Metals and Total Dust Deposition

Sampling Period: **11th June to 11th July 2008 (31 days)**

Samples taken by: **Justine Haugh, Tipperary N Co. Co.**
Received in the laboratory on **15th October 2008**

The dust samples were collected in Kilner jars (glass jars with 8.8 cm diameter openings and internal height = 20cm, collection area = 0.00608 m^2). The jars were located and exposed for the sampling period. A description and the appearance of each sample, including the depth of water in each jar (rain minus evaporation) is given in the table below.

Analysis Procedure for the Dust Samples:

The objective of the analysis procedure is:
(a) to measure the metals deposited in the dust (as **µg/m²/day**) and
(b) to measure the total dust deposition (as **mg/m²/day** - excluding any insects or leaves, etc.).

1. **Removal of insects, leaves etc**. The sample jars may contain rainwater along with algae, dust, dead insects, leaves, etc. (the appearance of each sample is reported below). Therefore each sample as received is filtered through a 1.12 mm sieve (to remove insect parts and leaves, etc.) and the liquid is collected in a beaker. The liquid (after sieving) is transferred back into the collection jar. A wash bottle with distilled water is used to assist with the sieving process.
   Note: If the sample as received is dry – then add 150 ml of deionised water to the jar and swirl around in order to dislodge dust and debris (leaves, insects, moulds, etc.) – before continuing with the filtration process and analysis as described.

2. **Determination of Total Dust Deposition (Total Solids mg/m²/day)**: The volume of the sample is adjusted to approx. 150 ml - by evaporation or by adding distilled water as appropriate - evaporation is by heating the open Kilner jar containing the sample on a low temperature hotplate (sample at approx. 80°C) - heat and cool the glass Kilner jars slowly in order to avoid cracking. Transfer the sample to a 250 ml beaker that has been washed, dried and pre-weighed. Dry the beaker+sample overnight in the oven set at 180°C – cool in the desiccator and weigh. Calculate the total solids as mg/m^2/day.

3. **Digestion Procedure for Trace Metals:** Add 100 ml of 10% HNO_3 to each beaker (containing the dried sample) and cover the beaker with a clock glass. Place the beaker on the hotplate for 1 hour at 100°C followed by 1½ hours at approx. 122°C. Cool and make the volume back up to 100 ml. The digested samples are analysed for trace metals analysis by ICP/MS (Inductively Coupled Plasma/Mass Spectrometry) at the Dublin EPA Laboratory.

4. The laboratory results (as either µg/l or mg/l) are used to calculate the metals deposition in the dust samples and these are expressed as **µg/m^2/day** – results are given in the attached table.

Analysis Procedure for the Tailings Pond Rainwater Runoff

The sample as received is acidified in 0.5%HNO_3 and analysed by ICP/MS – the results are reported as µg/l or mg/l as appropriate (see results sheet).

Dust Samples - Description and Appearance

Kilkenny Lab Number	Sample Description	Appearance	Water cm (rain–evaporation)
5423	North	Clear, colourless liquid. Large dead insect and small amount of particulate matter present.	10.0
5424	North 150m	Clear, colourless liquid. One large dead insect present.	7.3
5425	North 300m	Clear colourless liquid. One large bunch of vegetative matter.	7.4
5426	South	Clear, colourless liquid. Approx. 5 small dead insects.	7.8
	South 150m	NO SAMPLE	--
	South 300m	NO SAMPLE	--
5427	East	Clear, colourless liquid. Slight yellow tinge possible from jar.	7.4
5428	East Boundary	Clear, colourless liquid. Small bunch insects.	8.3
5429	East 150 m	Clear, colourless liquid. Good amount of sand-like particulate matter present.	7.0
5430	East 300m	Clear, colourless liquid. Large amount of sand-like particulate matter present.	6.8
5431	West	Clear, colourless liquid. Two large and some small dead insects. Small amount of sand-like particulate matter.	9.8
5432	West Bounary	Clear, colourless liquid. Large amount s of sand-like particulate matter.	5.8
5433	West 150m	Clear, colourless liquid. Approx 4 dead small insects.	7.9
5434	West 300m	Clear colourless liquid with some particulate matter and small insects present.	8.0
5435	Farm 300 (formerly PJ Ryan 1)	Clear colourless liquid. Approx 7 small dead insects present. Small amount of particulate matter.	8.2
5436	Farm 600 (formerly PJ Ryan 2)	Clear, colourless liquid. One large and a few small dead insects present.	8.7
5437	Silvermines School	Clear, colourless liquid. Two large dead insects and a small amount of particulate matter present.	10.5
5438	Control	Clear colourless liquid. Large amount of vegetative matter and particulate matter present.	7.9
5440	**Tailings Pond Run-off**		

The results of analyses are given in the attached table.

Signed : M Neill

Michael Neill, Regional Chemist/Manager

Fifteen Dust Samples (plus control) from the Vicinity of the Mo[illegible] Tailings Pond at Silvermines, Co. Tipperary.
- along with a sample of rainwater run-off from the tailings Pond
Sampling Period: 11 June to 11 July 2008 (31 days)

Results of Analyses µg per m2 per day.

Laboratory Number		5423	5424	5425	5426			5427	5428	5429	5430	5431	5432	5433	5434	5435	5436	5437	5438	5440	
Sample Description		North	North 150 m	North 300 m	South	South 150 m	South 300 m	East	East Boundary	East 150 m	East 300 m	West	West Boundary	West 150 m	West 300 m	Farm 300	Farm 600	S-mines School	Control	Tailings Pond Units	Tailings Pond Run - Off
Analyte	**Units**																				
Calcium	µg/m2/day Ca	2452	2102	3798	1393			765831	6219	382401	228721	2786	214000	2333	2811	1033	<514	4276	2010	mg/l	
Magnesium	µg/m2/day Mg	1151	1270	1609	869			52426	2976	18657	17475	838	14443	565	550	<514	1886	2539	2503	mg/l	
Sodium	µg/m2/day Na	9457	10896	10382	10434	No	No	35002	7607	15060	13877	5551	10382	4261	2827	12233	9868	13055	9920	mg/l	17
Potassium	µg/m2/day K	5094	987	5500	828	sample	sample	9663	1948	8789	8635	3094	7658	612	3002	<514	2005	2724	4903	mg/l	4
Aluminium	µg/m2/day Al	118	158	144	154			98	79	1115	1717	96	694	170	285	270	103	79	64	µg/l	<25
Antimony	µg/m2/day Sb	0.8	<0.5	<0.5	<0.5			<0.5	<0.5	3.8	3.4	<0.5	2.8	<0.5	<0.5	<0.5	0.5	<0.5	<0.5	µg/l	
Arsenic	µg/m2/day As	4.5	<0.5	<0.5	<0.5			<0.5	<0.5	19.6	11.8	3.9	8.8	<0.5	<0.5	0.9	<0.5	0.7	<0.5	µg/l	<1
Barium	µg/m2/day Ba	298	56	31	13			37	16	421	246	142	211	18	18	15	12	35	7.2	µg/l	19
Beryllium	µg/m2/day Be	<0.5	<0.5	<0.5	<0.5			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	µg/l	<1
Boron	µg/m2/day B	71	47	98	68			215	37	175	354	79	426	71	37	348	69	28	42	µg/l	<10
Cadmium	µg/m2/day Cd	<0.5	<0.5	<0.5	<0.5			5.8	<0.5	2.4	1.5	<0.5	1.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	µg/l	3
Chromium	µg/m2/day Cr	0.9	0.6	0.8	0.5			<0.5	<0.5	1.7	1.3	<0.5	1.8	<0.5	1.2	0.7	0.7	0.6	0.7	µg/l	4
Cobalt	µg/m2/day Co	<0.5	<0.5	<0.5	<0.5			0.6	<0.5	1.2	0.8	<0.5	0.7	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	µg/l	<1
Copper	µg/m2/day Cu	66	22	45	54			43	20	38	53	29	38	44	41	27	20	41	19	µg/l	1
Iron	µg/m2/day Fe	1475	503	373	497			812	502	5294	2945	648	1665	396	817	251	565	481	632	µg/l	222
Lead	µg/m2/day Pb	49	5.0	4.0	3.3			1.8	2.4	<0.5	<0.5	18	114	3.1	2.8	2.5	3.2	52	2.2	µg/l	<1
Manganese	µg/m2/day Mn	77	<5.1	43	<5.1			123	8	84	48	27	34	7.7	44	<5.1	<5.1	28	38	µg/l	12
Mercury	µg/m2/day Hg	<0.26	<0.26	<0.26	<0.26			<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	µg/l	<0.5
Molybdenum	µg/m2/day Mo	0.6	<0.5	<0.5	<0.5			<0.5	<0.5	0.9	<0.5	<0.5	0.7	<0.5	<0.5	<0.5	1.3	0.8	0.9	µg/l	<1
Nickel	µg/m2/day Ni	2.0	1.3	0.6	3.7			47	1.9	16.4	11.3	2.2	8.9	1.6	1.9	1.6	2.2	3.4	1.5	µg/l	17
Selenium	µg/m2/day Se	<0.5	<0.5	<0.5	<0.5			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	µg/l	<1
Silver	µg/m2/day Ag																			µg/l	
Thallium	µg/m2/day Tl	<0.5	<0.5	<0.5	<0.5			25.0	<0.5	8.9	8.1	<0.5	6.9	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	µg/l	6
Thorium	µg/m2/day Th																			µg/l	
Tin	µg/m2/day Sn	<1.0	<1.0	1.1	<1.0			<1.0	<1.0	1.2	<1.0	<1.0	19.3	<1.0	1.4	<1.0	1.2	<1.0	<1.0	µg/l	<2
Uranium	µg/m2/day U	<0.5	<0.5	<0.5	<0.5			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	µg/l	<1
Vanadium	µg/m2/day V	0.9	1.0	0.7	1.0			0.6	1.0	1.5	1.3	0.8	1.8	1.0	1.2	1.0	1.0	0.9	0.8	µg/l	<1
Zinc	µg/m2/day Zn	196	971	300	581			5294	596	2082	1043	352	487	601	992	236	403	1259	328	µg/l	2980
Dustfall																					
Total Solids mg/m2/day		80	89	108	68			4138	103	935	908	78	723	60	91	74	62	92	84		

Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

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A Report to:

Tipperary N County Council.
Attn. Mr. Michael Wolfe, Senior Engineer.

Date of Report 8th April 2009

Sixteen Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.

Analyses for Trace Metals and Total Dust Deposition

Sampling Period: **11th July to 15th August 2008 - 35 days**
- except for samples No 6124 & 6125 - 11 June to 15 August - 66 days each

Samples taken by: **Justine Haugh, Tipperary N Co. Co.**
Received in the laboratory on 10th Nov 2008

The dust samples were collected in Kilner jars (glass jars with 8.8 cm diameter openings and internal height = 20cm, collection area = 0.00608 m^2). The jars were located and exposed for the sampling period. A description and the appearance of each sample, including the depth of water in each jar (rain minus evaporation) is given in the table below.

Analysis Procedure for the Dust Samples:

The objective of the analysis procedure is:
(a) to measure the metals deposited in the dust (as **µg/m^2/day**) and
(b) to measure the total dust deposition (as **mg/m^2/day** - excluding any insects or leaves, etc.).

1. **Removal of insects, leaves etc.** The sample jars may contain rainwater along with algae, dust, dead insects, leaves, etc. (the appearance of each sample is reported below). Therefore each sample as received is filtered through a 1.12 mm sieve (to remove insect parts and leaves, etc.) and the liquid is collected in a beaker. The liquid (after sieving) is transferred back into the collection jar. A wash bottle with distilled water is used to assist with the sieving process.
   Note: If the sample as received is dry – then add 150 ml of deionised water to the jar and swirl around in order to dislodge dust and debris (leaves, insects, moulds, etc.) – before continuing with the filtration process and analysis as described.

2. **Determination of Total Dust Deposition (Total Solids mg/m^2/day)**: The volume of the sample is adjusted to approx. 150 ml - by evaporation or by adding distilled water as appropriate - evaporation is by heating the open Kilner jar containing the sample on a low temperature hotplate (sample at approx. 80°C) - heat and cool the glass Kilner jars slowly in order to avoid cracking. Transfer the sample to a 250 ml beaker that has been washed, dried and pre-weighed. Dry the beaker+sample overnight in the oven set at 180°C – cool in the desiccator and weigh. Calculate the total solids as mg/m^2/day.

3. **Digestion Procedure for Trace Metals**: Add 100 ml of 10% HNO_3 to each beaker (containing the dried sample) and cover the beaker with a clock glass. Place the beaker on the hotplate for 1 hour at 100°C followed by 1½ hours at approx. 122°C. Cool and make the volume back up to 100 ml. The digested samples are analysed for trace metals analysis by ICP/MS (Inductively Coupled Plasma/Mass Spectrometry) at the Dublin EPA Laboratory.

4. The laboratory results (as either µg/l or mg/l) are used to calculate the metals deposition in the dust samples and these are expressed as **µg/m²/day** – results are given in the attached table.

Dust Samples - Description and Appearance

Kilkenny Lab Number	Sample Description	Appearance	Water cm (rain–evaporation)
6120	North	No sample.	--
6121	North 150m	Clear, colourless solution. Some sediment/dust, dead fly.	7.3
6122	North 300m	Clear, colourless solution, some organic matter i.e. twigs	6.4
6123	South	Clear, colourless liquid, small amount of particulate.	7.5
*6124	South 150m	**Sampling Period 66 days.** Clear colourless solution, good amount of particulate (brownish)	12.8
6125	South 300m	**Sampling period 66 days.** Clear colourless solution, good amount of particulate present.	13.1
6126	East	Clear, colourless solution. Small amount of particulate.	7.2
6127	East Boundary	Clear, colourless solution. White-ish colour sediment – small amount.	8.1
*6128	East 150 m	Slight green/brown tinge to the colour of solution. Green organic matter and some bugs.	9.7
6129	East 300m	Green tinge to colour of solution. Plenty green particulate present (organic)	10.7
6130	West	Clear, colourless solution. Some particulate and few small dead bugs.	9.8
*6131	West Boundary	Slight green/brown colour to solution. Some sediment (green) and small bundle of dead insects and organic matter.	11.4
6132	West 150m	Clear, colourless liquid. Small bundle of dead insects and organic matter.	8.2
6133	West 300m	Clear, colourless solution. Some particulate and one dead large bug.	8.3
6134	Farm 300 (formerly PJ Ryan 1)	Clear solution with a slightly white colouring. Very small amount of particulate.	11.0
*6135	Farm 600 (formerly PJ Ryan 2)	Clear, colourless solution. Three large dead insects and small amounts of particulate.	9.1
6136	Silvermines School	Clear, colourless solution. Very small amount of greyish/brown particulate.	11.6
6137	Control	Clear colourless solution. Some particulate matter.	8.6

The results of analyses are given in the attached table.

* Samples which were left on hotplate too long and dried out completely. Added 100ml D.I.

Signed : M. Neill

Michael Neill, Regional Chemist/Manager

Sixteen Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.

Sampling Period: 11 July to 15 August 2008 - 35 days (except for samples No 6124 & 6125 - 11 June to 15 August - 66 days each)

Results of Analyses µg per m2 per day.

Laboratory Number		6120	6121	6122	6123	6124	6125	6126	6127	6128	6129	6130	6131	6132	6133	6134	6135	6136	6137
Sample Description		North	North 150 m	North 300 m	South	South 150 m	South 300 m	East	East Boundary	East 150 m	East 300 m	West	West Boundary	West 150 m	West 300 m	Farm 300	Farm 600	S-mines School	Control
Analyte	Units					66 days	66 days												
Calcium	µg/m2/day Ca		799	1551	1030000	34900	23425	987000	1310000	14500	10808	2538	1316	846	846	12218	987	846	3055
Magnesium	µg/m2/day Mg		423	658	1175000	18400	12709	1450000	1690000	17857	6109	658	1410	517	611	7519	1316	564	658
Sodium	µg/m2/day Na		3008	2914	46523	24671	27412	32000	36000	14568	11748	4652	9868	5169	3947	15508	5169	4558	4605
Potassium	µg/m2/day K		2303	2820	24436	3738	3489	33000	56000	10338	17857	1222	5169	2491	1551	19267	7049	470	2397
Aluminium	µg/m2/day Al	No	117	230	254	1047	673	174	310	164	338	108	56	47	43	66	52	47	66
Antimony	µg/m2/day Sb	sample	<0.24	<0.24	<0.24	0.25	<0.12	0.5	0.8	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24
Arsenic	µg/m2/day As		<0.24	<0.24	1.3	0.9	0.3	1.3	2.1	<0.24	2.3	1.9	<0.24	<0.24	<0.24	0.3	<0.24	<0.24	<0.24
Barium	µg/m2/day Ba		10.3	8.5	21.1	9.2	6.2	19.3	24.4	39.5	108.1	150	9.4	2.8	<3.0	30.5	16.4	7.0	3.8
Beryllium	µg/m2/day Be		<0.24	<0.24	<0.24	<0.12	<0.12	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24
Boron	µg/m2/day B		52	15	320	399	249	395	611	155	99	75	66	47	45	150	113	30	56
Cadmium	µg/m2/day Cd		<0.24	<0.24	**3.1**	<0.12	<0.12	<0.24	<0.24	**3.0**	**2.8**	<0.24	<0.24	<0.24	<0.24	0.3	<0.24	<0.24	<0.24
Chromium	µg/m2/day Cr		0.9	0.9	0.9	2.7	1.5	0.9	1.4	1.4	3.8	0.9	0.9	0.9	0.9	1.4	0.9	0.9	0.9
Cobalt	µg/m2/day Co		<0.24	<0.24	3.8	1.1	0.5	9.9	11.7	0.4	0.5	<0.24	<0.24	<0.24	<0.24	6.6	<0.24	<0.24	<0.24
Copper	µg/m2/day Cu		12.2	4.7	11.7	6.2	4.7	14.1	12.2	22.1	30.1	18.8	6.1	4.2	16.4	44.6	5.2	8.5	8.5
Iron	µg/m2/day Fe		470	517	2538	2741	1371	2068	2820	611	1410	517	150	183	155	423	254	240	211
Lead	µg/m2/day Pb		2.6	2.0	3.8	2.3	1.1	4.7	9.4	24.9	29.6	8.0	0.6	<0.24	0.7	7.5	6.1	2.6	4.5
Manganese	µg/m2/day Mn		<12	40	517	85	67	2679	2914	127	108	<12	<12	<12	<12	343	99	<12	30
Mercury	µg/m2/day Hg		<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24
Molybdenum	µg/m2/day Mo		0.4	0.4	<0.24	0.1	<0.12	<0.24	<0.24	0.5	1.0	<0.24	<0.24	<0.24	<0.24	1.4	0.3	<0.24	<0.24
Nickel	µg/m2/day Ni		1.4	1.4	56	6.5	3.2	**85**	**89**	3.3	3.6	4.0	<0.24	<0.24	1.6	10.8	0.3	0.6	1.1
Selenium	µg/m2/day Se		<0.24	<0.24	3.7	0.1	0.2	3.7	5.6	<0.24	0.4	<0.24	<0.24	<0.24	<0.24	1.5	<0.24	<0.24	<0.24
Silver	µg/m2/day Ag																		
Thallium	µg/m2/day Tl		<0.24	<0.24	<0.24	0.7	0.1	<0.24	<0.24	**3.3**	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24
Thorium	µg/m2/day Th																		
Tin	µg/m2/day Sn		<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24
Uranium	µg/m2/day U																		
Vanadium	µg/m2/day V		0.7	0.6	0.5	2.4	1.2	0.7	0.9	0.9	1.7	0.5	0.8	0.5	0.5	0.8	0.6	0.5	0.5
Zinc	µg/m2/day Zn		305	428	**3524**	648	159	**4699**	**6579**	940	1410	611	202	216	470	**6109**	**1598**	451	470
Dustfall																			
Total Solids mg/m2/day			42	55	**10437**	313	220	**10147**	**12292**	274	555	34	46	20	14	267	55	3	29

Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

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A Report to:

Tipperary N County Council.
Attn. Mr. Michael Wolfe, Senior Engineer.

Date of Report 8th April 2009

Fifteen Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.

Analyses for Trace Metals and Total Dust Deposition

Sampling Period: **16 Aug to 30 Sep 2008 (46 days)**

Samples taken by: **Justine Haugh, Tipperary N Co. Co.**
Received in the laboratory on **16th Dec 2008**

The dust samples were collected in Kilner jars (glass jars with 8.8 cm diameter openings and internal height = 20cm, collection area = 0.00608 m^2). The jars were located and exposed for the sampling period. A description and the appearance of each sample, including the depth of water in each jar (rain minus evaporation) is given in the table below.

Analysis Procedure for the Dust Samples:

The objective of the analysis procedure is:
(a) to measure the metals deposited in the dust (as **µg/m^2/day**) and
(b) to measure the total dust deposition (as **mg/m^2/day** - excluding any insects or leaves, etc.).

1. **Removal of insects, leaves etc**. The sample jars may contain rainwater along with algae, dust, dead insects, leaves, etc. (the appearance of each sample is reported below). Therefore each sample as received is filtered through a 1.12 mm sieve (to remove insect parts and leaves, etc.) and the liquid is collected in a beaker. The liquid (after sieving) is transferred back into the collection jar. A wash bottle with distilled water is used to assist with the sieving process.
   Note: If the sample as received is dry – then add 150 ml of deionised water to the jar and swirl around in order to dislodge dust and debris (leaves, insects, moulds, etc.) – before continuing with the filtration process and analysis as described.

2. **Determination of Total Dust Deposition (Total Solids mg/m^2/day)**: The volume of the sample is adjusted to approx. 150 ml - by evaporation or by adding distilled water as appropriate - evaporation is by heating the open Kilner jar containing the sample on a low temperature hotplate (sample at approx. 80°C) - heat and cool the glass Kilner jars slowly in order to avoid cracking. Transfer the sample to a 250 ml beaker that has been washed, dried and pre-weighed. Dry the beaker+sample overnight in the oven set at 180°C – cool in the desiccator and weigh. Calculate the total solids as mg/m^2/day.

3. **Digestion Procedure for Trace Metals**: Add 100 ml of 10% HNO_3 to each beaker (containing the dried sample) and cover the beaker with a clock glass. Place the beaker on the hotplate for 1 hour at 100°C followed by 1½ hours at approx. 122°C. Cool and make the volume back up to 100 ml. The digested samples are analysed for trace metals analysis by ICP/MS (Inductively Coupled Plasma/Mass Spectrometry) at the Dublin EPA Laboratory.

4. The laboratory results (as either µg/l or mg/l) are used to calculate the metals deposition in the dust samples and these are expressed as **µg/m^2/day** – results are given in the attached table.

Dust Samples - Description and Appearance

Kilkenny Lab Number	Sample Description	Appearance	Water cm (rain–evaporation)
	North	No Sample	--
6566	North 150m	Clear, colourless liquid. Few small dead insects present and some particulate.	6.3
6567	North 300m	Clear, colourless liquid. One small and one large dead insect. Little particulate.	6.6
6568	South	Clear colourless liquid. Two bunches (small) of vegetative matter and some particulate.	14.5
6569	South 150m	Clear, colourless liquid. One large bunch of vegetative matter with dead insects.	15.8
6570	South 300m	Clear, slightly green coloured liquid. Large bunch of matter containing some dead insects.	16.6
6571	East	Clear colourless liquid. Some particulate present, brown in colour.	14.7
6572	East Boundary	Clear, colourless liquid. Two large dead insects and small amount of particulate.	13.4
6573	East 150 m	Clear, colourless liquid. Some particulate, brown in colour.	9.3
6574	East 300m	No Sample	--
6575	West	Clear, colourless liquid. One large dead insect.	9.4
6576	West Boundary	Clear, colourless liquid. Two large dead insects.	7.9
6577	West 150m	Clear, colourless liquid. One large dead insect.	7.4
6578	West 300m	Clear colourless liquid. Small amount of particulate.	3.6
6579	Farm 300 (formerly PJ Ryan 1)	Clear, colourless liquid. Some particulate present.	12.2
	Farm 600 (formerly PJ Ryan 2)	No. Sample	--
6580	Silvermines School	Clear, colourless liquid. One large bundle of dead insects.	13.3
6581	Control	Brown coloured liquid. Strong odour. Large amount of particulate suspended and sediments. Sample unreliable – possible remains of dead bird.	5.9

The results of analyses are given in the attached table.

Signed : M Neill

Michael Neill, Regional Chemist/Manager

Fifteen Dust Samples (plus control) from the Vicinity of th[illegible]gul Tailings Pond at Silvermines, Co. Tipperary.

Sampling Period: 16 Aug to 30 Sep 2008 (46 days)

Results of Analyses µg per m2 per day.

Laboratory Number			6566	6567	6568	6569	6570	6571	6572	6573	6574	6575	6576	6577	6578	6579		6580	6581
Sample Description		North	North	North	South	South	South	East	East	East	East	West	West	West	West	Farm	Farm	S-mines	Control
			150 m	300 m		150 m	300 m		Boundary	150 m	300 m		Boundary	150 m	300 m	300	600	School	
Analyte	**Units**																		
Calcium	µg/m2/day Ca		933	682	1256	1507	1112	502000	2798	466000	610	3600	789	1040	<180	290000		2224	
Magnesium	µg/m2/day Mg		825	1076	2045	2500	1870	43000	1970	54000	1400	1830	1220	1600	466	35900		2117	
Sodium	µg/m2/day Na		8250	6460	11100	11500	10800	34800	14300	23000	1760	10400	10800	10000	3600	28000	No	14349	
Potassium	µg/m2/day K	No	717	2368	2300	4305	4664	22600	4305	15800	<180	1399	3587	3946	1040	26500	sample	3587	
Aluminium	µg/m2/day Al	sample	1148	646	97	179	72	1040	100	1543	39	136	115	111	104	395		79	
Antimony	µg/m2/day Sb		0.32	<0.18	0.3	0.3	0.3	10.0	0.5	47	<0.18	0.5	0.2	0.2	<0.18	9.7		0.4	
Arsenic	µg/m2/day As		<0.18	<0.18	0.29	1.4	0.7	**43**	1.9	**5381**	<0.18	3.4	0.6	0.3	<0.18	**24.0**		1.1	
Barium	µg/m2/day Ba		10	6	11	10	19	1184	65	2404	5	430	30	19	14	1076		43	
Beryllium	µg/m2/day Be		<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	2.5	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18		<0.18	
Boron	µg/m2/day B		47	31	47	68	90	240	43	212	47	169	104	65	24	172		97	
Cadmium	µg/m2/day Cd		<0.18	<0.18	<0.18	<0.18	<0.18	**5.0**	<0.18	**104**	<0.18	<0.18	<0.18	<0.18	<0.18	**5.0**		<0.18	
Chromium	µg/m2/day Cr		<0.36	0.36	<0.36	0.36	<0.36	3.23	<0.36	22	<0.36	<0.36	<0.36	<0.36	<0.36	1.43		0.36	
Cobalt	µg/m2/day Co		0.29	0.22	0.25	0.32	0.43	2.62	0.29	22	<0.18	0.36	0.22	0.29	<0.18	2.33		0.25	
Copper	µg/m2/day Cu		18	19	20	32	20	61	21	179	7.5	14	13	20	10	31		22.2	
Iron	µg/m2/day Fe		502	298	352	251	219	7175	753	**111200**	126	574	502	466	248	4664		574	
Lead	µg/m2/day Pb		1.1	0.4	3.5	2.0	11.5	**538**	25.8	**12556**	<0.18	36	11.1	4.3	2.1	<0.18		39.5	
Manganese	µg/m2/day Mn		15	28	20	24	43	143	20	**2762**	<9	50	14	30	<9	172		20	
Mercury	µg/m2/day Hg		<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	0.6	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18		<0.18	<0.18
Molybdenum	µg/m2/day Mo		0.6	0.5	0.8	0.7	0.7	1.2	0.6	3.6	0.5	0.5	0.5	0.5	0.5	1.4		0.6	
Nickel	µg/m2/day Ni		0.6	1.2	0.7	0.8	0.6	**28**	1.3	**290**	<0.18	0.9	0.7	1.3	<0.18	**27**		0.6	
Selenium	µg/m2/day Se		<0.18	<0.18	<0.18	0.4	<0.18	1.4	<0.18	3.4	<0.18	<0.18	<0.18	<0.18	<0.18	1.0		<0.18	
Silver	µg/m2/day Ag																		
Thallium	µg/m2/day Tl		<0.18	<0.18	<0.18	<0.18	<0.18	**14.0**	<0.18	53.8	<0.18	0.3	<0.18	<0.18	<0.18	**17.2**		<0.18	
Thorium	µg/m2/day Th																		
Tin	µg/m2/day Sn		0.4	<0.36	1.4	0.4	1.1	3.6	<0.36	0.7	<0.36	<0.36	<0.36	0.7	<0.36	0.4		<0.36	
Uranium	µg/m2/day U		0.3	0.3	0.3	0.3	0.3	0.8	0.3	2.0	0.3	0.3	0.3	0.3	0.3	0.8		0.3	
Vanadium	µg/m2/day V		0.5	0.5	0.8	1.2	1.0	2.3	0.8	21.9	<0.18	0.5	0.6	0.5	0.3	1.7		0.6	
Zinc	µg/m2/day Zn		574	**1471**	265	825	258	1722	251	**3587**	15	538	122	682	122	**1256**		337	
Dustfall																			
Total Solids mg/m2/day			**3**	15	51	112	60	**1905**	28	**3067**		54	42	21	8	**1435**		70	

A Report to:

Tipperary N County Council.
Attn. Mr. Michael Wolfe, Senior Engineer.

Date of Report 8th April 2009

Fifteen Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.

Analyses for Trace Metals and Total Dust Deposition

Sampling Period: **16 Aug to 30 Sep 2008 (46 days)**

Samples taken by: **Justine Haugh, Tipperary N Co. Co.**
Received in the laboratory on **16th Dec 2008**

The dust samples were collected in Kilner jars (glass jars with 8.8 cm diameter openings and internal height = 20cm, collection area = 0.00608 m^2). The jars were located and exposed for the sampling period. A description and the appearance of each sample, including the depth of water in each jar (rain minus evaporation) is given in the table below.

Analysis Procedure for the Dust Samples:

The objective of the analysis procedure is:
(a) to measure the metals deposited in the dust (as **µg/m^2/day**) and
(b) to measure the total dust deposition (as **mg/m^2/day** - excluding any insects or leaves, etc.).

1. **Removal of insects, leaves etc**. The sample jars may contain rainwater along with algae, dust, dead insects, leaves, etc. (the appearance of each sample is reported below). Therefore each sample as received is filtered through a 1.12 mm sieve (to remove insect parts and leaves, etc.) and the liquid is collected in a beaker. The liquid (after sieving) is transferred back into the collection jar. A wash bottle with distilled water is used to assist with the sieving process.
   Note: If the sample as received is dry – then add 150 ml of deionised water to the jar and swirl around in order to dislodge dust and debris (leaves, insects, moulds, etc.) – before continuing with the filtration process and analysis as described.

2. **Determination of Total Dust Deposition (Total Solids mg/m^2/day)**: The volume of the sample is adjusted to approx. 150 ml - by evaporation or by adding distilled water as appropriate - evaporation is by heating the open Kilner jar containing the sample on a low temperature hotplate (sample at approx. 80°C) - heat and cool the glass Kilner jars slowly in order to avoid cracking. Transfer the sample to a 250 ml beaker that has been washed, dried and pre-weighed. Dry the beaker+sample overnight in the oven set at 180°C – cool in the desiccator and weigh. Calculate the total solids as mg/m^2/day.

Fifteen Dust Samples (plus control) from the Vicinity of the Lagui Tailings Pond at Silvermines, Co. Tipperary.

Sampling Period: 16 Aug to 30 Sep 2008 (46 days)

Results of Analyses µg per m2 per day.

Laboratory Number			6566	6567	6568	6569	6570	6571	6572	6573	6574	6575	6576	6577	6578	6579		6580	6581
Sample Description		**North**	**North 150 m**	**North 300 m**	**South**	**South 150 m**	**South 300 m**	**East**	**East Boundary**	**East 150 m**	**East 300 m**	**West**	**West Boundary**	**West 150 m**	**West 300 m**	**Farm 300**	**Farm 600**	**S-mines School**	**Control**
Analyte	**Units**																		
Calcium	µg/m2/day Ca		933	682	1256	1507	1112	502000	2798	466000	610	3600	789	1040	<180	290000		2224	
Magnesium	µg/m2/day Mg		825	1076	2045	2500	1870	43000	1970	54000	1400	1830	1220	1600	466	35900		2117	
Sodium	µg/m2/day Na		8250	6460	11100	11500	10800	34800	14300	23000	1760	10400	10800	10000	3600	28000	No	14349	
Potassium	µg/m2/day K	No	717	2368	2300	4305	4664	22600	4305	15800	<180	1399	3587	3946	1040	26500	sample	3587	
Aluminium	µg/m2/day Al	sample	1148	646	97	179	72	1040	100	1543	39	136	115	111	104	395		79	
Antimony	µg/m2/day Sb		0.32	<0.18	0.3	0.3	0.3	10.0	0.5	47	<0.18	0.5	0.2	0.2	<0.18	9.7		0.4	
Arsenic	µg/m2/day As		<0.18	<0.18	0.29	1.4	0.7	**43**	1.9	**5381**	<0.18	3.4	0.6	0.3	<0.18	**24.0**		1.1	
Barium	µg/m2/day Ba		10	6	11	10	19	1184	65	2404	5	430	30	19	14	1076		43	
Beryllium	µg/m2/day Be		<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	2.5	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18		<0.18	
Boron	µg/m2/day B		47	31	47	68	90	240	43	212	47	169	104	65	24	172		97	
Cadmium	µg/m2/day Cd		<0.18	<0.18	<0.18	<0.18	<0.18	**5.0**	<0.18	**104**	<0.18	<0.18	<0.18	<0.18	<0.18	**5.0**		<0.18	
Chromium	µg/m2/day Cr		<0.36	0.36	<0.36	0.36	<0.36	3.23	<0.36	22	<0.36	<0.36	<0.36	<0.36	<0.36	1.43		0.36	
Cobalt	µg/m2/day Co		0.29	0.22	0.25	0.32	0.43	2.62	0.29	22	<0.18	0.36	0.22	0.29	<0.18	2.33		0.25	
Copper	µg/m2/day Cu		18	19	20	32	20	61	21	179	7.5	14	13	20	10	31		22.2	
Iron	µg/m2/day Fe		502	298	352	251	219	7175	753	**111200**	126	574	502	466	248	4664		574	
Lead	µg/m2/day Pb		1.1	0.4	3.5	2.0	11.5	**538**	25.8	**12556**	<0.18	36	11.1	4.3	2.1	<0.18		39.5	
Manganese	µg/m2/day Mn		15	28	20	24	43	143	20	**2762**	<9	50	14	30	<9	172		20	
Mercury	µg/m2/day Hg		<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	0.6	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18		<0.18	<0.18
Molybdenum	µg/m2/day Mo		0.6	0.5	0.8	0.7	0.7	1.2	0.6	3.6	0.5	0.5	0.5	0.5	0.5	1.4		0.6	
Nickel	µg/m2/day Ni		0.6	1.2	0.7	0.8	0.6	**28**	1.3	**290**	<0.18	0.9	0.7	1.3	<0.18	**27**		0.6	
Selenium	µg/m2/day Se		<0.18	<0.18	<0.18	0.4	<0.18	1.4	<0.18	3.4	<0.18	<0.18	<0.18	<0.18	<0.18	1.0		<0.18	
Silver	µg/m2/day Ag																		
Thallium	µg/m2/day Tl		<0.18	<0.18	<0.18	<0.18	<0.18	**14.0**	<0.18	**53.8**	<0.18	0.3	<0.18	<0.18	<0.18	**17.2**		<0.18	
Thorium	µg/m2/day Th																		
Tin	µg/m2/day Sn		0.4	<0.36	1.4	0.4	1.1	3.6	<0.36	0.7	<0.36	<0.36	<0.36	0.7	<0.36	0.4		<0.36	
Uranium	µg/m2/day U		0.3	0.3	0.3	0.3	0.3	0.8	0.3	2.0	0.3	0.3	0.3	0.3	0.3	0.8		0.3	
Vanadium	µg/m2/day V		0.5	0.5	0.8	1.2	1.0	2.3	0.8	21.9	<0.18	0.5	0.6	0.5	0.3	1.7		0.6	
Zinc	µg/m2/day Zn		574	**1471**	265	825	258	1722	251	**3587**	15	538	122	682	122	**1256**		337	
Dustfall																			
Total Solids mg/m2/day			3	15	51	112	60	**1905**	28	**3067**		54	42	21	8	**1435**		70	

Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

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A Report to:

Tipperary N County Council.
Attn. Mr. Michael Wolfe, Senior Engineer.

Date of Report **11th August 2009**

Fifteen Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.

along with a sample of rainwater run-off from the Tailings Pond

Analyses for Trace Metals and Total Dust Deposition

Sampling Period: **30th Sept to 7th Nov 2008 (39 days)**

Samples taken by: Justine Haugh, Tipperary N Co. Co.
Received in the laboratory on 26th Jan 2009

The dust samples were collected in Kilner jars (glass jars with 8.8 cm diameter openings and internal height = 20cm, collection area = 0.00608 m^2). The jars were located and exposed for the sampling period. A description and the appearance of each sample, including the depth of water in each jar (rain minus evaporation) is given in the table below.

Analysis Procedure for the Dust Samples:

The objective of the analysis procedure is:
(a) to measure the metals deposited in the dust (as **µg/m^2/day**) and
(b) to measure the total dust deposition (as **mg/m^2/day** - excluding any insects or leaves, etc.).

1. **Removal of insects, leaves etc**. The sample jars may contain rainwater along with algae, dust, dead insects, leaves, etc. (the appearance of each sample is reported below). Therefore each sample as received is filtered through a 1.12 mm sieve (to remove insect parts and leaves, etc.) and the liquid is collected in a beaker. The liquid (after sieving) is transferred back into the collection jar. A wash bottle with distilled water is used to assist with the sieving process.
2. **Note: If the sample as received is dry – then add 150 ml of deionised water to the jar and swirl around in order to dislodge dust and debris (leaves, insects, moulds, etc.) – before continuing with the filtration process and analysis as described.**

3. **Determination of Total Dust Deposition (Total Solids mg/m^2/day)**: The volume of the sample is adjusted to approx. 150 ml - by evaporation or by adding distilled water as appropriate - evaporation is by heating the open Kilner jar containing the sample on a low temperature hotplate (sample at approx. 80°C) - heat and cool the glass Kilner jars slowly in order to avoid cracking. Transfer the sample to a 250 ml beaker that has been washed, dried and pre-weighed. Dry the beaker+sample overnight in the oven set at 180°C – cool in the desiccator and weigh. Calculate the total solids as mg/m^2/day.

4. **Digestion Procedure for Trace Metals:** Add 100 ml of 10% HNO_3 to each beaker (containing the dried sample) and cover the beaker with a clock glass. Place the beaker on the hotplate for 1 hour at 100°C followed by 1½ hours at approx. 122°C. Cool and make the volume back up to 100 ml. The digested samples are analysed for trace metals analysis by ICP/MS (Inductively Coupled Plasma/Mass Spectrometry) at the Dublin EPA Laboratory.

5. The laboratory results (as either µg/l or mg/l) are used to calculate the metals deposition in the dust samples and these are expressed as **µg/m^2/day** – results are given in the attached table.

Dust Samples - Description and Appearance

Kilkenny Lab Number	Sample Description	Appearance	Water cm (rain–evaporation)
----	North	Jar broken.	--
436	North 150m	Clear, colourless liquid. Large amount of dust like particles present.	8.3
437	North 300m	Clear, colourless liquid. Small amount of dust like particles and small dead spiders present.	11.3
435	South	Jar broken.	12.4
----	South 150m	Jar was not received with others - jar broken	---
439	South 300m	Clear, colourless liquid. Small amount of particulate matter present.	10.4
440	East	Clear, colourless liquid. Large amount of dust like particulate matter present.	11.6
441	East Boundary	Clear, colourless liquid. Small amount of vegetative matter present.	11.4
442	East 150 m	Clear, slightly brown coloured liquid. Large amount of dust like particles present.	10.6
443	East 300m	Clear, colourless liquid. Large clump of dead insects and associated algal growth present.	17.7
444	West	Clear, colourless liquid. Small amount of algal growth and vegetative matter present.	15.1
445	West Boundary	Clear, colourless liquid. Very small amount of black particles present.	11.3
446	West 150m	Clear, green coloured liquid. A number of small dead insects and vegetative matter present.	10.9
447	West 300m	Clear, colourless liquid. Small amount of dead insects and dust like particles present.	10.4
448	Farm 300 (formerly PJ Ryan 1)	Clear, green coloured liquid. Large amount of green algal growth present.	17.3
449	Farm 600 (formerly PJ Ryan 2)	Clear, slightly green coloured liquid. Small amount of green algal growth present..	>19.0 Jar overflowing
450	Silvermines School	Clear, colourless liquid. Small number of dead insects, insect parts and associated algal growth present.	17.5
451	Control	Clear, colourless liquid. Very small amount of dust like particulate matter present.	9.2

The results of analyses are given in the attached table.

Signed : M Neill

Michael Neill, Regional Chemist/Manager

Fifteen Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary

- along with a sample of rainwater run-off from the tailings Pond

Sampling Period: 30 Sep to 7 Nov 2008 (39 days).

Results of Analyses µg per m2 per day.

Laboratory Number			436	437	435	438	439	440	441	442	443	444	445	446	447	448	449	450	451	453	
Sample Description		North	North	North	South	South	South	East	East	East	East	West	West	West	West	Farm	Farm	S-mines	Control	Tailings Pond	
			150 m	300 m		150 m	300 m		Boundary	150 m	300 m		Boundary	150 m	300 m	300	600	School		Run-Off	
Analyte	**Units**																			**Units**	
Calcium	µg/m2/day Ca		759	633	633		1181	54825	2657	46390	1856	1096	590	1813	8435	6326	1434	1096	295	mg/l	130
Magnesium	µg/m2/day Mg		337	337	464		590	3922	1350	3922	1307	675	422	506	380	2193	1054	675	211	mg/l	69
Sodium	µg/m2/day Na		3922	5482	5482		5061	8435	5904	4639	11808	7169	5482	5482	4639	21086	9278	8013	3922	mg/l	3.3
Potassium	µg/m2/day K	Jar	843	211	<210	Jar	380	5904	337	4175	2994	337	<210	590	<210	11387	843	843	<210	mg/l	2.9
Aluminium	µg/m2/day Al	broken	135	42	51	broken	42	590	67	590	72	59	46	42	101	928	72	51	37	µg/l	<25
Antimony	µg/m2/day Sb		<0.21	<0.21	<0.21		<0.21	5.1	<0.21	3.5	<0.21	0.3	<0.21	<0.21	<0.21	0.9	<0.21	<0.21	<0.21	µg/l	1.9
Arsenic	µg/m2/day As		<0.21	<0.21	<0.21		<0.21	12.2	0.2	**23.2**	<0.21	3.0	0.3	<0.21	<0.21	**4.6**	<0.21	<0.21	<0.21	µg/l	<0.5
Barium	µg/m2/day Ba		6.7	<2.5	<2.5		3.8	396	28	418	15	127	55	3.4	2.5	156	28	8.9	<2.5	µg/l	19
Beryllium	µg/m2/day Be		<0.21	<0.21	<0.21		<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	µg/l	<0.5
Boron	µg/m2/day B		19	76	34		8.4	245	51	198	46	8.4	32	17	148	67	35	51	16	µg/l	<5.0
Cadmium	µg/m2/day Cd		<0.21	<0.21	<0.21		<0.21	**2.1**	<0.21	1.6	0.4	<0.21	<0.21	<0.21	<0.21	**6.7**	<0.21	<0.21	<0.21	µg/l	1.2
Chromium	µg/m2/day Cr		<0.42	<0.42	<0.42		<0.42	0.8	<0.42	0.8	<0.42	<0.42	<0.42	<0.42	<0.42	2.5	<0.42	<0.42	<0.42	µg/l	<1.0
Cobalt	µg/m2/day Co		<0.21	<0.21	<0.21		<0.21	0.8	<0.21	0.6	<0.21	<0.21	<0.21	<0.21	<0.21	1.2	<0.21	<0.21	<0.21	µg/l	0.6
Copper	µg/m2/day Cu		46	33	38		42	51	28	46	55	29	27	28	29	59	30	27	21	µg/l	<3.0
Iron	µg/m2/day Fe		325	55	156		143	3416	464	5904	283	590	211	253	84	2615	590	249	363	µg/l	**150**
Lead	µg/m2/day Pb		1.2	<0.21	1.9		1.0	**506**	14	**548**	8.0	24	1.9	1.3	<0.21	**114**	8.4	4.6	0.9	µg/l	<0.2
Manganese	µg/m2/day Mn		<11	<11	<11		12.7	177	10.5	55	32	11.8	<11	<11	<11	304	18.1	<11	<11	µg/l	<25
Mercury	µg/m2/day Hg		<0.21	<0.21	<0.21		<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	µg/l	<0.5
Molybdenum	µg/m2/day Mo		<0.21	<0.21	<0.21		<0.21	0.3	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	1.6	<0.21	<0.21	<0.21	µg/l	1.7
Nickel	µg/m2/day Ni		<0.21	<0.21	0.8		2.1	5.9	1.3	7.6	1.8	0.3	0.2	0.5	<0.21	4.2	1.3	<0.21	0.3	µg/l	7.5
Selenium	µg/m2/day Se		<0.21	<0.21	<0.21		<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	0.3	<0.21	<0.21	<0.21	µg/l	<0.5
Silver	µg/m2/day Ag																				
Thallium	µg/m2/day Tl		<0.21	<0.21	<0.21		<0.21	**5.9**	<0.21	**4.6**	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	µg/l	4.3
Thorium	µg/m2/day Th																				
Tin	µg/m2/day Sn		<0.42	<0.42	<0.42		<0.42	<0.42	<0.42	<0.42	0.4	<0.42	<0.42	<0.42	<0.42	<0.42	<0.42	<0.42	<0.42	µg/l	7
Uranium	µg/m2/day U		<0.21	<0.21	<0.21		<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	µg/l	2.3
Vanadium	µg/m2/day V		<0.21	<0.21	<0.21		<0.21	0.8	<0.21	0.9	0.3	<0.21	<0.21	<0.21	<0.21	2.4	0.4	0.3	<0.21	µg/l	<0.5
Zinc	µg/m2/day Zn		291	215	312		1476	928	**1096**	**2024**	1940	405	291	358	270	590	**1898**	143	375	µg/l	**1400**
Dustfall																					
Total Solids mg/m2/day			61	75	60		65	**386**	90	**354**	154	51	40	73	78	**955**	121	62	43		

epa
Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

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A Report to:

Tipperary N County Council.
Attn. Mr. Michael Wolfe, Senior Engineer.

Date of Report **11th August 2009**

Fourteen Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.

along with a sample of rainwater run-off from the Tailings Pond

Analyses for Trace Metals and Total Dust Deposition

Sampling Period: **7th Nov to 15th Dec 2008 (38 days)**

Samples taken by: Margaret O'Sullivan, Tipperary N Co. Co.
Received in the laboratory on 9th April 2009

The dust samples were collected in Kilner jars (glass jars with 8.8 cm diameter openings and internal height = 20cm, collection area = 0.00608 m^2). The jars were located and exposed for the sampling period. A description and the appearance of each sample, including the depth of water in each jar (rain minus evaporation) is given in the table below.

Analysis Procedure for the Dust Samples:

The objective of the analysis procedure is:
(a) to measure the metals deposited in the dust (as **µg/m^2/day**) and
(b) to measure the total dust deposition (as **mg/m^2/day** - excluding any insects or leaves, etc.).

1. **Removal of insects, leaves etc.** The sample jars may contain rainwater along with algae, dust, dead insects, leaves, etc. (the appearance of each sample is reported below). Therefore each sample as received is filtered through a 1.12 mm sieve (to remove insect parts and leaves, etc.) and the liquid is collected in a beaker. The liquid (after sieving) is transferred back into the collection jar. A wash bottle with distilled water is used to assist with the sieving process.
2. **Note:** If the sample as received is dry – then add 150 ml of deionised water to the jar and swirl around in order to dislodge dust and debris (leaves, insects, moulds, etc.) – before continuing with the filtration process and analysis as described.

3. **Determination of Total Dust Deposition (Total Solids mg/m^2/day)**: The volume of the sample is adjusted to approx. 150 ml - by evaporation or by adding distilled water as appropriate - evaporation is by heating the open Kilner jar containing the sample on a low temperature hotplate (sample at approx. 80°C) - heat and cool the glass Kilner jars slowly in order to avoid cracking. Transfer the sample to a 250 ml beaker that has been washed, dried and pre-weighed. Dry the beaker+sample overnight in the oven set at 180°C – cool in the desiccator and weigh. Calculate the total solids as mg/m^2/day.

4. **Digestion Procedure for Trace Metals**: Add 100 ml of 10% HNO_3 to each beaker (containing the dried sample) and cover the beaker with a clock glass. Place the beaker on the hotplate for 1 hour at 100°C followed by 1½ hours at approx. 122°C. Cool and make the volume back up to 100 ml. The digested samples are analysed for trace metals analysis by ICP/MS (Inductively Coupled Plasma/Mass Spectrometry) at the Dublin EPA Laboratory.

5. The laboratory results (as either µg/l or mg/l) are used to calculate the metals deposition in the dust samples and these are expressed as **µg/m^2/day** – results are given in the attached table.

Dust Samples - Description and Appearance

Kilkenny Lab Number	Sample Description	Appearance	Water cm (rain–evaporation)
----	North	Missing.	--
2296	North 150m	Clear, colourless liquid. Very small amount of particulate matter present.	10.3
2297	North 300m	Clear, colourless liquid. Very small amount of particulate matter present.	8.6
----	South	Missing.	--
2298	South 150m	Clear, colourless liquid. Very small amount of particulate matter present.	10.4
2299	South 300m	Clear, colourless liquid. Very small amount of particulate matter present.	7.5
2300	East	Brown coloured liquid. Large amount of vegetative matter present. Large crack in jar - obvious water loss.	(0.7) *
2301	East Boundary	Clear, colourless liquid. Very small amount of particulate matter present.	8.8
----	East 150 m	Missing.	--
2302	East 300m	Clear, slightly brown coloured liquid. Large amount of mud and dust particles present.	9.4
2303	West	Clear, colourless liquid. Small amount of dust like particles present	11.3
2304	West Boundary	Clear, colourless liquid. Very small amount of particulate matter present.	9.1
2305	West 150m	Clear, colourless liquid. Large dead insect and associated algal growth present.	8.3
2306	West 300m	Clear, colourless liquid. Very small amount of particulate matter present.	8.1
2307	Farm 300 (formerly PJ Ryan 1)	Clear, colourless liquid. Very small amount of particulate matter present.	6.0
2308	Farm 600 (formerly PJ Ryan 2)	Clear, colourless liquid. Small amount of particulate and vegetative matter present.	9.5
2309	Silvermines School	Clear, colourless liquid. Small amount of particulate matter present. Number of dead insects and associated algal growth present.	12.4
2310	Control	Clear, colourless liquid. Very small amount of particulate matter present.	6.5

The results of analyses are given in the attached table.

* Large crack in jar – obvious fluid loss and concentration.

Signed : M. Neill

Michael Neill, Regional Chemist/Manager

Fourteen Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.

- along with a sample of rainwater run-off from the tailings Pond

Sampling Period: 7 Nov to 15 Dec 2008 (38 days).

Results of Analyses µg per m2 per day.

Laboratory Number			2296	2297		2298	2299	2300	2301		2302	2303	2304	2305	2306	2307	2308	2309	2310	2312	
Sample Description		North	North	North	South	South	South	East	East	East	East	West	West	West	West	Farm	Farm	S-mines	Control	Tailings Pond	
			150 m	300 m		150 m	300 m		Boundary	150 m	300 m		Boundary	150 m	300 m	300	600	School		Run-off	
Analyte	**Units**																			**Units**	
Calcium	µg/m2/day Ca		1991	1818		1688	1342	1125	1515		173000	5627	28600	27268	1472	1255	1428	1904	822	mg/l	170
Magnesium	µg/m2/day Mg		2034	2121		2034	1775	1125	2034		7358	2207	2251	2034	1818	1472	1904	2251	1169	mg/l	74
Sodium	µg/m2/day Na		15149	13850		21641	10821	1948	12985		8657	14300	14300	12119	11253	11300	12119	14716	7791	mg/l	3.7
Potassium	µg/m2/day K	No	952	1169	No	1169	952	1645	1039	No	11686	1212	1125	1342	995	866	1039	2467	606	mg/l	2.2
Aluminium	µg/m2/day Al	sample	87	82	sample	143	26	299	65	sample	5194	130	147	156	48	69	52	65	37	µg/l	<25
Antimony	µg/m2/day Sb		0.9	1.2		1.5	1.2	1.3	1.1		16	1.4	1.2	1.2	1.1	1.3	1.1	1.2	0.8	µg/l	<0.5
Arsenic	µg/m2/day As		0.2	0.5		0.9	0.5	2.3	0.5		69	4.8	0.6	0.6	0.5	1.0	0.5	0.5	<0.22	µg/l	<0.5
Barium	µg/m2/day Ba		5.2	7.8		9.1	7.8	29.0	8.7		4761	108	13	11	6.9	7.8	6.9	13	3.5	µg/l	8.0
Beryllium	µg/m2/day Be		<0.22	<0.22		<0.22	<0.22	<0.22	<0.22		0.26	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	µg/l	<0.5
Boron	µg/m2/day B		24	78		268	26	16	40		126	56	151	242	52	82	36	48	15	µg/l	<5
Cadmium	µg/m2/day Cd		<0.22	0.4		0.4	0.5	1.2	0.4		15.1	0.5	0.5	0.4	0.4	0.4	0.8	0.8	<0.22	µg/l	<0.5
Chromium	µg/m2/day Cr		0.4	1.3		0.9	0.9	2.2	0.9		5.6	1.3	0.9	0.9	0.9	0.9	0.9	0.9	<0.43	µg/l	<1.0
Cobalt	µg/m2/day Co		0.5	0.6		0.6	0.7	0.8	0.6		5.6	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.3	µg/l	<0.5
Copper	µg/m2/day Cu		43	39		23	23	42	24		65	19	16	16	23	11	10	16	12	µg/l	<3
Iron	µg/m2/day Fe		338	368		281	606	3636	368		25970	2684	186	199	316	273	260	251	519	µg/l	150
Lead	µg/m2/day Pb		0.6	0.6		1.3	1.6	31	1.2		3506	23	1.5	0.6	0.5	0.3	1.0	2.0	0.3	µg/l	<0.5
Manganese	µg/m2/day Mn		<11	<11		<11	17	37	<11		822	17	<11	<11	<11	<11	17	<11	<11	µg/l	<25
Mercury	µg/m2/day Hg		<0.22	<0.22		<0.22	<0.22	<0.22	<0.22		<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	µg/l	<0.5
Molybdenum	µg/m2/day Mo		0.6	1.0		0.9	1.0	1.1	1.0		2.4	1.1	0.9	0.9	1.0	1.0	1.0	0.9	0.7	µg/l	<0.5
Nickel	µg/m2/day Ni		1.0	1.4		1.1	2.0	2.5	0.8		31	1.7	0.8	0.7	0.8	0.6	0.6	1.0	0.3	µg/l	6.1
Selenium	µg/m2/day Se		0.5	0.4		0.5	0.3	<0.22	0.3		0.7	0.3	0.4	0.3	0.3	<0.22	0.2	0.3	<0.22	µg/l	<0.5
Silver	µg/m2/day Ag																				
Thallium	µg/m2/day Tl		<0.22	<0.22		<0.22	<0.22	<0.22	<0.22		17	0.3	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	µg/l	3.3
Thorium	µg/m2/day Th																				
Tin	µg/m2/day Sn		1.3	2.6		2.2	2.2	2.2	2.6		2.6	2.6	3.0	2.2	2.2	2.2	2.2	3.0	1.3	µg/l	<1.0
Uranium	µg/m2/day U		<0.22	<0.22		<0.22	<0.22	<0.22	<0.22		1	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	µg/l	<0.5
Vanadium	µg/m2/day V		0.9	1.1		1.2	0.8	1.9	1.0		5.2	1.2	1.2	1.0	0.8	0.9	1.0	1.2	0.5	µg/l	<0.5
Zinc	µg/m2/day Zn		822	476		398	779	177	377		8657	359	139	351	368	195	424	476	164	µg/l	1700
Dustfall																					
Total Solids mg/m2/day			74	39		87	75	222	55		883	84	159	140	54	45	59	103	32		

Note: Results for sample No 2302 appear anomalous - the sample may have been interfered with.

A Report to:

Tipperary N County Council.
Attn. Mr. Michael Wolfe, Senior Engineer.

Date of Report **11th August 2009**

Sixteen Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.

along with a sample of rainwater run-off from the Tailings Pond

Analyses for Trace Metals and Total Dust Deposition

Sampling Period: **15th Dec 2008 to 30th Jan 2009 (50 days)**

Samples taken by: Margaret O'Sullivan, Tipperary N Co. Co.
Received in the laboratory on 22 May 2009

The dust samples were collected in Kilner jars (glass jars with 8.8 cm diameter openings and internal height = 20cm, collection area = 0.00608 m^2). The jars were located and exposed for the sampling period. A description and the appearance of each sample, including the depth of water in each jar (rain minus evaporation) is given in the table below.

Analysis Procedure for the Dust Samples:

The objective of the analysis procedure is:
(a) to measure the metals deposited in the dust (as **µg/m²/day**) and
(b) to measure the total dust deposition (as **mg/m²/day** - excluding any insects or leaves, etc.).

1. **Removal of insects, leaves etc**. The sample jars may contain rainwater along with algae, dust, dead insects, leaves, etc. (the appearance of each sample is reported below). Therefore each sample as received is filtered through a 1.12 mm sieve (to remove insect parts and leaves, etc.) and the liquid is collected in a beaker. The liquid (after sieving) is transferred back into the collection jar. A wash bottle with distilled water is used to assist with the sieving process.
2. **Note**: If the sample as received is dry – then add 150 ml of deionised water to the jar and swirl around in order to dislodge dust and debris (leaves, insects, moulds, etc.) – before continuing with the filtration process and analysis as described.

3. **Determination of Total Dust Deposition (Total Solids mg/m²/day)**: The volume of the sample is adjusted to approx. 150 ml - by evaporation or by adding distilled water as appropriate - evaporation is by heating the open Kilner jar containing the sample on a low temperature hotplate (sample at approx. 80°C) - heat and cool the glass Kilner jars slowly in order to avoid cracking. Transfer the sample to a 250 ml beaker that has been washed, dried

and pre-weighed. Dry the beaker+sample overnight in the oven set at 180°C – cool in the desiccator and weigh. Calculate the total solids as mg/m^2/day.

4. **Digestion Procedure for Trace Metals**: Add 100 ml of 10% HNO_3 to each beaker (containing the dried sample) and cover the beaker with a clock glass. Place the beaker on the hotplate for 1 hour at 100°C followed by 1½ hours at approx. 122°C. Cool and make the volume back up to 100 ml. The digested samples are analysed for trace metals analysis by ICP/MS (Inductively Coupled Plasma/Mass Spectrometry) at the Dublin EPA Laboratory.

5. The laboratory results (as either µg/l or mg/l) are used to calculate the metals deposition in the dust samples and these are expressed as **µg/m^2/day** – results are given in the attached table.

Dust Samples - Description and Appearance

Kilkenny Lab Number	Sample Description	Appearance	Water cm (rain–evaporation)
2589	North	Clear, colourless liquid. Small amount of black particulate matter present.	11.8
2590	North 150m	Clear, colourless liquid. Small amount of black particulate matter present.	9.9
2591	North 300m	Clear, colourless liquid. Small amount of vegetative matter (twigs etc) present.	7.8
2592	South	Clear, colourless liquid. Small amount of vegetative matter present.	11.5
2593	South 150m	Clear, colourless liquid. Small amount of black particulate matter present.	9.2
2594	South 300m	Clear, colourless liquid. Very small amount of particulate matter present.	7.2
2595	East	Clear, colourless liquid. Dead insect and associated algal growth present. Small amount of dust like particles present.	11.0
2596	East Boundary	Clear, colourless liquid. Vegetation and associated alagal growth present.	10.5
2597	East 150 m	Jar completely empty. Looks like it was not opened at all.	--
2598	East 300m	Clear, colourless liquid. Small amount of dust like particles present.	16.5
2599	West	Clear, colourless liquid. Small amount of dust like particles present.	10.5
2600	West Boundary	Clear, colourless liquid. Very small amount of particulate matter present.	8.9
2601	West 150m	Clear, colourless liquid. One small twig and associated algal growth present.	7.2
2602	West 300m	Clear, colourless liquid. Very small amount of particulate matter present.	7.2
2603	Farm 300 (formerly PJ Ryan 1)	Clear, colourless liquid. Large amount of dust like matter present.	5.5
2604	Farm 600 (formerly PJ Ryan 2)	Clear, colourless liquid. Small amount of particulate matter present.	8.4
2605	Silvermines School	Clear, colourless liquid. One large dead insect and associated algal growth present.	17.5
2606	Control	Clear, colourless liquid. Very small amount of particulate matter present.	7.1

The results of analyses are given in the attached table.

Signed :_____

Michael Neill, Regional Chemist/Manager

Sixteen Dust Samples (plus control) from the Vicinity of the Tynagh Tailings Pond at Silvermines, Co. Tipperary.

- along with a sample of rainwater run-off from the tailings Pond

Sampling Period: 15 Dec 2008 to 30 Jan 09 (50 days).

Results of Analyses µg per m2 per day.

Laboratory Number		2589	2590	2591	2592	2593	2594	2595	2596	2597	2598	2599	2600	2601	2602	2603	2604	2605	2606	2608	
Sample Description		North	North 150 m	North 300 m	South	South 150 m	South 300 m	East	East Boundary	East 150 m	East 300 m	West	West Boundary	West 150 m	West 300 m	Farm 300	Farm 600	S-mines School	Control	Tailings Pond Run-off	
Analyte	Units																			Units	
Calcium	µg/m2/day Ca	7237	1513	1283	1513	1612	987	10197	1809		1809	1743	888	2368	1447	7566	1086	1678	1414	mg/l	130
Magnesium	µg/m2/day Mg	3092	2467	1842	2434	2664	1645	3059	2072		3224	2599	2039	1776	1776	1612	2237	3191	1151	mg/l	40
Sodium	µg/m2/day Na	22039	22039	15789	20066	23355	13487	22697	17434		28947	22368	19737	15132	15461	13158	21382	27632	11184	mg/l	5.4
Potassium	µg/m2/day K	888	789	691	987	757	559	2303	1480	No	1316	987	559	1579	592	3059	724	1480	296	mg/l	2.6
Aluminium	µg/m2/day Al	822	99	72	59	102	95	59	32	sample	49	72	46	46	69	174	56	46	39	µg/l	<25
Antimony	µg/m2/day Sb	0.46	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16		<0.16	0.26	<0.16	<0.16	<0.16	0.20	<0.16	<0.16	<0.16	µg/l	2
Arsenic	µg/m2/day As	3.2	<0.16	<0.16	<0.16	<0.16	<0.16	0.53	<0.16		<0.16	2.99	<0.16	<0.16	<0.16	1.78	<0.16	<0.16	<0.16	µg/l	<0.5
Barium	µg/m2/day Ba	191	5.9	5.3	3.3	2.6	2.6	36	2.3		2.6	128	4.6	13.8	2.0	95.4	5.6	5.6	<2.0	µg/l	16
Beryllium	µg/m2/day Be	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16		<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	µg/l	<0.5
Boron	µg/m2/day B	25	16	46	14	30	20	21	13		16	15	36	43	11	43	20	25	43	µg/l	<5
Cadmium	µg/m2/day Cd	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	2.53	<0.16		<0.16	<0.16	<0.16	<0.16	<0.16	8.88	<0.16	<0.16	<0.16	µg/l	1.4
Chromium	µg/m2/day Cr	1.97	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	<0.33	<0.33	<0.33	<0.33	0.33	<0.33	<0.33	<0.33	µg/l	3
Cobalt	µg/m2/day Co	0.43	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16		<0.16	<0.16	<0.16	<0.16	<0.16	0.72	<0.16	<0.16	<0.16	µg/l	0.8
Copper	µg/m2/day Cu	43	14	17	23	19	15	16	8		15	13	8	9	21	22	21	14	10	µg/l	<3
Iron	µg/m2/day Fe	2138	234	237	362	243	230	789	161		329	625	155	227	313	559	855	322	428	µg/l	180
Lead	µg/m2/day Pb	24.0	1.2	1.1	5.9	1.5	2.0	11.5	1.2		2.1	21.7	0.6	0.6	1.4	52.6	4.3	4.3	0.6	µg/l	0.6
Manganese	µg/m2/day Mn	46.1	<8.2	10.2	12.8	<8.2	8.9	36.2	11.5		8.2	10.5	<8.2	8.2	<8.2	92.1	9.9	9.9	<8.2	µg/l	<25
Mercury	µg/m2/day Hg	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16		<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	µg/l	<0.5
Molybdenum	µg/m2/day Mo	59.2	1.0	42.8	0.8	0.4	<0.16	1.1	0.2		0.3	0.2	0.2	0.2	0.3	0.6	1.5	0.3	0.2	µg/l	1.5
Nickel	µg/m2/day Ni	2.86	0.49	0.20	0.72	0.86	0.56	1.05	1.05		0.95	0.69	<0.16	<0.16	0.95	1.18	0.79	0.89	<0.16	µg/l	5.9
Selenium	µg/m2/day Se	<0.16	<0.16	<0.16	<0.16	0.20	<0.16	<0.16	<0.16		<0.16	<0.16	<0.16	<0.16	<0.16	0.53	<0.16	<0.16	<0.16	µg/l	<0.5
Silver	µg/m2/day Ag																				
Thallium	µg/m2/day Tl	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16		<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	µg/l	4.9
Thorium	µg/m2/day Th																				
Tin	µg/m2/day Sn	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	0.33	µg/l	3
Uranium	µg/m2/day U	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53		0.49	0.53	0.49	0.53	0.53	0.66	0.53	0.53	0.49	µg/l	<0.5
Vanadium	µg/m2/day V	1.58	0.69	0.39	0.46	0.53	0.39	0.43	0.36		0.76	0.56	0.43	0.26	0.26	0.82	0.43	0.76	0.16	µg/l	0.7
Zinc	µg/m2/day Zn	1447	1776	724	1414	3618	1612	757	658		1612	1579	309	987	4605	1151	362	1020	280	µg/l	970
Dustfall																					
Total Solids mg/m2/day		150	90	65	83	100	59	145	75		95	84	72	68	77	87	64	107	46		

Appendix B

Monitoring Results 2009

Fifteen Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.

- along with a sample of rainwater run-off from the tailings Pond

Sampling Period: 16 Feb to 15 Mar 2010 (27 days).

Results of Analyses µg per m2 per day

Laboratory Number		1861	1862	1863	1864	1865	1866	1867	1868	1869	1870	1871	1872	1873	1874	1875	1876	1877	1878		1880
Sample Description		North	North	North	South	South	South	East	East	East	East	West	West	West	West	Farm	Farm	S-mines	Control	Tailings Pond	
			150 m	300 m		150 m	300 m		Bound	150 m	300 m		Bound	150 m	300 m	300	600	School		Run-off	
Analyte	**Units**																			**Units**	
Calcium	µg/m2/day Ca	No	1096.491	852.8265	1949.318	913.7427	974.6589	1705.653	2071.15	1096.491	1096.491	3411.306	2863	730.9942	1583.821	974.6589	1279.24	No	670	mg/l	140
Magnesium	µg/m2/day Mg	jar	426	426.4133	487.3294	487.3294	426.4133	487.3294	548.2456	487	487.3294	548.2456	1340	426.4133	487.3294	365.4971	487.3294	jar	365	mg/l	25
Sodium	µg/m2/day Na		2436.647	2436.647	2314.815	2863.06	2436.647	7309.942	2863.06	2680.312	2436.647	2741.228	10356	2132.066	2071.15	1461.988	1827.485		1766.569	mg/l	3.3
Potassium	µg/m2/day K		<305	609.1618	304.5809	<305	,305	1218.324	548.2456	426	548.2456	487.3294	1096	304.5809	365.4971	365.4971	487.3294		<305	mg/l	2.2
Aluminium	µg/m2/day Al		73	115.7407	158.3821	73	85	140.1072	231.4815	110	127.924	188.8402	280	109.6491	91	231.4815	554.3372		97	µg/l	<25
Antimony	µg/m2/day Sb		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.304581	0.7	<0.3	<0.3	<0.3	1.0		<0.3	µg/l	1.4
Arsenic	µg/m2/day As		<0.3	<0.3	0.4	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	2.2	0.9	<0.3	<0.3	1.5	3.5		<0.3	µg/l	0.7
Barium	µg/m2/day Ba		6.1	3.7	17	5.5	6.1	4.9	9.7	4.3	5.5	85	21	19	4.9	38.98635	134.0156		6.7	µg/l	25
Beryllium	µg/m2/day Be		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		<0.3	µg/l	<0.5
Boron	µg/m2/day B		45	54	13	51	79	57	21	40	24	79	280	67.0078	16	21	18		29	µg/l	<5
Cadmium	µg/m2/day Cd		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.426413	1.401072		<0.3	µg/l	0.6
Chromium	µg/m2/day Cr		0.4	0.4	0.4	<0.3	<0.3	0.4	0.5	<0.3	<0.3	0.4	2.1	<0.3	<0.3	0.8	1.2		<0.3	µg/l	2.3
Cobalt	µg/m2/day Co		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.4	<0.3	<0.3	0.6	2.9		0.4	µg/l	<0.5
Copper	µg/m2/day Cu		21	24	121.8324	10	26	40	91	61	73	109.6491	50	19	79	67.0078	79		18	µg/l	2.1
Iron	µg/m2/day Fe		195	243.6647	432.5049	219.2982	176.6569	450.7797	566.5205	231	194.9318	517.7875	5300	170.5653	286.306	566.5205	1340.156		268.0312	µg/l	94
Lead	µg/m2/day Pb		0.9	1.2	21	5.0	0.9	2.3	5.8	2.6	1.9	12	5.6	1.0	2.0	67.0078	176.6569		16	µg/l	11
Manganese	µg/m2/day Mn		<15	<15	<15	<15	<15	<15	49	26	<15	<15	35	<15	<15	31	298.4893		55	µg/l	42
Mercury	µg/m2/day Hg		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		0	µg/l	<0.5
Molybdenum	µg/m2/day Mo		<0.3	<0.3	<0.3	0.365497	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.5	<0.3	<0.3	<0.3	0.4		<0.3	µg/l	<0.5
Nickel	µg/m2/day Ni		0.5	0.6	1.3	0.5	0.5	1.3	0.8	0.5	0.9	0.7	3.3	0.6	0.609162	1.401072	4.1		6.7	µg/l	4.1
Selenium	µg/m2/day Se		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.4	<0.3	<0.3	<0.3	<0.3		<0.3	µg/l	<0.5
Thallium	µg/m2/day Tl		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		<0.3	µg/l	12
Tin	µg/m2/day Sn		<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	2.4	<0.6	<0.6	<0.6	<0.6		<0.6	µg/l	<1
Uranium	µg/m2/day U		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		<0.3	µg/l	<0.5
Vanadium	µg/m2/day V		<0.3	0.304581	0.5	<0.3	<0.3	0.4	0.6	0.4	<0.3	0.4	1.2	<0.3	<0.3	0.8	1.3		0.4	µg/l	<0.5
Zinc	µg/m2/day Zn		244	365.4971	225.3899	852.8265	292.3977	109.6491	194.9318	250	353.3138	420.3216	975	249.7563	292.3977	164.4737	194.9318		231	µg/l	340
Dustfall																					
Total Solids mg/m2/day			0	0	1	12	10	35	6	9	32	34	21	22	1	18	61		3074		

Note: No results available for Samples 'North' or 'Silvermines School' as the jars were broken in the field.

Results highlighted in yellow are approaching or exceeding the T.A.Luft limits.

Eleven Dust Samples (no control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.

- along with a sample of rainwater run-off from the tailings Pond

Sampling Period: 14 Dec 09 ot 16 Feb 10 (64 days).

Results of Analyses µg per m2 per day

Laboratory Number				1417	1418	1419	1420	1421	1422			1423	1424	1425	1426			1427		1429
Sample Description		**North**	**North 150 m**	**North 300 m**	**South**	**South 150 m**	**South 300 m**	**East**	**East Bound**	**East 150 m**	**East 300 m**	**West**	**West Bound**	**West 150 m**	**West 300 m**	**Farm 300**	**Farm 600**	**S-mines School**	**Control**	**Tailings Pond Run-off**
Analyte	**Units**																			**Units**
Calcium	µg/m2/day Ca	No	No	873.76645	1002.2615	822	770.97039	1439.1447	925.16447	No	No	745.27138	719.57237	720	668.17434	No	No	720	No	mg/l <0.5
Magnesium	µg/m2/day Mg	jar	jar	256.99013	334	385	334.08717	359.78618	385.4852	jar	jar	334.08717	385.4852	308	308.38816	jar	jar	360	jar	mg/l <0.5
Sodium	µg/m2/day Na			2364.3092	4625.8224	5653.7829	4882.8125	5396.7928	2826.8914			3083.8816	3083.8816	2467.1053	2390.0082			3597.8618		mg/l <0.5
Potassium	µg/m2/day K			282.68914	180	360	231.29112	205.59211	256.99013			231.29112	359.78618	282.68914	205.59211			308		mg/l <0.5
Aluminium	µg/m2/day Al			30.838816	39	20	23	100.22615	33			31	28	28.268914	59			28		µg/l <25
Antimony	µg/m2/day Sb			0.1	0.2	<0.1	0.1	0.3	<0.1			<0.1	<0.1	<0.1	<0.1			<0.1		µg/l <0.5
Arsenic	µg/m2/day As			<0.1	0.3	<0.1	0.2	0.6	<0.1			1.0022615	0.3	0.2	<0.1			<0.1		µg/l 0.7
Barium	µg/m2/day Ba			3.1	3.6	2.1	2.6	8.0	3.3			26	2.6	2.1	2.6			2.6		µg/l <3
Beryllium	µg/m2/day Be			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	<0.1	<0.1	<0.1			<0.1		µg/l <0.5
Boron	µg/m2/day B			24	46.3	23	12	120.78536	18			39	14	15.7	14.648438			36		µg/l <5
Cadmium	µg/m2/day Cd			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	<0.1	<0.1	<0.1			<0.1		µg/l <0.5
Chromium	µg/m2/day Cr			0.1	<0.1	<0.1	<0.1	0.2	<0.1			<0.1	<0.1	<0.1	0.2			0.2		µg/l <0.5
Cobalt	µg/m2/day Co			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	0.5	0.2	<0.1			<0.1		µg/l <0.5
Copper	µg/m2/day Cu			10.022615	6.9	5.1	11	4.4	6.7			2.6	6.2	6.9	7.1957237			4.9		µg/l <0.5
Iron	µg/m2/day Fe			87	103	93	100.22615	359.78618	334			233.86102	187.6028	182	251.85033			308		µg/l 210
Lead	µg/m2/day Pb			0.1	0.4	<0.1	0.6	2.5	0.6			3.9	0.6	0.2	0.6			0.2		µg/l <0.5
Manganese	µg/m2/day Mn			<6.4	<6.4	<6.4	<6.4	6.4	6.9			<6.4	<6.4	<6.4	7.1957237			<6.4		µg/l <25
Mercury	µg/m2/day Hg			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	<0.1	<0.1	<0.1			<0.1		µg/l <0.5
Molybdenum	µg/m2/day Mo			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	<0.1	<0.1	<0.1			<0.1		µg/l <0.5
Nickel	µg/m2/day Ni			0.3	0.3	0.3	0.5	0.5	0.5			0.4	0.5	0.7	0.7			0.3		µg/l <0.5
Selenium	µg/m2/day Se			0.1	0.3	0.3	0.2	0.2	0.2			<0.1	0.2	0.2	0.2			0.2		µg/l <0.5
Thallium	µg/m2/day Tl			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	<0.1	<0.1	<0.1			<0.1		µg/l <0.5
Tin	µg/m2/day Sn			<0.3	0.3	<0.3	0.3	<0.3	0.3			<0.3	0.8	0.3	0.5			<0.3		µg/l <1
Uranium	µg/m2/day U			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	<0.1	<0.1	<0.1			<0.1		µg/l <0.5
Vanadium	µg/m2/day V			0.2	0.3	0.3	0.3	0.3	0.2			<0.1	0.3	0.2	0.3			0.2		µg/l <0.5
Zinc	µg/m2/day Zn			169.61349	134	334	513.98026	69	231			46	308.38816	308	182.46299			44		µg/l <3
Dustfall																				
Total Solids mg/m2/day				26	24	35	30	31	18			16	20	13	18			18		

Note: No results available for Samples 'Norht, North 150m, East 150m, East 300m, Farm 300, Farm 600, Control' as jars broken in the field.

Results highlighted in yellow are approaching or exceeding the T.A.Luft limits.

Thirteen Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.

- along with a sample of rainwater run-off from the tailings Pond

Sampling Period: 16 Nov to 14 Dec 09 (28 days).

Results of Analyses µg per m2 per day

Laboratory Number		489	490	491	492	493	494	495	496	497	498		499	500	501		502	503	504	506	
Sample Description		North	North 150 m	North 300 m	South	South 150 m	South 300 m	East	East Bound	East 150 m	East 300 m	West	West Bound	West 150 m	West 300 m	Farm 300	Farm 600	S-mines School	Control	Tailings Pond Run-off	
Analyte	Units																			Units	
Calcium	µg/m2/day	Ca 11160.7143	1703	2525.84586	2467.10526	1762	3230.73308	2467.10526	1469				1820.95865	2526	1468.51504		2173.40226	2643	2350	mg/l	120
Magnesium	µg/m2/day	Mg 2819.54887	1469	2408.36466	2349.62406	1175	2114.66165	1997.18045	411	Empty	Empty	Jar	2290.88346	2173	1233.55263	Jar	2467.10526	2643	1234	mg/l	25
Sodium	µg/m2/day	Na 39356.203	27020.6767	25845.8647	26433.2707	21734.0226	24083.6466	29957.7068	7636			Broke	23496.2406	19971.8045	12922.9323	Broke	26433.2707	28195.4887	14098	mg/l	4.8
Potassium	µg/m2/day	K 1585.99624	1116	1292.29323	5345.39474	1057	1233.55263	1351.03383	822				1468.51504	2115	1116.07143		1762.21805	1527	1234	mg/l	2.8
Aluminium	µg/m2/day	Al 999	370	258	135	117	112	129	94				94	822	176		164	88	88	µg/l	<25
Antimony	µg/m2/day	Sb 1.0	0.5	0.3	<0.3	<0.3	<0.3	<0.3	<0.3				<0.3	<0.3	<0.3		<0.3	<0.3	<0.3	µg/l	2.3
Arsenic	µg/m2/day	As 2.1	<0.3	0.8	<0.3	<0.3	<0.3	<0.3	<0.3				<0.3	<0.3	<0.3		<0.3	<0.3	<0.3	µg/l	<0.5
Barium	µg/m2/day	Ba 140.977444	7.0	76	17.0	5.9	4.7	5.9	3.5				5.9	27	4.7		6.5	10.0	4.1	µg/l	32
Beryllium	µg/m2/day	Be <0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3				<0.3	<0.3	<0.3		<0.3	<0.3	<0.3	µg/l	<0.5
Boron	µg/m2/day	B 1116.07143	705	43	65	129	76	187.969925	70				44	51	76		65	56	88	µg/l	<5
Cadmium	µg/m2/day	Cc <0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3				<0.3	<0.3	<0.3		<0.3	<0.3	<0.3	µg/l	<0.5
Chromium	µg/m2/day	Cr 2.0	<0.3	0.7	0.4	<0.3	<0.3	1.3	<0.3				<0.3	1.7	0.6		0.3	<0.3	<0.3	µg/l	<0.5
Cobalt	µg/m2/day	Cc 9.4	2.2	2.8	2.4	1.9	2.2	1.3	1.2				3.1	2.6	2.2		4.9	4.0	88	µg/l	<0.5
Copper	µg/m2/day	Cu 24	1.4	<0.3	3.9	5.5	4.3	<0.3	<0.3				<0.3	5.1	18		17	11	94	µg/l	<0.5
Iron	µg/m2/day	Fe 1409.77444	276	822	582	182	206	206	288				881	1410	405		370	446	323	µg/l	210
Lead	µg/m2/day	Pb 25	1.4	12	4.5	0.7	0.4	3.1	1.1				<0.3	5.3	0.5		4.8	5.1	<0.3	µg/l	15
Manganese	µg/m2/day	Mn 42	<15	22	19	16	<15	<15	<15				16	50	17		17	25	<15	µg/l	65
Mercury	µg/m2/day	Hg <0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3				<0.3	<0.3	<0.3		<0.3	<0.3	0.5	µg/l	<0.5
Molybdenum	µg/m2/day	Mo 1.4	1.0	0.8	0.9	0.8	0.8	0.8	0.8				0.8	0.9	0.8		0.8	0.8	0.8	µg/l	1.3
Nickel	µg/m2/day	Ni 1.9	<0.3	0.7	0.8	<0.3	<0.3	<0.3	<0.3				1.1	2.2	<0.3		0.9	0.5	<0.3	µg/l	5.8
Selenium	µg/m2/day	Se <0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3				<0.3	<0.3	<0.3		<0.3	<0.3	<0.3	µg/l	<0.5
Thallium	µg/m2/day	Tl <0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3				<0.3	<0.3	<0.3		<0.3	<0.3	<0.3	µg/l	11
Tin	µg/m2/day	Sn 1.2	<0.6	<0.6	0.6	<0.6	<0.6	<0.6	<0.6				<0.6	0.6	<0.6		<0.6	<0.6	<0.6	µg/l	<1
Uranium	µg/m2/day	U 0	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3				<0.3	<0.3	<0.3		<0.3	<0.3	<0.3	µg/l	0.9
Vanadium	µg/m2/day	V 1.8	0.6	1.1	0.8	0.5	0.7	0.6	<0.3				0.5	1.7	0.5		0.7	0.6	<0.3	µg/l	<0.5
Zinc	µg/m2/day	Zn 352	194	206	234.962406	529	217	705	499				1703.47744	1234	429		2408.36466	458	382	µg/l	620
Dustfall																					
Total Solids mg/m2/day		200	4	410	219	59	48	0	75				31	38	27	35	36	32	6		

Note: No results available for Samples 'West' or 'Farm 300m' as jars broken in the field.

No results available for Samples 'East 150m' or 'East 300m' as jars empty

Results highlighted in yellow are approaching or exceeding the T.A.Luft limits.

Seventeen Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.

- along with a sample of rainwater run-off from the tailings Pond

Sampling Period: 19 October to 16 November 09 (28 days).

Results of Analyses µg per m2 per day

Laboratory Number		998	999	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1017	
Sample Description		North	North 150m	North 300m	South	South 150 m	South 300 m	East	East Bound	East 150 m	East 300 m	West	West Bound	West 150 m	West 300 m	Farm 300	Farm 600	S-mines School	Control	Tailings Pond Run-off	
Analyte	Units																			Units	
Calcium	µg/m2/day	C	9985.90226	1820.95865	1703.47744	1585.99624	1645	1585.99624	1703.47744	1469	1469	1880	1938.43985	1174.81203	1057	1585.99624	2349.62406	1409.77444	1116	1410	mg/l	48
Magnesium	µg/m2/day	N	3054.51128	1880	2290.88346	2467.10526	1762	2702.06767	1820.95865	1880	1938	1880	2232.14286	2408.36466	2056	1997.18045	2290.88346	2467.10526	1820.95865	1645	mg/l	3
Sodium	µg/m2/day	N	22908.8346	17034.7744	18796.9925	20559.2105	16447.3684	21146.6165	17034.7744	17034.7744	17622.1805	17034.7744	21146.6165	22908.8346	18209.5865	17034.7744	18209.5865	22908.8346	16447.3684	13510	mg/l	4.6
Potassium	µg/m2/day	K	1174.81203	1057	1233.55263	1174.81203	646	1527.25564	646	822	822	999	822	822	998.590226	1233.55263	5580.35714	1057.33083	1938	1351	mg/l	2.3
Aluminium	µg/m2/day	A	999	141	82	112	76	88	100	70	70	82	100	106	70	129	112	140.977444	43	76	µg/l	180.0
Antimony	µg/m2/day	S	0.9	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.4	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	µg/l	<0.5
Arsenic	µg/m2/day	A	2.4	0.5	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	3.4	0.5	<0.3	0.6	0.6	<0.3	0.3	<0.3	µg/l	0.9
Barium	µg/m2/day	B	135	5.3	10.6	3.5	1.8	<1.8	5.3	2.3	2.3	3.5	117	4.7	2.3	4.7	21	4.7	7.6	4.1	µg/l	18
Beryllium	µg/m2/day	B	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	µg/l	<0.5
Boron	µg/m2/day	B	576	65	70	135	94	56	140.977444	70	106	117	88	129	55	59	59	88	65	70	µg/l	20
Cadmium	µg/m2/day	C	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	µg/l	<0.5
Chromium	µg/m2/day	C	1.8	0.5	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.4	0.4	<0.3	<0.3	0.9	µg/l	0.7
Cobalt	µg/m2/day	C	0.5	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	µg/l	<0.5
Copper	µg/m2/day	C	48	25	16	47	16	41	14	14	12	7.6	19	21	23	35	40	27	17	19	µg/l	3.7
Iron	µg/m2/day	F	1703.47744	376	206	217	235	646	452	223	176	258	646	187.969925	206	352	476	388	164	705	µg/l	130
Lead	µg/m2/day	P	25	2.1	1.1	3.4	0.4	2.2	1.8	0.8	1.0	0.4	15	1.0	1.2	3.8	22	1.1	0.3	0.6	µg/l	1
Manganese	µg/m2/day	M	46	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	17	30	36	<15	18	µg/l	30
Mercury	µg/m2/day	H	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	µg/l	<0.5
Molybdenum	µg/m2/day	M	0.4	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.8	<0.3	<0.3	<0.3	µg/l	<0.5
Nickel	µg/m2/day	N	2.1	0.6	0.4	1.7	1.0	1.2	0.5	0.6	1.3	1.4	0.5	<0.3	0.5	1.1	0.9	1.9	0.6	0.5	µg/l	2.6
Selenium	µg/m2/day	S	0.5	0.5	0.6	0.5	0.4	0.8	0.4	0.4	0.5	0.3	0.5	0.4	0.4	0.5	0.4	0.5	0.4	0.5	µg/l	0.8
Thallium	µg/m2/day	T	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.4	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	µg/l	<0.5
Tin	µg/m2/day	S	0.6	<0.6	<0.6	<0.6	<0.6	0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	µg/l	<1
Uranium	µg/m2/day	U	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	µg/l	2.3
Vanadium	µg/m2/day	V	1.6	0.3	<0.3	<0.3	<0.3	0.4	<0.3	<0.3	<0.3	<0.3	0.6	0.6	0.6	0.3	0.4	<0.3	0.4	<0.3	µg/l	<0.5
Zinc	µg/m2/day	Z	123	159	493	705	82	1292.29323	112	411	1469	282	182	53	705	1703.47744	382	1820.95865	646	223	µg/l	91
Dustfall																					
Total Solids mg/m2/day		180	85	97	109	80	114	77	88	102	82	98	98	85	102	127	109	132	80		

Seventeen Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.

- along with a sample of rainwater run-off from the tailings Pond

Sampling Period: 22 Sept to 19 Oct 09 (27 days).

Results of Analyses µg per m2 per day

Laboratory Number		6310	6311	6312	6313	6314	6315	6316	6317	6318	6319	6320	6321	6322	6323	6324	6325	6326	6327	6329	
Sample Description		North	North 150 m	North 300 m	South	South 150 m	South 300 m	East	East Bound	East 150 m	East 300 m	West	West Bound	West 150 m	West 300 m	Farm 300	Farm 600	S-mines School	Control	Tailings Pond Run-off	
Analyte	Units																			Units	
Calcium	µg/m2/day	Ca 45077.97271	4447	5177.875244	3533.138402	975	853	3898.635478	20711.50097	1767	1645	1401.072125	1157.407407	1340.155945	1279.239766	1096.491228	1157.407407	1645	2924	mg/l	320
Magnesium	µg/m2/day	Mg 4507.797271	<305	3167.641326	<305	<305	<305	<305	3107	<305	<305	<305	<305	<305	<305	<305	<305	<305	487	mg/l	110
Sodium	µg/m2/day	Na 4873.294347	5482	3472.222222	2680.311891	2680	1705.653021	3045.808967	3654.97076	2558	2376	3228.557505	3411.306043	2498	2192.982456	2741.22807	2436.647173	3229	6701	mg/l	6.9
Potassium	µg/m2/day	K 2619.395712	1340	6700.779727	670	670	548	670	3046	670	792	975	730.994152	1218	730.994152	730.994152	792	2071	4812	mg/l	4.5
Aluminium	µg/m2/day	Al 6700.779727	670	17056.53021	286	110	104	439	8528	231	164	195	134.0155945	128	104	110	116	152	311	µg/l	<25
Antimony	µg/m2/day	Sb 1.8	<0.3	<0.3	<0.3	<0.3	<0.3	0.3	0.5	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0	<0.3	<0.3	µg/l	0.9
Arsenic	µg/m2/day	As 12	<0.3	6.7	<0.3	<0.3	<0.3	0.3	6.1	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	µg/l	<0.5
Barium	µg/m2/day	Ba 475	25	457	13	3.7	3.7	36	341	13.4	9.7	17.1	5.5	5.5	3.7	6.7	5.5	10.4	8.5	µg/l	11
Beryllium	µg/m2/day	Be <0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	µg/l	<0.5
Boron	µg/m2/day	B 609	195	122	122	79	79	274	975	183	177	116	122	134	116	506	110	244	104	µg/l	<0.5
Cadmium	µg/m2/day	Cd <0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	1.1	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	µg/l	<0.5
Chromium	µg/m2/day	Cr 15	1.3	23	0.3	<0.3	<0.3	0.5	15	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.8	µg/l	<0.5
Cobalt	µg/m2/day	Co 4.1	<0.3	6.0	<0.3	<0.3	<0.3	<0.3	6.7	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	µg/l	<0.5
Copper	µg/m2/day	Cu 39	48	38	19	3.6	0.5	<0.3	34	24	1.7	7.9	-0.3	11	<0.3	19	<0.3	16	45	µg/l	<0.5
Iron	µg/m2/day	Fe 10355.75049	1036	16447.36842	560	140	244	792	10964.91228	457	365	365	213	414	329	256	268.0311891	518	567	µg/l	350
Lead	µg/m2/day	Pb 128	9.7	61	4.5	<0.3	<0.3	19	201	6.7	2.7	5.4	0.3	1.2	0.4	1.0	1.0	1.9	2.4	µg/l	5.1
Manganese	µg/m2/day	Mn 268.0311891	29	372	16	<15	<15	24	853	16	<15	17	<15	<15	<15	<15	33	<15	54	µg/l	29
Mercury	µg/m2/day	Hg <0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	µg/l	
Molybdenum	µg/m2/day	Mo 1.8	1.0	1.6	0.9	0.9	0.8	0.9	1.3	0.8	0.9	0.9	0.9	0.9	0.8	0.9	0.9	0.9	0.9	µg/l	<0.5
Nickel	µg/m2/day	Ni 16	1.3	18	<0.3	13.4	<0.3	0.4	19	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.3	µg/l	6
Selenium	µg/m2/day	Se <0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	µg/l	<0.5
Thallium	µg/m2/day	Tl 0.5	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	µg/l	17
Tin	µg/m2/day	Sn 1.2	0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	µg/l	<1
Uranium	µg/m2/day	U 0.7	<0.3	1.0	<0.3	<0.3	<0.3	<0.3	0.5	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	µg/l	0.5
Vanadium	µg/m2/day	V 13	1.2	27	0.6	<0.3	<0.3	0.7	13	0.4	0.4	0.4	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.5	µg/l	<0.5
Zinc	µg/m2/day	Zn 207	914	609	493	317	158	152	670	177	171	670	280	853	177	146	158	158	286	µg/l	970
Dustfall																					
Total Solids mg/m2/day		512	118	677	85	69	55	80	387	46	43	58	44	50	44	30	35	43	82		

Note: Results highlighted in yellow are approaching or exceeding the T.A.Luft limits.

Seventeen Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.

- along with a sample of rainwater run-off from the tailings Pond

Sampling Period: 23 August to 22 Sept 09 (30 days).

Results of Analyses µg per m2 per day

Laboratory Number		**5332**	**5333**	**5334**	**5335**	**5336**	**5337**	**5338**	**5339**	**5340**	**5341**	**5342**	**5343**	**5344**	**5345**	**5346**	**5347**	**5348**	**5349**	**5351**	
Sample Description		**North**	**North**	**North**	**South**	**South**	**South**	**East**	**East**	**East**	**East**	**West**	**West**	**West**	**West**	**Farm**	**Farm**	**S-mines**	**Control**	**Tailings Pond**	
			150 m	**300 m**		**150 m**	**300 m**		**Bound**	**150 m**	**300 m**		**Bound**	**150 m**	**300 m**	**300**	**600**	**School**		**Run-off**	
Analyte	**Units**																			**Units**	
Calcium	µg/m2/day Ca		1535		1206	548		87719	33443	1151	987	768	822	1206	439		329	603	<274	mg/l	510
Magnesium	µg/m2/day Mg		<274		<274	<274		1974	439	<274	<274	<274	<274	<274	<274		<274	439	<274	mg/l	180
Sodium	µg/m2/day Na		5482		9320	5482		10417	5318	8224	6579	5208	7127	6579	4441		5428	9320	4496	mg/l	8.1
Potassium	µg/m2/day K		<274		439	<274		1480	439	<274	932	<274	1535	1974	<274		<274	2138	603	mg/l	5.4
Aluminium	µg/m2/day Al		428		208	121		4331	1919	274	132	154	126	121	164		132	132	93	µg/l	<25
Antimony	µg/m2/day Sb		0.4		0.3	<0.3		1.2	0.8	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		<0.3	<0.3	<0.3	µg/l	<0.5
Arsenic	µg/m2/day As		<0.3		<0.3	<0.3		3.7	3.2	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		<0.3	<0.3	<0.3	µg/l	<0.5
Barium	µg/m2/day Ba		7.7		9.3	2.2		110	137	7.7	3.3	25	<1.6	<1.6	<1.6		3.8	9.3	<1.6	µg/l	<3
Beryllium	µg/m2/day Be		<0.3		<0.3	<0.3		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		<0.3	<0.3	<0.3	µg/l	<0.5
Boron	µg/m2/day B		285		482	88		877	987	406	208	154	148	110	115		132	110	77	µg/l	<5
Cadmium	µg/m2/day Cd		<0.3		<0.3	<0.3		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		<0.3	<0.3	<0.3	µg/l	<0.5
Chromium	µg/m2/day Cr		<0.3		<0.3	<0.3		4.8	1.1	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		<0.3	<0.3	<0.3	µg/l	<0.5
Cobalt	µg/m2/day Co		<0.3		<0.3	<0.3		1.9	0.5	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		<0.3	<0.3	<0.3	µg/l	<0.5
Copper	µg/m2/day Cu		17		25	15		21	19	19	11	9.9	28	43	21		12	11	9.3	µg/l	<0.5
Iron	µg/m2/day Fe		428		192	318		6579	2741	362	186	318	148	164	203		713	340	334	µg/l	500
Lead	µg/m2/day Pb		1.5		1.4	<0.3		71.3	71.3	3.5	<0.3	3.0	<0.3	<0.3	<0.3		<0.3	29.6	<0.3	µg/l	5.8
Manganese	µg/m2/day Mn		14		<13.7	<13.7		143	77	14	17	18	14	36	15		15	22	14	µg/l	100
Mercury	µg/m2/day Hg		<0.3		<0.3	<0.3		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		<0.3	<0.3	<0.3	µg/l	<0.5
Molybdenum	µg/m2/day Mo		0.9		0.7	0.7		0.9	0.9	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		<0.3	<0.3	<0.3	µg/l	<0.5
Nickel	µg/m2/day Ni		<0.3		<0.3	<0.3		6.0	2.2	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		<0.3	<0.3	<0.3	µg/l	3.5
Selenium	µg/m2/day Se		<0.3		<0.3	<0.3		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		<0.3	<0.3	<0.3	µg/l	<0.5
Thallium	µg/m2/day Tl		<0.3		<0.3	<0.3		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		<0.3	<0.3	<0.3	µg/l	17
Tin	µg/m2/day Sn		<0.5		2.7	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	µg/l	<1
Uranium	µg/m2/day U		<0.3		<0.3	<0.3		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		<0.3	<0.3	<0.3	µg/l	1.1
Vanadium	µg/m2/day V		<0.3		<0.3	<0.3		3.8	1.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		<0.3	<0.3	<0.3	µg/l	<0.5
Zinc	µg/m2/day Zn		186		44	181		400	186	42	148	170	51	104	99		197	110	175	µg/l	670
Dustfall																					
Total Solids mg/m2/day			10		-	-		299	96	-	20	9	-	21	-	-		19	19		

Note: No results available for samples 'North', 'North 300m', 'South 300m' and 'Farm 300m' as the jars were broken in the lab prior to analysis.

Results highlighted in yellow are approaching or exceeding the T.A.Luft limits.

Sixteen Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.

- along with a sample of rainwater run-off from the tailings Pond

Sampling Period: 24 July to 23 Aug 09 (29 days).

Results of Analyses µg per m2 per day

Laboratory Number		4898	4899	4900	4901	4902	4903		4904	4905	4906	4907	4908	4909	4910	4911	4912	4913	4914	4916	
Sample Description		North	North 150 m	North 300 m	South	South 150 m	South 300 m	East	East Bound	East 150 m	East 300 m	West	West Bound	West 150 m	West 300 m	Farm 300	Farm 600	S-mines School	Control	Tailings Pond Run-off	
Analyte	Units																			Units	
Calcium	µg/m2/day	Ca 85073	6239	3289	2892	2269	2495		6806	2439	2949	2722	2382	2439	2269	9074	2609	2666	2495	mg/l	220
Magnesium	µg/m2/day	Mg 22119	2779	1872	2269	1758	1928		1701	1645	2042	1872	1928	2098	1758	5672	1928	2098	1815	mg/l	45
Sodium	µg/m2/day	Na 9074	6806	5672	7373	6806	6239		5672	6806	9074	6806	8507	7373	6239	6239	6239	7940	4934	mg/l	5.6
Potassium	µg/m2/day	K 6239	5275	2382	5331	2098	3460		1985	1872	4480	2212	2212	4254	2836	2552	2552	2722	1985	mg/l	4.8
Aluminium	µg/m2/day	Al 27223	1248	403	289	159	204		624	113	159	159	323	85	221	125	227	153	142	µg/l	<25
Antimony	µg/m2/day	Sb 4.3	2.2	2.2	2.2	2.1	2.1		2.3	2.0	2.1	2.3	2.2	2.1	2.2	2.1	2.2	2.1	2.1	µg/l	2.6
Arsenic	µg/m2/day	As 14	1.6	3.2	1.5	1.1	1.1		1.9	1.1	1.2	2.7	1.5	1.1	1.4	1.1	1.4	1.4	1.1	µg/l	1.3
Barium	µg/m2/day	Ba 272	22	17	23	14	15		37	15	19	49	17	15	16	15	20	22	13	µg/l	30
Beryllium	µg/m2/day	Be 1.1	0.3	0.3	0.3	0.3	0.3		0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	µg/l	<0.5
Boron	µg/m2/day	B 431	68	193	79	56	96		329	62	79	27	49	68	74	53	74	74	47	µg/l	10
Cadmium	µg/m2/day	Cd 1.2	0.9	0.9	1.1	0.9	0.9		1.0	0.9	1.0	0.9	0.9	0.9	0.9	1.0	0.9	1.1	1.0	µg/l	5.9
Chromium	µg/m2/day	Cr 56	3.9	4.1	2.2	1.8	1.8		2.3	1.6	1.8	1.9	2.0	1.6	1.8	1.8	2.2	2.3	1.8	µg/l	2.1
Cobalt	µg/m2/day	Co 17	2.3	1.7	1.7	1.6	1.6		1.9	1.6	1.6	1.6	1.8	1.6	1.6	1.6	1.7	1.6	1.6	µg/l	1.2
Copper	µg/m2/day	Cu 49	25	18	20	15	25		10	14	15	14	10	22	20	11	36	27	6.8	µg/l	8.4
Iron	µg/m2/day	Fe 45372	2212	505	624	352	233		1475	267	499	624	794	204	340	250	505	295	1758	µg/l	320
Lead	µg/m2/day	Pb 85	7.9	2.6	10.2	2.7	4.5		31.2	2.1	4.3	12	14	2.9	6.2	4.8	5.3	4.1	2.3	µg/l	15
Manganese	µg/m2/day	Mn 794	42	<15	26	<15	<15		29	<15	<15	<15	19	<15	<15	16	<15	<15	<15	µg/l	430
Mercury	µg/m2/day	Hg <0.3	<0.3	<0.3	<0.3	<0.3	<0.3		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	µg/l	<0.5
Molybdenum	µg/m2/day	Mo 1.9	2.2	1.9	2.0	2.0	1.9		1.4	1.9	2.2	2.1	2.0	2.2	1.9	2.0	2.1	1.9	1.9	µg/l	1.6
Nickel	µg/m2/day	Ni 74	4.7	1.7	2.0	1.8	1.5		2.6	1.4	1.8	1.7	1.9	1.3	1.5	1.5	1.7	1.4	2.5	µg/l	14
Selenium	µg/m2/day	Se 1.3	0.8	0.7	0.7	0.7	0.6		0.7	0.7	0.8	0.7	0.7	0.7	0.6	0.7	0.7	0.7	0.7	µg/l	<0.5
Thallium	µg/m2/day	Tl 1.4	0.7	0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	µg/l	22
Tin	µg/m2/day	Sn <0.6	<0.6	<0.6	1.7	<0.6	<0.6		<0.6	<0.6	14	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	µg/l	<1
Uranium	µg/m2/day	U 1.3	0.4	0.3	0.3	0.3	0.4		0.4	0.3	0.4	0.3	0.3	0.3	0.3	0.4	0.3	0.3	0.3	µg/l	1.9
Vanadium	µg/m2/day	V 40	3.3	2.3	2.3	2.0	2.0		2.4	1.8	2.0	2.0	2.3	1.8	2.0	2.2	2.2	2.2	1.9	µg/l	1.9
Zinc	µg/m2/day	Zn 431	352	153	216	96	471		176	255	278	465	96	147	323	363	125	176	147	µg/l	1400
Dustfall																					
Total Solids	**mg/m2/day**	1496	208	67	110	48	77		75	40	125	50	54	74	52	109	59	70	36		

Note: No results available for Sample 'East' as the jar was broken in the field.

Results highlighted in yellow are approaching or exceeding the T.A.Luft limits.

Sixteen Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.

- along with a sample of rainwater run-off from the tailings Pond

Sampling Period: 26 June to 24 July 09 (29 days).

Results of Analyses µg per m2 per day

Laboratory Number		4117	4118	4119	4120	4121	4122	4123	4124	4125	4126		4127	4128	4129	4130	4131	4132	4133	4135	
Sample Description		North	North 150 m	North 300 m	South	South 150 m	South 300 m	East	East Bound	East 150 m	East 300 m	West	West Bound	West 150 m	West 300 m	Farm 300	Farm 600	S-mines School	Control	Tailings Pond Run-off	
Analyte	Units																			Units	
Calcium	µg/m2/day	6239	1872	4424	1985	1645	1701	2325	1815	3800	4424		2552	2325	2269	1588	2382	2155	14179	mg/l	290
Magnesium	µg/m2/day	1418	794	1078	964	794	794	851	964	1021	2495		1078	907	964	681	1021	1588	2666	mg/l	61
Sodium	µg/m2/day	4083	2779	3630	2836	2949	2382	3063	2892	2269	4027		3289	2949	2552	2212	2949	5331	4764	mg/l	5.0
Potassium	µg/m2/day	2155	1304	3289	2382	1588	1645	1701	3346	3686	13612		2269	1985	2609	1191	2212	7373	9642	mg/l	4.8
Aluminium	µg/m2/day	851	125	199	74	74	91	91	85	272	85		85	102	91	74	91	113	2155	µg/l	<25
Antimony	µg/m2/day	1.8	1.6	1.6	1.6	1.6	1.6	1.8	1.6	1.7	1.6		1.6	1.6	1.6	1.6	1.6	1.7	1.6	µg/l	3.6
Arsenic	µg/m2/day	1.3	0.5	0.6	0.6	0.4	0.5	6.8	0.7	1.7	0.7		0.5	0.6	0.5	0.5	0.5	0.6	1.3	µg/l	1.4
Barium	µg/m2/day	49	13	27	16	15	22	85	14	35	33		14	12	14	12	16	27	30	µg/l	34
Beryllium	µg/m2/day	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	µg/l	<0.5
Boron	µg/m2/day	27	35	47	49	57	53	41	79	62	62		68	68	44	57	74	193	96	µg/l	12
Cadmium	µg/m2/day	1.0	1.0	1.2	1.0	0.9	1.0	1.0	1.0	1.5	1.6		1.2	1.0	1.0	1.0	1.0	1.4	4.8	µg/l	2.9
Chromium	µg/m2/day	2.7	1.2	1.3	1.2	1.1	1.1	1.2	1.2	1.7	1.8		1.3	1.2	1.2	1.1	1.2	1.2	5.4	µg/l	2.7
Cobalt	µg/m2/day	1.9	1.0	1.1	1.0	1.0	1.0	1.0	1.0	1.4	1.1		1.0	1.0	1.0	1.0	1.2	1.1	2.9	µg/l	1.9
Copper	µg/m2/day	53	28	47	24	20	37	23	41	27	74		35	35	36	24	27	48	49	µg/l	5.4
Iron	µg/m2/day	1191	216	278	567	79	159	737	193	907	624		295	181	199	91	244	176	3630	µg/l	500
Lead	µg/m2/day	11	2.3	2.7	2.0	0.9	4.5	25.0	2.6	90.7	4.0		1.4	1.6	2.1	1.6	4.5	4.4	17.6	µg/l	16
Manganese	µg/m2/day	68	14.7	32.3	15.3	<14	18.1	18.7	<14	79.4	73.7		14.2	14.7	21.0	<14	15.3	54.4	187.2	µg/l	340
Mercury	µg/m2/day	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	µg/l	<0.5
Molybdenum	µg/m2/day	1.5	1.5	1.7	1.6	1.6	1.5	1.6	1.7	1.8	2.4		1.7	1.6	1.6	1.6	1.8	1.8	2.0	µg/l	2.9
Nickel	µg/m2/day	3.8	0.9	1.1	1.2	0.5	0.9	1.3	1.0	2.3	1.5		1.0	1.0	1.1	0.6	1.3	0.9	6.2	µg/l	8.2
Selenium	µg/m2/day	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.6	µg/l	<0.5
Thallium	µg/m2/day	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	µg/l	18
Tin	µg/m2/day	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1		1.1	1.1	1.1	1.1	1.1	1.1	1.1	µg/l	2.0
Uranium	µg/m2/day	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.6	µg/l	0.8
Vanadium	µg/m2/day	2.7	1.6	1.8	1.5	1.4	1.5	1.5	1.4	1.8	1.5		1.6	1.6	1.6	1.5	1.5	1.6	4.5	µg/l	2.3
Zinc	µg/m2/day	1815	369	624	267	108	567	199	329	250	459		284	369	681	147	125	113	346	µg/l	430
Dustfall																					
Total Solids mg/m2/day		55	0	19	0	0	0	5	9	136	246		5	2	0	0	10	79	554		

Note: No results available for Sample 'West' as the jar was broken in the field.

Results highlighted in yellow are approaching or exceeding the T.A.Luft limits.

Sixteen Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.

- along with a sample of rainwater run-off from the tailings Pond

Sampling Period: 26 June to 24 July 09 (29 days).

Results of Analyses µg per m2 per day

Laboratory Number		4117	4118	4119	4120	4121	4122	4123	4124	4125	4126		4127	4128	4129	4130	4131	4132	4133	4135	
Sample Description		North	North 150 m	North 300 m	South	South 150 m	South 300 m	East	East Bound	East 150 m	East 300 m	West	West Bound	West 150 m	West 300 m	Farm 300	Farm 600	S-mines School	Control	Tailings Pond Run-off	
Analyte	Units																			Units	
Calcium	µg/m2/day	6239	1872	4424	1985	1645	1701	2325	1815	3800	4424		2552	2325	2269	1588	2382	2155	14179	mg/l	290
Magnesium	µg/m2/day	1418	794	1078	964	794	794	851	964	1021	2495		1078	907	964	681	1021	1588	2666	mg/l	61
Sodium	µg/m2/day	4083	2779	3630	2836	2949	2382	3063	2892	2269	4027		3289	2949	2552	2212	2949	5331	4764	mg/l	5.0
Potassium	µg/m2/day	2155	1304	3289	2382	1588	1645	1701	3346	3686	13612		2269	1985	2609	1191	2212	7373	9642	mg/l	4.8
Aluminium	µg/m2/day	851	125	199	74	74	91	91	85	272	85		85	102	91	74	91	113	2155	µg/l	<25
Antimony	µg/m2/day	1.8	1.6	1.6	1.6	1.6	1.6	1.8	1.6	1.7	1.6		1.6	1.6	1.6	1.6	1.6	1.7	1.6	µg/l	3.6
Arsenic	µg/m2/day	1.3	0.5	0.6	0.6	0.4	0.5	6.8	0.7	1.7	0.7		0.5	0.6	0.5	0.5	0.5	0.6	1.3	µg/l	1.4
Barium	µg/m2/day	49	13	27	16	15	22	85	14	35	33		14	12	14	12	16	27	30	µg/l	34
Beryllium	µg/m2/day	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	µg/l	<0.5
Boron	µg/m2/day	27	35	47	49	57	53	41	79	62	62		68	68	44	57	74	193	96	µg/l	12
Cadmium	µg/m2/day	1.0	1.0	1.2	1.0	0.9	1.0	1.0	1.0	1.5	1.6		1.2	1.0	1.0	1.0	1.0	1.4	4.8	µg/l	2.9
Chromium	µg/m2/day	2.7	1.2	1.3	1.2	1.1	1.1	1.2	1.2	1.7	1.8		1.3	1.2	1.2	1.1	1.2	1.2	5.4	µg/l	2.7
Cobalt	µg/m2/day	1.9	1.0	1.1	1.0	1.0	1.0	1.0	1.0	1.4	1.1		1.0	1.0	1.0	1.0	1.2	1.1	2.9	µg/l	1.9
Copper	µg/m2/day	53	28	47	24	20	37	23	41	27	74		35	35	36	24	27	48	49	µg/l	5.4
Iron	µg/m2/day	1191	216	278	567	79	159	737	193	907	624		295	181	199	91	244	176	3630	µg/l	500
Lead	µg/m2/day	11	2.3	2.7	2.0	0.9	4.5	25.0	2.6	90.7	4.0		1.4	1.6	2.1	1.6	4.5	4.4	17.6	µg/l	16
Manganese	µg/m2/day	68	14.7	32.3	15.3	<14	18.1	18.7	<14	79.4	73.7		14.2	14.7	21.0	<14	15.3	54.4	187.2	µg/l	340
Mercury	µg/m2/day	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	µg/l	<0.5
Molybdenum	µg/m2/day	1.5	1.5	1.7	1.6	1.6	1.5	1.6	1.7	1.8	2.4		1.7	1.6	1.6	1.6	1.8	1.8	2.0	µg/l	2.9
Nickel	µg/m2/day	3.8	0.9	1.1	1.2	0.5	0.9	1.3	1.0	2.3	1.5		1.0	1.0	1.1	0.6	1.3	0.9	6.2	µg/l	8.2
Selenium	µg/m2/day	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.6	µg/l	<0.5
Thallium	µg/m2/day	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	µg/l	18
Tin	µg/m2/day	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1		1.1	1.1	1.1	1.1	1.1	1.1	1.1	µg/l	2.0
Uranium	µg/m2/day	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.6	µg/l	0.8
Vanadium	µg/m2/day	2.7	1.6	1.8	1.5	1.4	1.5	1.5	1.4	1.8	1.5		1.6	1.6	1.6	1.5	1.5	1.6	4.5	µg/l	2.3
Zinc	µg/m2/day	1815	369	624	267	108	567	199	329	250	459		284	369	681	147	125	113	346	µg/l	430
Dustfall																					
Total Solids mg/m2/day		55	0	19	0	0	0	5	9	136	246		5	2	0	0	10	79	554		

Note: No results available for Sample 'West' as the jar was broken in the field.

Results highlighted in yellow are approaching or exceeding the T.A.Luft limits.

Fifteen Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.

- along with a sample of rainwater run-off from the tailings Pond

Sampling Period: 30 Jan to 17 Apr 09 (77 days).

Results of Analyses µg per m2 per day

Laboratory Number			2870	2871		2872	2873	2874	2875	2876	2877	2878	2879	2880	2881	2882	2883	2884	2885	2887	
Sample Description		North	North	North	South	South	South	East	East	East	East	West	West	West	West	Farm	Farm	S-mines	Control	Tailings Pond	
			150 m	300 m		150 m	300 m		Boundary	150 m	300 m		Boundary	150 m	300 m	300	600	School		Run-off	
Analyte	**Units**																			**Units**	
Calcium	µg/m2/day	Ca	1282	1452		1089	854	2350	1410	1431	1324	1944	1324	2563	2051	1132	961	1559	513	mg/l	260
Magnesium	µg/m2/day	Mg	726	940		1025	812	1410	1111	1773	1004	1303	1089	1410	1004	684	1047	1431	662	mg/l	130
Sodium	µg/m2/day	Na	4272	6408		7262	5554	9398	6622	13457	6835	7903	7262	8758	5340	4272	7690	9612	4058	mg/l	6.9
Potassium	µg/m2/day	K	384	577		491	619	555	1218	790	705	2136	748	5981	748	470	534	5554	470	mg/l	3.2
		No			No																
Aluminium	µg/m2/day	A	182	105		77	47	96	98	107	64	75	56	662	662	73	64	62	36	µg/l	<25
		sample			sample																
Antimony	µg/m2/day	Sb	0.3	0.6		0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.3	0.3	0.2	0.3	0.2	0.2	µg/l	<0.5
Arsenic	µg/m2/day	As	<0.11	<0.11		<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	0.7	<0.11	0.3	0.7	<0.11	0.2	<0.11	<0.11	µg/l	<0.5
Barium	µg/m2/day	Ba	20.5	4.9		4.1	3.6	5.8	3.6	5.3	6.8	32.0	3.6	25.6	23.5	4.1	8.3	9.6	1.9	µg/l	8.0
Beryllium	µg/m2/day	Be	<0.11	<0.11		<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	µg/l	<0.5
Boron	µg/m2/day	B	9.4	20.5		18.8	15.0	19.2	25.6	27.8	23.5	40.6	21.4	38.4	18.2	11.1	15.6	53.4	21.4	µg/l	<5
Cadmium	µg/m2/day	Cd	<0.11	<0.11		<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	0.2	<0.11	µg/l	1.3
Chromium	µg/m2/day	Cr	0.4	0.4		0.2	0.2	0.4	0.4	0.4	0.4	0.2	0.4	1.7	1.3	0.2	0.4	0.2	0.2	µg/l	1.0
Cobalt	µg/m2/day	Co	0.2	0.2		0.2	0.1	0.3	0.2	0.2	0.4	0.1	0.1	0.9	0.9	0.2	0.3	0.2	0.1	µg/l	<0.5
Copper	µg/m2/day	Cu	23.5	17.3		7.3	9.6	13.2	7.7	8.5	7.5	10.7	8.5	13.5	11.3	7.9	8.3	7.9	8.5	µg/l	<3.0
Iron	µg/m2/day	Fe	278	342		179	162	384	406	256	235	197	363	**1282**	1346	188	256	256	190	µg/l	**240**
Lead	µg/m2/day	Pb	2.6	0.7		0.9	2.3	3.0	1.6	4.1	4.3	3.6	0.6	7.7	10.0	2.1	4.5	2.8	0.4	µg/l	<0.5
Manganese	µg/m2/day	Mn	<5.3	<5.3		8.5	<5.3	18.6	8.3	<5.3	20.7	<5.3	<5.3	98.3	205.1	<5.3	<5.3	9.4	<5.3	µg/l	<25
Mercury	µg/m2/day	Hg	<0.11	<0.11		<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	µg/l	<0.5
Molybdenum	µg/m2/day	Mo	0.3	0.4		0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.5	0.3	0.3	0.4	0.3	0.3	µg/l	0.7
Nickel	µg/m2/day	Ni	0.5	0.6		0.7	0.3	1.2	0.6	0.7	1.6	0.3	0.7	1.7	1.7	0.1	0.4	1.0	0.1	µg/l	11
Selenium	µg/m2/day	Se	<0.11	<0.11		<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	0.4	<0.11	<0.11	<0.11	<0.11	<0.11	µg/l	<0.5
Silver	µg/m2/day	Ag																			
Thallium	µg/m2/day	Tl	<0.11	<0.11		<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	µg/l	5.8
Thorium	µg/m2/day	Th																			
Tin	µg/m2/day	Sn	0.6	0.9		0.4	0.6	0.4	0.6	0.6	0.4	0.4	0.4	0.9	0.6	0.4	0.4	0.6	0.6	µg/l	<1.0
Uranium	µg/m2/day	U	<0.11	<0.11		<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	0.1	0.1	<0.11	0.1	<0.11	<0.11	µg/l	2.3
Vanadium	µg/m2/day	V	0.7	0.5		0.6	0.6	0.4	0.6	0.7	0.4	0.6	0.6	1.6	1.4	0.6	0.7	0.7	0.5	µg/l	<0.5
Zinc	µg/m2/day	Zn	175	684		235	145	833	427	577	577	235	214	320	406	214	167	115	90	µg/l	**2400**
Dustfall																					
Total Solids mg/m2/day			32	34		30	26	36	39	51	30	34	29	102	59	20	25	50	16		

Sixteen Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.

- along with a sample of rainwater run-off from the tailings Pond

Sampling Period: 15 Dec 2008 to 30 Jan 09 (50 days).

Results of Analyses µg per m2 per day.

Laboratory Number		2589	2590	2591	2592	2593	2594	2595	2596	2597	2598	2599	2600	2601	2602	2603	2604	2605	2606	2608	
Sample Description		North	North 150 m	North 300 m	South	South 150 m	South 300 m	East	East Boundary	East 150 m	East 300 m	West	West Boundary	West 150 m	West 300 m	Farm 300	Farm 600	S-mines School	Control	Tailings Pond Run-off	
Analyte	**Units**																			**Units**	
Calcium	µg/m2/day C	7237	1513	1283	1513	1612	987	10197	1809		1809	1743	888	2368	1447	7566	1086	1678	1414	mg/l	130
Magnesium	µg/m2/day M	3092	2467	1842	2434	2664	1645	3059	2072		3224	2599	2039	1776	1776	1612	2237	3191	1151	mg/l	40
Sodium	µg/m2/day N	22039	22039	15789	20066	23355	13487	22697	17434		28947	22368	19737	15132	15461	13158	21382	27632	11184	mg/l	5.4
Potassium	µg/m2/day K	888	789	691	987	757	559	2303	1480	No	1316	987	559	1579	592	3059	724	1480	296	mg/l	2.8
Aluminium	µg/m2/day A	822	99	72	59	102	95	59	32	sample	49	72	46	46	69	174	56	46	39	µg/l	<25
Antimony	µg/m2/day S	0.46	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16		<0.16	0.26	<0.16	<0.16	<0.16	0.20	<0.16	<0.16	<0.16	µg/l	2
Arsenic	µg/m2/day A	3.2	<0.16	<0.16	<0.16	<0.16	<0.16	0.53	<0.16		<0.16	2.99	<0.16	<0.16	<0.16	1.78	<0.16	<0.16	<0.16	µg/l	<0.5
Barium	µg/m2/day B	191	5.9	5.3	3.3	2.6	2.6	36	2.3		2.6	128	4.6	13.8	2.0	95.4	5.6	5.6	<2.0	µg/l	18
Beryllium	µg/m2/day B	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16		<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	µg/l	<0.5
Boron	µg/m2/day B	25	16	46	14	30	20	21	13		16	15	36	43	11	43	20	25	43	µg/l	<5
Cadmium	µg/m2/day C	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	2.53	<0.16		<0.16	<0.16	<0.16	<0.16	<0.16	8.88	<0.16	<0.16	<0.16	µg/l	1.4
Chromium	µg/m2/day C	1.97	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	<0.33	<0.33	<0.33	<0.33	0.33	<0.33	<0.33	<0.33	µg/l	2
Cobalt	µg/m2/day C	0.43	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16		<0.16	<0.16	<0.16	<0.16	<0.16	0.72	<0.16	<0.16	<0.16	µg/l	0.8
Copper	µg/m2/day C	43	14	17	23	19	15	16	8		15	13	8	9	21	22	21	14	10	µg/l	<3
Iron	µg/m2/day F	2138	234	237	362	243	230	789	161		329	625	155	227	313	559	855	322	428	µg/l	**160**
Lead	µg/m2/day P	24.0	1.2	1.1	5.9	1.5	2.0	11.5	1.2		2.1	21.7	0.6	0.6	1.4	52.6	4.3	4.3	0.6	µg/l	0.6
Manganese	µg/m2/day M	46.1	<8.2	10.2	12.8	<8.2	8.9	36.2	11.5		8.2	10.5	<8.2	8.2	<8.2	92.1	9.9	9.9	<8.2	µg/l	<25
Mercury	µg/m2/day H	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16		<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	µg/l	<0.5
Molybdenum	µg/m2/day M	59.2	1.0	42.8	0.8	0.4	<0.16	1.1	0.2		0.3	0.2	0.2	0.2	0.3	0.6	1.5	0.3	0.2	µg/l	1.5
Nickel	µg/m2/day N	2.86	0.49	0.20	0.72	0.86	0.56	1.05	1.05		0.95	0.69	<0.164473(	<0.16	0.95	1.18	0.79	0.89	<0.16	µg/l	5.9
Selenium	µg/m2/day S	<0.16	<0.16	<0.16	<0.16	0.20	<0.16	<0.16	<0.16		<0.16	<0.16	<0.16	<0.16	<0.16	0.53	<0.16	<0.16	<0.16	µg/l	<0.5
Silver	µg/m2/day Ag																				
Thallium	µg/m2/day T	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16		<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	µg/l	4.9
Thorium	µg/m2/day Th																				
Tin	µg/m2/day S	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	0.33	µg/l	3
Uranium	µg/m2/day U	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53		0.49	0.53	0.49	0.53	0.53	0.66	0.53	0.53	0.49	µg/l	<0.5
Vanadium	µg/m2/day V	1.58	0.69	0.39	0.46	0.53	0.39	0.43	0.36		0.76	0.56	0.43	0.26	0.26	0.82	0.43	0.76	0.16	µg/l	0.7
Zinc	µg/m2/day Z	1447	1776	724	1414	3618	1612	757	658		1612	1579	309	987	4605	1151	362	1020	280	µg/l	**970**
Dustfall																					
Total Solids mg/m2/day		150	90	65	83	100	59	145	75		95	84	72	68	77	87	64	107	46		

Appendix C

Monitoring Results 2010

Sixteen Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.

Sampling Period: 15 March to 12 April 10 (28 days).

Results of Analyses µg per m2 per day

Laboratory Number			2515	2516	2517	2518	2519	2520	2521	2522	2523	2524	2525	2526	2527	2528	2529	2530	2531
Sample Description		**North**	**North**	**North**	**South**	**South**	**South**	**East**	**East**	**East**	**East**	**West**	**West**	**West**	**West**	**Farm**	**Farm**	**S-mines**	**Control**
			150 m	**300 m**		**150 m**	**300 m**		**Bound**	**150 m**	**300 m**		**Bound**	**150 m**	**300 m**	**300**	**600**	**School**	
Analyte	**Units**																		
Calcium	µg/m2/day Ca	No	4464	1292	1292	1116	2056	1645	1469	1057	1057	1879.6992	2878	1762.218	1703.4774	1351.0338	1174.812	1116.0714	1116
Magnesium	µg/m2/day Mg	jar	881	529	411	411	352	352	352	411	<294	470	470	411	529	411	529	<294	352
Sodium	µg/m2/day Na		4875	3289	4582	3113	4112	4229	7636	2761	1880	8224	3113	2820	2820	2467	2878	999	2761
Potassium	µg/m2/day K		940	587	294	352	352	352	352	999	646	704.88722	587	469.92481	1292.2932	528.66541	822.36842	352.44361	587
Aluminium	µg/m2/day Al		223	117	147	117	164	141	235	129	129	194	153	117	141	1351	241	76	170
Antimony	µg/m2/day Sb		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.3	<0.3	<0.3	0.4	<0.3	<03	<0.4	<04	0.4	<0.3	<0.3
Arsenic	µg/m2/day As		0.4	<0.3	<0.3	<0.3	<0.3	<0.3	0.5	<0.3	0.3	1.8	0.5	0.3	0.6	6.5	0.9	<0.3	0.3
Barium	µg/m2/day Ba		9.4	2.3	4.7	5.3	5.9	5.3	11	4.1	7.0	38	3.5	-1.8	2.9	170	42	2.3	2.3
Beryllium	µg/m2/day Be		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Boron	µg/m2/day B		76	44	82	46	999	100	258	82	33	182	33	45	57	25	39	30	70
Cadmium	µg/m2/day Cd		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	1.6	<0.3	<0.3	<0.3
Chromium	µg/m2/day Cr		0.7	0.5	1.3	0.4	1.6	0.6	0.6	0.5	0.4	0.5	0.5	0.5	0.5	2.8	0.6	0.3	0.5
Cobalt	µg/m2/day Co		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	1.6	0.5	<0.3	0.4
Copper	µg/m2/day Cu		88	51	56	59	32	53	59	53	58	58	52	49	56	70	76	43.5	29
Iron	µg/m2/day Fe		288	582	382	364	276	300	587	446	270	382	764	764	587	2173	587	264	1586
Lead	µg/m2/day Pb		2.9	1.8	3.9	2.6	1.5	2.6	3.8	4.4	5.9	9.4	2.8	2.6	2.9	264	43	7.0	7.0
Manganese	µg/m2/day Mn		<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	100	32	<15	<15
Mercury	µg/m2/day Hg		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Molybdenum	µg/m2/day Mo		0.4	<0.3	<0.3	0.4	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.5	<0.3	<0.3	<0.3
Nickel	µg/m2/day Ni		0.7	0.6	0.9	0.4	1.1	0.8	0.9	0.8	0.6	0.5	0.9	0.8	0.5	5.0	1.2	0.4	0.9
Selenium	µg/m2/day Se		0.4	<0.3	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.3	<0.3	<0.3	<0.3
Thallium	µg/m2/day Tl		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Tin	µg/m2/day Sn		<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	1.2	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
Uranium	µg/m2/day U		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.3	<0.3	<0.3	<0.3
Vanadium	µg/m2/day V		0.5	0.4	0.4	0.4	0.4	0.4	0.5	0.4	0.3	0.5	0.4	0.4	0.4	3.0	0.6	<0.3	0.5
Zinc	µg/m2/day Zn		376	394	370	123	112	282	141	370	388	129	94	441	112	394	341	76	100
Dustfall																			
Total Solids mg/m2/day			78	43	41	45	24	46	141	39	33	55	53	29	49	140	42	0	35

Note: No results available for Sample 'North' as the jar was broken in the field. No sample received in lab for tailings pond

Results highlighted in yellow are approaching or exceeding the T.A.Luft limits.

Fifteen Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.

- along with a sample of rainwater run-off from the tailings Pond

Sampling Period: 16 Feb to 15 Mar 2010 (27 days).

Results of Analyses µg per m2 per day

Laboratory Number		1861	1862	1863	1864	1865	1866	1867	1868	1869	1870	1871	1872	1873	1874	1875	1876	1877	1878		1880
Sample Description		North	North	North	South	South	South	East	East	East	East	West	West	West	West	Farm	Farm	S-mines	Control	Tailings Pond	
			150 m	300 m		150 m	300 m		Bound	150 m	300 m		Bound	150 m	300 m	300	600	School		Run-off	
Analyte	**Units**																			**Units**	
Calcium	µg/m2/day Ca	No	1096.491	852.8265	1949.318	913.7427	974.6589	1705.653	2071.15	1096.491	1096.491	3411.306	2863	730.9942	1583.821	974.6589	1279.24	No	670	mg/l	140
Magnesium	µg/m2/day Mg	jar	426	426.4133	487.3294	487.3294	426.4133	487.3294	548.2456	487	487.3294	548.2456	1340	426.4133	487.3294	365.4971	487.3294	jar	365	mg/l	25
Sodium	µg/m2/day Na		2436.647	2436.647	2314.815	2863.06	2436.647	7309.942	2863.06	2680.312	2436.647	2741.228	10356	2132.066	2071.15	1461.988	1827.485		1766.569	mg/l	3.3
Potassium	µg/m2/day K		<305	609.1618	304.5809	<305	,305	1218.324	548.2456	426	548.2456	487.3294	1096	304.5809	365.4971	365.4971	487.3294		<305	mg/l	2.2
Aluminium	µg/m2/day Al		73	115.7407	158.3821	73	85	140.1072	231.4815	110	127.924	188.8402	280	109.6491	91	231.4815	554.3372		97	µg/l	<25
Antimony	µg/m2/day Sb		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.304581	0.7	<0.3	<0.3	<0.3	1.0		<0.3	µg/l	1.4
Arsenic	µg/m2/day As		<0.3	<0.3	0.4	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	2.2	0.9	<0.3	<0.3	1.5	3.5		<0.3	µg/l	0.7
Barium	µg/m2/day Ba		6.1	3.7	17	5.5	6.1	4.9	9.7	4.3	5.5	85	21	19	4.9	38.98635	134.0156		6.7	µg/l	25
Beryllium	µg/m2/day Be		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		<0.3	µg/l	<0.5
Boron	µg/m2/day B		45	54	13	51	79	57	21	40	24	79	280	67.0078	16	21	18		29	µg/l	<5
Cadmium	µg/m2/day Cd		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.426413	1.401072		<0.3	µg/l	0.6
Chromium	µg/m2/day Cr		0.4	0.4	0.4	<0.3	<0.3	0.4	0.5	<0.3	<0.3	0.4	2.1	<0.3	<0.3	0.8	1.2		<0.3	µg/l	2.3
Cobalt	µg/m2/day Co		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.4	<0.3	<0.3	0.6	2.9		0.4	µg/l	<0.5
Copper	µg/m2/day Cu		21	24	121.8324	10	26	40	91	61	73	109.6491	50	19	79	67.0078	79		18	µg/l	2.1
Iron	µg/m2/day Fe		195	243.6647	432.5049	219.2982	176.6569	450.7797	566.5205	231	194.9318	517.7875	5300	170.5653	286.306	566.5205	1340.156		268.0312	µg/l	94
Lead	µg/m2/day Pb		0.9	1.2	21	5.0	0.9	2.3	5.8	2.6	1.9	12	5.6	1.0	2.0	67.0078	176.6569		16	µg/l	11
Manganese	µg/m2/day Mn		<15	<15	<15	<15	<15	<15	49	26	<15	<15	35	<15	<15	31	298.4893		55	µg/l	42
Mercury	µg/m2/day Hg		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		0	µg/l	<0.5
Molybdenum	µg/m2/day Mo		<0.3	<0.3	<0.3	0.365497	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.5	<0.3	<0.3	<0.3	0.4		<0.3	µg/l	<0.5
Nickel	µg/m2/day Ni		0.5	0.6	1.3	0.5	0.5	1.3	0.8	0.5	0.9	0.7	3.3	0.6	0.609162	1.401072	4.1		6.7	µg/l	4.1
Selenium	µg/m2/day Se		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.4	<0.3	<0.3	<0.3	<0.3		<0.3	µg/l	<0.5
Thallium	µg/m2/day Tl		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		<0.3	µg/l	12
Tin	µg/m2/day Sn		<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	2.4	<0.6	<0.6	<0.6	<0.6		<0.6	µg/l	<1
Uranium	µg/m2/day U		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		<0.3	µg/l	<0.5
Vanadium	µg/m2/day V		<0.3	0.304581	0.5	<0.3	<0.3	0.4	0.6	0.4	<0.3	0.4	1.2	<0.3	<0.3	0.8	1.3		0.4	µg/l	<0.5
Zinc	µg/m2/day Zn		244	365.4971	225.3899	852.8265	292.3977	109.6491	194.9318	250	353.3138	420.3216	975	249.7563	292.3977	164.4737	194.9318		231	µg/l	340
Dustfall																					
Total Solids mg/m2/day			0	0	1	12	10	35	6	9	32	34	21	22	1	18	61		3074		

Note: No results available for Samples 'North' or 'Silvermines School' as the jars were broken in the field.

Results highlighted in yellow are approaching or exceeding the T.A.Luft limits.

Eleven Dust Samples (no control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.

- along with a sample of rainwater run-off from the tailings Pond

Sampling Period: 14 Dec 09 ot 16 Feb 10 (64 days).

Results of Analyses µg per m2 per day

Laboratory Number				1417	1418	1419	1420	1421	1422			1423	1424	1425	1426			1427		1429
Sample Description		**North**	**North 150 m**	**North 300 m**	**South**	**South 150 m**	**South 300 m**	**East**	**East Bound**	**East 150 m**	**East 300 m**	**West**	**West Bound**	**West 150 m**	**West 300 m**	**Farm 300**	**Farm 600**	**S-mines School**	**Control**	**Tailings Pond Run-off**
Analyte	**Units**																			**Units**
Calcium	µg/m2/day Ca	No	No	873.76645	1002.2615	822	770.97039	1439.1447	925.16447	No	No	745.27138	719.57237	720	668.17434	No	No	720	No	mg/l <0.5
Magnesium	µg/m2/day Mg	jar	jar	256.99013	334	385	334.08717	359.78618	385.4852	jar	jar	334.08717	385.4852	308	308.38816	jar	jar	360	jar	mg/l <0.5
Sodium	µg/m2/day Na			2364.3092	4625.8224	5653.7829	4882.8125	5396.7928	2826.8914			3083.8816	3083.8816	2467.1053	2390.0082			3597.8618		mg/l <0.5
Potassium	µg/m2/day K			282.68914	180	360	231.29112	205.59211	256.99013			231.29112	359.78618	282.68914	205.59211			308		mg/l <0.5
Aluminium	µg/m2/day Al			30.838816	39	20	23	100.22615	33			31	28	28.268914	59			28		µg/l <25
Antimony	µg/m2/day Sb			0.1	0.2	<0.1	0.1	0.3	<0.1			<0.1	<0.1	<0.1	<0.1			<0.1		µg/l <0.5
Arsenic	µg/m2/day As			<0.1	0.3	<0.1	0.2	0.6	<0.1			1.0022615	0.3	0.2	<0.1			<0.1		µg/l 0.7
Barium	µg/m2/day Ba			3.1	3.6	2.1	2.6	8.0	3.3			26	2.6	2.1	2.6			2.6		µg/l <3
Beryllium	µg/m2/day Be			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	<0.1	<0.1	<0.1			<0.1		µg/l <0.5
Boron	µg/m2/day B			24	46.3	23	12	120.78536	18			39	14	15.7	14.648438			36		µg/l <5
Cadmium	µg/m2/day Cd			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	<0.1	<0.1	<0.1			<0.1		µg/l <0.5
Chromium	µg/m2/day Cr			0.1	<0.1	<0.1	<0.1	0.2	<0.1			<0.1	<0.1	<0.1	0.2			0.2		µg/l <0.5
Cobalt	µg/m2/day Co			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	0.5	0.2	<0.1			<0.1		µg/l <0.5
Copper	µg/m2/day Cu			10.022615	6.9	5.1	11	4.4	6.7			2.6	6.2	6.9	7.1957237			4.9		µg/l <0.5
Iron	µg/m2/day Fe			87	103	93	100.22615	359.78618	334			233.86102	187.6028	182	251.85033			308		µg/l 210
Lead	µg/m2/day Pb			0.1	0.4	<0.1	0.6	2.5	0.6			3.9	0.6	0.2	0.6			0.2		µg/l <0.5
Manganese	µg/m2/day Mn			<6.4	<6.4	<6.4	<6.4	6.4	6.9			<6.4	<6.4	<6.4	7.1957237			<6.4		µg/l <25
Mercury	µg/m2/day Hg			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	<0.1	<0.1	<0.1			<0.1		µg/l <0.5
Molybdenum	µg/m2/day Mo			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	<0.1	<0.1	<0.1			<0.1		µg/l <0.5
Nickel	µg/m2/day Ni			0.3	0.3	0.3	0.5	0.5	0.5			0.4	0.5	0.7	0.7			0.3		µg/l <0.5
Selenium	µg/m2/day Se			0.1	0.3	0.3	0.2	0.2	0.2			<0.1	0.2	0.2	0.2			0.2		µg/l <0.5
Thallium	µg/m2/day Tl			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	<0.1	<0.1	<0.1			<0.1		µg/l <0.5
Tin	µg/m2/day Sn			<0.3	0.3	<0.3	0.3	<0.3	0.3			<0.3	0.8	0.3	0.5			<0.3		µg/l <1
Uranium	µg/m2/day U			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	<0.1	<0.1	<0.1			<0.1		µg/l <0.5
Vanadium	µg/m2/day V			0.2	0.3	0.3	0.3	0.3	0.2			<0.1	0.3	0.2	0.3			0.2		µg/l <0.5
Zinc	µg/m2/day Zn			169.61349	134	334	513.98026	69	231			46	308.38816	308	182.46299			44		µg/l <3
Dustfall																				
Total Solids mg/m2/day				26	24	35	30	31	18			16	20	13	18			18		

Note: No results available for Samples 'Norht, North 150m, East 150m, East 300m, Farm 300, Farm 600, Control' as jars broken in the field.

Results highlighted in yellow are approaching or exceeding the T.A.Luft limits.

Appendix D

Monitoring Results 2011

Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

Regional Inspectorate, Seville Lodge,
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A Report to:

Tipperary N County Council.
Attn. Ms. Valerie Crowley,
Silvermines Rehabilitation Project, Administration Assisstant

Date of Report 09 May 2012

Eleven Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.

along with a sample of rainwater run-off from the Tailings Pond

Analyses for Trace Metals and Total Dust Deposition

Sampling Period: **13th December 2010 to 7th March 2011 (56 days)**

Samples taken by: Harry Hickey, **Tipperary N Co. Co.**
Received in the laboratory on 10th March 2011

The dust samples were collected in Kilner jars (glass jars with 8.8 cm diameter openings and internal height = 20cm, collection area = 0.00608 m^2). The jars were located and exposed for the sampling period. A description and the appearance of each sample, including the depth of water in each jar (rain minus evaporation) is given in the table below.

Analysis Procedure for the Dust Samples:

The objective of the analysis procedure is:
(a) to measure the metals deposited in the dust (as **µg/m^2/day**) and
(b) to measure the total dust deposition (as **mg/m^2/day** - excluding any insects or leaves, etc.).

1. **Removal of insects, leaves etc.** The sample jars may contain rainwater along with algae, dust, dead insects, leaves, etc. (the appearance of each sample is reported below). Therefore each sample as received is filtered through a 1.12 mm sieve (to remove insect parts and leaves, etc.) and the liquid is collected in a beaker. The liquid (after sieving) is transferred back into the collection jar. A wash bottle with distilled water is used to assist with the sieving process.
   Note: If the sample as received is dry – then add 150 ml of deionised water to the jar and swirl around in order to dislodge dust and debris (leaves, insects, moulds, etc.) – before continuing with the filtration process and analysis as described.

2. **Determination of Total Dust Deposition (Total Solids mg/m^2/day)**: The volume of the sample is adjusted to approx. 150 ml - by evaporation or by adding distilled water as appropriate - evaporation is by heating the open Kilner jar containing the sample on a low temperature hotplate (sample at approx. 80°C) - heat and cool the glass Kilner jars slowly in order to avoid cracking. Transfer the

sample to a 250 ml beaker that has been washed, dried and pre-weighed. Dry the beaker+sample overnight in the oven set at 180°C – cool in the desiccator and weigh. Calculate the total solids as mg/m^2/day.

3. **Digestion Procedure for Trace Metals**: Add 100 ml of 10% HNO_3 to each beaker (containing the dried sample) and cover the beaker with a clock glass. Place the beaker on the hotplate for 1 hour at 100°C followed by 1½ hours at approx. 122°C. Cool and make the volume back up to 100 ml. The digested samples are analysed for trace metals analysis by ICP/MS (Inductively Coupled Plasma/Mass Spectrometry).

4. The laboratory results (as either µg/l or mg/l) are used to calculate the metals deposition in the dust samples and these are expressed as **µg/m^2/day** – results are given in the attached table.

Dust Samples - Description and Appearance

Kilkenny Lab Number	Sample Description	Appearance	Water cm (rain–evaporation)
1281	North	Clear, colourless liquid with a small amount of vegetative like particles	17.0
--	North 150m	Broken	--
1282	North 300m	Clear, colourless liquid with a small amount of vegetative like particles	11.6
1283	South	Clear, colourless liquid with a small amount of algal like growth	11.1
--	South 150m	Broken	--
1284	South 300m	Clear, colourless liquid with small amount of vegetative particles	11.1
1285	East	Clear, colourless liquid with small amount of vegetative particles	12.7
1286	East Boundary	Clear, colourless liquid with particulate matter (dust like)	11.1
1287	East 150 m	Clear, colourless liquid with small particulate.	11.1
1288	East 300m	Clear, colourless liquid with small amount of particles.	10.0
1289	West	Clear, colourless liquid with small amount of vegetative matter.	10.9
1290	West Boundary	Clear, colourless liquid with small amount of vegetative matter	12.0
--	West 150m	Broken	--
--	West 300m	Broken	--
--	Farm 300 (formerly PJ Ryan 1)	Broken	--
1291	Farm 600 (formerly PJ Ryan 2)	Clear, colourless liquid with small amount of vegetative particles.	
--	Silvermines School	No sample-broken	--
1292	Control	Clear, colourless liquid with small amount of vegetative matter.	2.5

The results of analyses are given in the attached table.

Signed : Adrienne Turner

Adrienne Turner, Office of Environmental Assessment

Eleven Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.
- along with a sample of rainwater run-off from the tailings Pond
Sampling Period: 13 December 2010 to 07 March 2011 (56 days).

Results of Analyses µg per m2 per day

Laboratory Number		1281		1282	1283		1284	1285	1286	1287	1288	1289	1290				1291		1292	1294
Sample Description		North	North 150 m	North 300 m	South	South 150 m	South 300 m	East	East Bound	East 150 m	East 300 m	West	West Bound	West 150 m	West 300 m	Farm 300	Farm 600	S-mines School	Control	Tailings Pond Run-off
Analyte	Units																			Units
Calcium	µg/m2/day Ca	2467	No	910.5	1322	No	734.3	910	969.2	1322	1057	705	910.5	No Sample			529	No	-147	mg/l 140
Magnesium	µg/m2/day Mg	1322	Sample	1057	1498	Sample	1028	1116	1116	1087	1087	969	1175				999	Sample	411	mg/l 33
Sodium	µg/m2/day Na	12042		8224	10573		7930	9986	7343	9398	7636	5874	8517				8224		1322	mg/l 3.9
Potassium	µg/m2/day K	264		<147	14391		205.6	<147	<147	<147	<147	<147	<147				<147		<147	mg/l 0.9
Aluminium	µg/m2/day Al	91		149.8	97		100	91	59	294	76	91	100				138		50	µg/l <25
Antimony	µg/m2/day Sb	1.2		0.7	0.6		0.5	0.6	0.5	0.6	0.5	0.6	0.5				0.6		0.4	µg/l 1.8
Arsenic	µg/m2/day As	0.3		<0.1	0.2		<0.1	0.3	<0.1	0.6	<0.1	3.5	<0.1				0.8		<0.1	µg/l 0.5
Barium	µg/m2/day Ba	14		5.3	5.6		5.0	4.1	4.4	22	3.5	68	3.2				11		<0.9	µg/l 19
Beryllium	µg/m2/day Be	<0.1		<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1				<0.1		<0.1	µg/l <0.5
Boron	µg/m2/day B	70		100	59		46.99	97	32	144	109	41	111.6				100		76	µg/l 13
Cadmium	µg/m2/day Cd	<0.1		<0.1	0.2		<0.1	<0.1	<0.1	0.3	<0.1	0.2	<0.1				0.2		<0.1	µg/l 1.1
Chromium	µg/m2/day Cr	0.6		0.6	0.7		0.4	0.6	0.5	0.7	0.5	0.5	0.6				0.6		0.4	µg/l 1.0
Cobalt	µg/m2/day Co	<0.1		<0.1	0.1		0.2	0.1	0.2	0.4	<0.1	0.1	0.2				0.4		<0.1	µg/l 0.6
Copper	µg/m2/day Cu	32		19	32		32	16	73	23	13	21	14				15		13	µg/l 3.2
Iron	µg/m2/day Fe	179		188	217		170.3	247	587	411	167	441	998.6				411		79	µg/l 370
Lead	µg/m2/day Pb	2.6		1.5	2.8		3.2	1.4	1.5	21	1.1	15	1.1				15		0.8	µg/l 7
Manganese	µg/m2/day Mn	<7.3		<7.3	11		<7.3	<7.3	<7.3	26	<7.3	<7.3	7.3				35		<7.3	µg/l 90
Mercury	µg/m2/day Hg	<0.1		<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1				<0.1		<0.1	µg/l <0.5
Molybdenum	µg/m2/day Mo	0.6		0.4	0.7		0.4	0.4	1.2	0.4	1.1	0.5	0.6				0.8		0.4	µg/l 0.6
Nickel	µg/m2/day Ni	1.0		0.7	0.8		0.6	0.8	0.9	1.0	0.5	0.6	0.8				1.0		0.6	µg/l 7.1
Selenium	µg/m2/day Se	0.5		0.5	0.7		0.5	0.5	0.5	0.4	0.4	0.4	0.4				0.5		0.3	µg/l 0.6
Thallium	µg/m2/day Tl	0.2		0.2	0.2		0.2	0.2	0.2	0.2	0.2	0.4	0.2				0.2		0.2	µg/l 11
Tin	µg/m2/day Sn	1.5		0.9	1.2		0.9	0.9	0.9	0.9	0.9	0.9	0.9				0.9		0.6	µg/l 2.0
Uranium	µg/m2/day U	<0.1		<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1				<0.1		<0.1	µg/l 0.6
Vanadium	µg/m2/day V	1.4		1.1	1.9		0.7	1.3	0.9	1.2	0.6	0.6	1.1				1.3		1.2	µg/l 0.7
Zinc	µg/m2/day Zn	144		704.9	382		185	79	94	144	167	179	93.98				132		9.7	µg/l 580
Dustfall																				
Total Solids mg/m2/day		0.033		0.038	0.329		0.027	**0.035**	0.006	0.036	0.022	0.03	0.035				0.04		0.356	

Note: No results available for a number of samples as the jars were broken in the field.
Results highlighted in yellow are approaching or exceeding the T.A.Luft limits.

Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

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A Report to:

Tipperary N County Council.
Attn. Ms. Valerie Crowley,
Silvermines Rehabilitation Project, Administration Assisstant

Date of Report 14 May 2012

Ten Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.

along with a sample of rainwater run-off from the Tailings Pond

Analyses for Trace Metals and Total Dust Deposition

Sampling Period: **7th March 2011 to 23rd May 2011 (77 days)**

Samples taken by: Harry Hickey, **Tipperary N Co. Co.**
Received in the laboratory on 25th May 2012

The dust samples were collected in Kilner jars (glass jars with 8.8 cm diameter openings and internal height = 20cm, collection area = 0.00608 m^2). The jars were located and exposed for the sampling period. A description and the appearance of each sample, including the depth of water in each jar (rain minus evaporation) is given in the table below.

Analysis Procedure for the Dust Samples:

The objective of the analysis procedure is:
(a) to measure the metals deposited in the dust (as **µg/m^2/day**) and
(b) to measure the total dust deposition (as **mg/m^2/day** - excluding any insects or leaves, etc.).

1. **Removal of insects, leaves etc.** The sample jars may contain rainwater along with algae, dust, dead insects, leaves, etc. (the appearance of each sample is reported below). Therefore each sample as received is filtered through a 1.12 mm sieve (to remove insect parts and leaves, etc.) and the liquid is collected in a beaker. The liquid (after sieving) is transferred back into the collection jar. A wash bottle with distilled water is used to assist with the sieving process.
   Note: If the sample as received is dry – then add 150 ml of deionised water to the jar and swirl around in order to dislodge dust and debris (leaves, insects, moulds, etc.) – before continuing with the filtration process and analysis as described.

2. **Determination of Total Dust Deposition (Total Solids mg/m^2/day)**: The volume of the sample is adjusted to approx. 150 ml - by evaporation or by adding distilled water as appropriate - evaporation is by heating the open Kilner jar containing the sample on a low temperature hotplate (sample at approx. 80°C) - heat and cool the glass Kilner jars slowly in order to avoid cracking. Transfer the sample to a 250 ml beaker that has been washed, dried and pre-weighed. Dry the beaker+sample

overnight in the oven set at 180°C – cool in the desiccator and weigh. Calculate the total solids as mg/m^2/day.

3. **Digestion Procedure for Trace Metals**: Add 100 ml of 10% HNO_3 to each beaker (containing the dried sample) and cover the beaker with a clock glass. Place the beaker on the hotplate for 1 hour at 100°C followed by 1½ hours at approx. 122°C. Cool and make the volume back up to 100 ml. The digested samples are analysed for trace metals analysis by ICP/MS (Inductively Coupled Plasma/Mass Spectrometry).

4. The laboratory results (as either µg/l or mg/l) are used to calculate the metals deposition in the dust samples and these are expressed as **µg/m^2/day** – results are given in the attached table.

Dust Samples - Description and Appearance

Kilkenny Lab Number	Sample Description	Appearance	Water cm (rain–evaporation)
2912	North	Green suspended matter present.	70.0
2913	North 150m	Green suspended matter present.	20.0
2914	North 300m	No sample	--
2915	South	No sample	--
2916	South 150m	No sample	--
2917	South 300m	No sample	--
2918	East	Clear colour, with green suspended matter (small amount)	38.0
2919	East Boundary	Clear colour, with green suspended matter (small amount)	37.0
2920	East 150 m	Clear colour, with green suspended matter (small amount)	35.0
2921	East 300m	Abundant amount of green matter present.	40.0
2922	West	Green suspended matter present.	59.0
2923	West Boundary	No sample	--
2924	West 150m	Green suspended matter present	48.0
2925	West 300m	No sample	--
2926	Farm 300 (formerly PJ Ryan 1)	No sample	--
2927	Farm 600 (formerly PJ Ryan 2)	No sample	--
2928	Silvermines School	Clear colour, tiny amount of green matter.	47.0
2929	Control	Green suspended matter present.	38.0

The results of analyses are given in the attached table.

Signed : Adrienne Turner

Adrienne Turner, Office of Environmental Assessment

Ten Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.
- along with a sample of rainwater run-off from the tailings Pond
Sampling Period: 07 March to 23 May 2011 (77 days).

Results of Analyses µg per m2 per day

Laboratory Number		2912	2913	2914	2915	2916	2917	2918	2919	2920	2921	2922	2923	2924	2925	2926	2927	2928	2929	2931
Sample Description		North	North 150 m	North 300 m	South	South 150 m	South 300 m	East	East Bound	East 150 m	East 300 m	West	West Bound	West 150 m	West 300 m	Farm 300	Farm 600	S-mines School	Control	Tailings Pond Run-off
Analyte	Units																			Units
Calcium	µg/m2/day Ca	2072	854					1666	684	2072	1965	1837		1153				1218	1025	mg/l 210
Magnesium	µg/m2/day Mg	1004	705					918	705	983	1068	983		897				1047	726	mg/l 60
Sodium	µg/m2/day Na	8544	4486	No Sample				6194	4699	6194	6194	5767	No	5767	No Sample			7262	4272	mg/l 4.6
Potassium	µg/m2/day K	2563	619					363	513	577	3418	1324	Sample	812				299	876	mg/l <0.5
Aluminium	µg/m2/day Al	192	137					60	83	154	150	111		77				100	92	µg/l <25
Antimony	µg/m2/day Sb	0.4	0.4					0.3	0.4	0.4	0.4	0.5		0.4				0.4	0.3	µg/l 0.6
Arsenic	µg/m2/day As	0.5	0.2					<0.1	0.2	0.4	0.2	1.6		0.1				0.1	0.1	µg/l 0.9
Barium	µg/m2/day Ba	15	3.2					6.6	4.5	13	11	17		4.1				5.1	4.3	µg/l 14
Beryllium	µg/m2/day Be	<0.1	<0.1					<0.1	<0.1	<0.1	<0.1	<0.1		<0.1				<0.1	<0.1	µg/l <0.5
Boron	µg/m2/day B	137	139					98	73	100	79	81		94				41	98	µg/l 6
Cadmium	µg/m2/day Cd	0.2	<0.1					0.1	<0.1	0.1	0.2	<0.1		<0.1				<0.1	<0.1	µg/l 1.4
Chromium	µg/m2/day Cr	0.9	0.5					0.3	0.6	0.5	0.8	0.6		0.5				0.5	0.5	µg/l <0.5
Cobalt	µg/m2/day Co	0.3	0.1					0.1	0.3	0.2	0.3	0.2		0.1				0.2	0.1	µg/l <0.5
Copper	µg/m2/day Cu	36	12					8.8	21	32	45	41		23				12	15	µg/l 2.1
Iron	µg/m2/day Fe	278	179					156	152	256	235	214		145				201	128	µg/l 84
Lead	µg/m2/day Pb	3.4	1.3					0.8	6.4	7.7	2.8	6.0		1.0				1.3	1.3	µg/l 3
Manganese	µg/m2/day Mn	19	6.2					5.8	88	9.8	21	14		8.1				10	<5.3	µg/l <25
Mercury	µg/m2/day Hg	<0.1	<0.1					<0.1	<0.1	<0.1	<0.1	<0.1		<0.1				<0.1	<0.1	µg/l <0.5
Molybdenum	µg/m2/day Mo	0.4	0.3					0.2	3.4	0.3	0.4	5.6		8.3				0.3	0.3	µg/l <0.5
Nickel	µg/m2/day Ni	0.9	0.5					0.6	0.6	0.6	1.1	0.8		0.5				1.0	0.4	µg/l 11.0
Selenium	µg/m2/day Se	0.4	0.3					0.3	0.3	0.3	0.4	0.3		0.4				0.5	0.3	µg/l 0.7
Thallium	µg/m2/day Tl	0.3	0.1					0.1	0.1	0.2	0.1	0.3		0.2				0.1	0.1	µg/l 12
Tin	µg/m2/day Sn	0.9	0.6					0.6	0.6	0.6	0.9	0.9		0.6				0.6	0.6	µg/l <1
Uranium	µg/m2/day U	<0.1	<0.1					<0.1	<0.1	<0.1	<0.1	<0.1		<0.1				<0.1	<0.1	µg/l <0.5
Vanadium	µg/m2/day V	0.9	0.6					0.2	0.4	0.5	1.3	0.7		1.1				0.9	0.9	µg/l <0.5
Zinc	µg/m2/day Zn	66	36					58	70	64	66	179		186				342	34	µg/l 660
Dustfall																				
Total Solids mg/m2/day		0.082	0.036					0.03	0.037	0.04	0.083	0.05		0.04				0.03	0.034	

Note: No results available for a number of samples as the jars were broken in the field.
Results highlighted in yellow are approaching or exceeding the T.A.Luft limits.

Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil
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A Report to:

Tipperary N County Council.
Attn. Ms. Valerie Crowley,
Silvermines Rehabilitation Project, Administration Assisstant

Date of Report 14 May 2012

Nine Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.

along with a sample of rainwater run-off from the Tailings Pond

Analyses for Trace Metals and Total Dust Deposition

Sampling Period: **23rd May 2011 to 25th July 2011 (63 days)**

Samples taken by: Harry Hickey, **Tipperary N Co. Co.**
Received in the laboratory on 27th July 2011

The dust samples were collected in Kilner jars (glass jars with 8.8 cm diameter openings and internal height = 20cm, collection area = 0.00608 m^2). The jars were located and exposed for the sampling period. A description and the appearance of each sample, including the depth of water in each jar (rain minus evaporation) is given in the table below.

Analysis Procedure for the Dust Samples:

The objective of the analysis procedure is:
(a) to measure the metals deposited in the dust (as **µg/m^2/day**) and
(b) to measure the total dust deposition (as **mg/m^2/day** - excluding any insects or leaves, etc.).

1. **Removal of insects, leaves etc.** The sample jars may contain rainwater along with algae, dust, dead insects, leaves, etc. (the appearance of each sample is reported below). Therefore each sample as received is filtered through a 1.12 mm sieve (to remove insect parts and leaves, etc.) and the liquid is collected in a beaker. The liquid (after sieving) is transferred back into the collection jar. A wash bottle with distilled water is used to assist with the sieving process.
   Note: If the sample as received is dry – then add 150 ml of deionised water to the jar and swirl around in order to dislodge dust and debris (leaves, insects, moulds, etc.) – before continuing with the filtration process and analysis as described.

2. **Determination of Total Dust Deposition (Total Solids mg/m^2/day)**: The volume of the sample is adjusted to approx. 150 ml - by evaporation or by adding distilled water as appropriate - evaporation is by heating the open Kilner jar containing the sample on a low temperature hotplate (sample at approx. 80°C) - heat and cool the glass Kilner jars slowly in order to avoid cracking. Transfer the sample to a 250 ml beaker that has been washed, dried and pre-weighed. Dry the beaker+sample overnight in the oven set at 180°C – cool in the desiccator and weigh. Calculate the total solids as mg/m^2/day.

3. **Digestion Procedure for Trace Metals**: Add 100 ml of 10% HNO_3 to each beaker (containing the dried sample) and cover the beaker with a clock glass. Place the beaker on the hotplate for 1 hour at 100°C followed by 1½ hours at approx. 122°C. Cool and make the volume back up to 100 ml. The digested samples are analysed for trace metals analysis by ICP/MS (Inductively Coupled Plasma/Mass Spectrometry).

4. The laboratory results (as either µg/l or mg/l) are used to calculate the metals deposition in the dust samples and these are expressed as **µg/m^2/day** – results are given in the attached table.

Dust Samples - Description and Appearance

Kilkenny Lab Number	Sample Description	Appearance	Water cm (rain–evaporation)
3607	North	Broken	--
3608	North 150m	Green organic suspended solids (small amount). Green colour	25.0
3609	East	Green suspended matter (small amount). Green colour.	39.0
3610	East Boundary	Green suspended matter (small amount). Green colour.	40.0
3611	East 150 m	Green suspended matter (small amount). Green colour.	20.0
3612	East 300m	Large amount of green suspended matter. Clear colour.	32.0
3613	West	Green suspended matter. Clear colour	51.0
3614	West 150m	Tiny amounts of green matter . Very clear colour.	40.0
3615	Silvermines School	Tiny amount of green matter. Very clear colour.	50.0
3616	Control	Small amount of green matter. Green colour.	21.0

The results of analyses are given in the attached table.

Signed : Adrienne Turner

Adrienne Turner, Office of Environmental Assessment

Nine Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.

- along with a sample of rainwater run-off from the tailings Pond

Sampling Period: 23 May to 25 July 2011 (63 days)

Results of Analyses µg per m2 per day

Laboratory Number		3607	3608	3609	3610	3611	3612	3613	3614	3615	3616	3618
Sample Description		North	North 150 m	East	East Bound	East 150 m	East 300 m	West	West 150 m	S-mines School	Control	Tailings Pond Run-off
Analyte	**Units**											**Units**
Calcium	µg/m2/day Ca	No	1358	1540	2115	4177	1697	1436	2872	2089	1070	mg/l 180
Magnesium	µg/m2/day Mg	Sample	1096	1044	1123	1044	914	966	1123	1123	731	mg/l 58
Sodium	µg/m2/day Na		8093	7832	6266	19841	4699	5221	5744	8093	2089	mg/l 4.7
Potassium	µg/m2/day K		522	574	1149	2872	1880	992	313	444	2219	mg/l 0.7
Aluminium	µg/m2/day Al		86	50	31	125	63	57	97	63	104	µg/l <25
Antimony	µg/m2/day Sb		0.4	0.4	0.4	0.6	0.4	0.4	0.4	0.4	0.4	µg/l 0.8
Arsenic	µg/m2/day As		<0.1	0.2	0.2	0.4	0.1	1.6	0.2	0.2	0.2	µg/l 1.1
Barium	µg/m2/day Ba		4.4	4.2	3.9	19	8.1	39	7.8	25	3.4	µg/l 15
Beryllium	µg/m2/day Be		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	µg/l <0.5
Boron	µg/m2/day B		86	42	44	175	154	63	89	57	68	µg/l 6
Cadmium	µg/m2/day Cd		<0.1	<0.1	0.2	0.9	<0.1	<0.1	<0.1	<0.1	<0.1	µg/l 1.0
Chromium	µg/m2/day Cr		0.6	0.6	0.4	0.9	0.7	0.7	0.5	0.4	0.6	µg/l 1.1
Cobalt	µg/m2/day Co		<0.1	<0.1	<0.1	0.5	<0.1	<0.1	<0.1	0.1	<0.1	µg/l <0.5
Copper	µg/m2/day Cu		31	12	13	26	50	29	39	31	42	µg/l 2.8
Iron	µg/m2/day Fe		251	191	206	217	99	214	313	131	245	µg/l 380
Lead	µg/m2/day Pb		1.3	1.0	0.9	5.7	2.0	7.0	2.6	3.9	1.9	µg/l 6
Manganese	µg/m2/day Mn		<6.5	<6.5	22	8.1	<6.5	10	9.9	<6.5	8.1	µg/l 60
Mercury	µg/m2/day Hg		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	µg/l <0.5
Molybdenum	µg/m2/day Mo		0.2	0.4	0.2	1.4	0.2	0.2	0.2	0.3	0.4	µg/l <0.5
Nickel	µg/m2/day Ni		0.5	0.5	0.7	1.5	0.5	0.6	0.6	0.7	0.5	µg/l 8.0
Selenium	µg/m2/day Se		0.5	0.4	0.5	1.0	0.4	0.4	0.4	0.4	0.3	µg/l 1.0
Thallium	µg/m2/day Tl		0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	µg/l 11
Tin	µg/m2/day Sn		0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	µg/l <1
Uranium	µg/m2/day U		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	µg/l 0.6
Vanadium	µg/m2/day V		1.4	0.8	1.0	0.7	0.8	0.4	1.0	0.6	0.7	µg/l <0.5
Zinc	µg/m2/day Zn		211	47	154	52	57	251	104	339	57	µg/l 540
Dustfall												
Total Solids mg/m2/day			0.072	0.05	0.046	0.129	0.048	0.069	0.04	0.054	-0.095	

Note: No results available for Sample 'North' as the jar was broken in the field.

Results highlighted in yellow are approaching or exceeding the T.A.Luft limits.

Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

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A Report to:

Tipperary N County Council.
Attn. Mr. Karl Cashen, Director of Services

Date of Report 08/03/2013

Nine Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.

along with a sample of rainwater run-off from the Tailings Pond

Analyses for Trace Metals and Total Dust Deposition

Sampling Period: **25th July to 1st October 2011 (68 days)**

Samples taken by: **Harry Hickey, Tipperary North Co. Co.**
Received in the laboratory on 04th October 2011

The dust samples were collected in Kilner jars (glass jars with 8.8 cm diameter openings and internal height = 20cm, collection area = 0.00608 m^2). The jars were located and exposed for the sampling period. A description and the appearance of each sample, including the depth of water in each jar (rain minus evaporation) is given in the table below.

Analysis Procedure for the Dust Samples:

The objective of the analysis procedure is:
(a) to measure the metals deposited in the dust (as **µg/m^2/day**) and
(b) to measure the total dust deposition (as **mg/m^2/day** - excluding any insects or leaves, etc.).

1. **Removal of insects, leaves etc.** The sample jars may contain rainwater along with algae, dust, dead insects, leaves, etc. (the appearance of each sample is reported below). Therefore each sample as received is filtered through a 1.12 mm sieve (to remove insect parts and leaves, etc.) and the liquid is collected in a beaker. The liquid (after sieving) is transferred back into the collection jar. A wash bottle with distilled water is used to assist with the sieving process.
   Note: If the sample as received is dry – then add 150 ml of deionised water to the jar and swirl around in order to dislodge dust and debris (leaves, insects, moulds, etc.) – before continuing with the filtration process and analysis as described.

2. **Determination of Total Dust Deposition (Total Solids mg/m^2/day)**: The volume of the sample is adjusted to approx. 150 ml - by evaporation or by adding distilled water as appropriate - evaporation is by heating the open Kilner jar containing the sample on a low temperature hotplate (sample at approx. 80°C) - heat and cool the glass Kilner jars slowly in order to avoid cracking. Transfer the sample to a 250 ml beaker that has been washed, dried and pre-weighed. Dry the beaker+sample overnight in the oven set at 180°C – cool in the desiccator and weigh. Calculate the total solids as mg/m^2/day.

3. **Digestion Procedure for Trace Metals**: Add 100 ml of 10% HNO_3 to each beaker (containing the dried sample) and cover the beaker with a clock glass. Place the beaker on the hotplate for 1 hour at 100°C followed by 1½ hours at approx. 122°C. Cool and make the volume back up to 100 ml. The digested samples are analysed for trace metals analysis by ICP/MS (Inductively Coupled Plasma/Mass Spectrometry) at the Dublin EPA Laboratory.

4. The laboratory results (as either µg/l or mg/l) are used to calculate the metals deposition in the dust samples and these are expressed as **µg/m^2/day** – results are given in the attached table.

Dust Samples - Description and Appearance

Kilkenny Lab Number	Sample Description	Appearance	Water cm (rain–evaporation)
4785	North	Green/brown colour with	34.0
4786	North 150m	Clear colour, tiny amount of particulate mater	44.0
--	East	Broken	
4787	East Boundary	Clear colour with dirt and biological species present (silt)	36.0
4788	East 150 m	Green colour with suspended green matter.	36.0
4789	East 300m	Brown colour with small leaves and green matter.	45.0
4790	West	Clear colour with green suspended matter.	75.0
4791	West 150m	Clear colour with small amount of green suspended matter.	50.0
4792	Silvermines School	Clear colour with	80.0
4793	Control	Green colour with biological species present along with green matter.	25.0

The results of analyses are given in the attached table.

Signed : Adrienne Turner

Adrienne Turner
Office of Environmental Assessment

Laboratory Number		4785	4786		4787	4788	4789	4790	4791	4792	4793	4795	
Sample Description		North	North 150 m	East	East Bound	East 150 m	East 300 m	West	West 150 m	S-mines School	Control	Tailings Pond Run-off	
Analyte	Units											Units	
Calcium	µg/m2/day Ca	9137	1258		67878	2402	6289	5744	3144	5744	992	mg/l	230
Magnesium	µg/m2/day Mg	3394	1282		8876	1462	3144	1540	871	2141	1044	mg/l	63
Sodium	µg/m2/day Na	13053	9675		8876	9921	8466	10965	5321	16186	5482	mg/l	6.9
Potassium	µg/m2/day K	10965	532		3655	888	6047	2167	339	1279	2324	mg/l	1.9
Aluminium	µg/m2/day Al	89	44		19058	110	223	76	73	86	37	µg/l	<25
Antimony	µg/m2/day Sb	0.42	0.36		1.75	0.47	0.58	0.52	0.36	0.47	0.34	µg/l	0.9
Arsenic	µg/m2/day As	0.34	0.24		26	0.57	0.17	1.57	0.46	0.42	-0.13	µg/l	0.7
Barium	µg/m2/day Ba	23	3.14		1070	14	39	63	8.47	44	2.61	µg/l	11
Beryllium	µg/m2/day Be	<0.13	<0.12		1.51	<0.13	<0.12	<0.13	<0.12	<0.13	<0.13	µg/l	<0.5
Boron	µg/m2/day B	81	20		191	84	484	102	58	104	84	µg/l	<5
Cadmium	µg/m2/day Cd	0.73	<0.120		7.57	0.16	0.22	1.02	<0.12	0.16	<0.13	µg/l	0.6
Chromium	µg/m2/day Cr	1.02	0.44		29	0.70	0.51	0.65	0.44	0.47	0.42	µg/l	<0.5
Cobalt	µg/m2/day Co	2.87	0.39		22	0.31	0.27	0.47	0.17	0.26	0.18	µg/l	<0.5
Copper	µg/m2/day Cu	60	44		63	44	48	26	70	68	17	µg/l	20
Iron	µg/m2/day Fe	251	111		41771	392	140	170	140	188	107	µg/l	150
Lead	µg/m2/day Pb	4.96	1.23		1358	13	1.45	3.39	2.13	8.09	1.28	µg/l	5.4
Manganese	µg/m2/day Mn	47	<6.05		3394	17	8.22	16	<6.05	6.53	<6.53	µg/l	54
Mercury	µg/m2/day Hg	<0.13	<0.12		<0.13	<0.13	<0.12	<0.13	<0.12	<0.13	<0.13	µg/l	<0.5
Molybdenum	µg/m2/day Mo	0.39	0.19		1.25	0.29	0.46	0.26	0.22	0.42	0.23	µg/l	<0.5
Nickel	µg/m2/day Ni	1.38	0.70		47	1.12	0.77	1.04	0.56	0.84	0.42	µg/l	2.6
Selenium	µg/m2/day Se	0.68	0.65		1.62	0.52	0.46	0.76	0.36	0.65	0.39	µg/l	0.6
Thallium	µg/m2/day Tl	0.57	0.17		0.94	0.21	0.17	0.34	0.17	0.18	0.18	µg/l	11
Tin	µg/m2/day Sn	0.78	0.73		0.78	0.78	0.73	0.78	0.73	0.78	0.78	µg/l	<1
Uranium	µg/m2/day U	<0.13	<0.12		1.07	<0.13	<0.13	<0.13	<0.12	<0.13	<0.13	µg/l	<0.5
Vanadium	µg/m2/day V	1.49	1.26		25	0.65	0.46	0.47	0.29	0.73	0.31	µg/l	<0.5
Zinc	µg/m2/day Zn	548	580		2872	444	174	496	131	204	102	µg/l	190
Dustfall													
Total Solids mg/m2/day		279	54		1276	76	84	106	45	87	83		

Note: No results available for Sample 'East' as the jar was broken in the field.

Results highlighted in yellow are approaching or exceeding the T.A.Luft limits.

Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

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A Report to:

Tipperary N County Council.
Attn. Mr. Karl Cashen, Director of Services

Date of Report 08/03/2013

Five Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.

along with a sample of rainwater run-off from the Tailings Pond

Analyses for Trace Metals and Total Dust Deposition

Sampling Period: **26th September -28th November 2011 (63 days)**

Samples taken by: **Harry Hickey, Tipperary North Co. Co.**

The dust samples were collected in Kilner jars (glass jars with 8.8 cm diameter openings and internal height = 20cm, collection area = 0.00608 m^2). The jars were located and exposed for the sampling period. A description and the appearance of each sample, including the depth of water in each jar (rain minus evaporation) is given in the table below.

Analysis Procedure for the Dust Samples:

The objective of the analysis procedure is:
(a) to measure the metals deposited in the dust (as **µg/m^2/day**) and
(b) to measure the total dust deposition (as **mg/m^2/day** - excluding any insects or leaves, etc.).

1. **Removal of insects, leaves etc.** The sample jars may contain rainwater along with algae, dust, dead insects, leaves, etc. (the appearance of each sample is reported below). Therefore each sample as received is filtered through a 1.12 mm sieve (to remove insect parts and leaves, etc.) and the liquid is collected in a beaker. The liquid (after sieving) is transferred back into the collection jar. A wash bottle with distilled water is used to assist with the sieving process.
   Note: If the sample as received is dry – then add 150 ml of deionised water to the jar and swirl around in order to dislodge dust and debris (leaves, insects, moulds, etc.) – before continuing with the filtration process and analysis as described.

2. **Determination of Total Dust Deposition (Total Solids mg/m^2/day)**: The volume of the sample is adjusted to approx. 150 ml - by evaporation or by adding distilled water as appropriate - evaporation is by heating the open Kilner jar containing the sample on a low temperature hotplate (sample at approx. 80°C) - heat and cool the glass Kilner jars slowly in order to avoid cracking. Transfer the sample to a 250 ml beaker that has been washed, dried and pre-weighed. Dry the beaker+sample overnight in the oven set at 180°C – cool in the desiccator and weigh. Calculate the total solids as mg/m^2/day.

3. **Digestion Procedure for Trace Metals**: Add 100 ml of 10% HNO_3 to each beaker (containing the dried sample) and cover the beaker with a clock glass. Place the beaker on the hotplate for 1 hour at 100°C followed by 1½ hours at approx. 122°C. Cool and make the volume back up to 100 ml. The digested samples are analysed for trace metals analysis by ICP/MS (Inductively Coupled Plasma/Mass Spectrometry) at the Dublin EPA Laboratory.

4. The laboratory results (as either µg/l or mg/l) are used to calculate the metals deposition in the dust samples and these are expressed as **µg/m^2/day** – results are given in the attached table.

Dust Samples - Description and Appearance

Kilkenny Lab Number	Sample Description	Appearance	Water cm (rain–evaporation)
1037	North	Clear, colourless liquid. 1 ca 3cm stick with associated algal growth present	18.5
--	East Boundary	BROKEN	---
1038	East 150 m	Clear, colourless liquid. Very small amount of particulate matter present.	14.0
1039	West	Clear, colourless liquid. Very small amount of particulate matter present.	17.5
1040	Silvermines School	Clear, colourless liquid. Small amount of vegetative and algal matter present.	18.0
1041	Control	Clear, colourless liquid. Very small amount of particulate matter present.	7.5

The results of analyses are given in the attached table.

Signed : Adrienne Turner

Adrienne Turner
Office of Environmental Assessment

Five Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.

Sampling Period: 26 Sept to 28 Nov 2011 (63 days).

Results of Analyses µg per m2 per day

Laboratory Number		1037	1038	1039	1040	1041
Sample Description		North	East 150	West	S-mines School	Control
Analyte	**Units**					
Calcium	µg/m2/day Ca	2872	4177	2036	1096	783
Magnesium	µg/m2/day Mg	3394	2872	2480	2872	2089
Sodium	µg/m2/day Na	26107	24541	20624	23496	17231
Potassium	µg/m2/day K	1880	1018	862	1044	653
Aluminium	µg/m2/day Al	55	55	65	133	55
Antimony	µg/m2/day Sb	0.2	0.1	0.2	0.2	<0.1
Arsenic	µg/m2/day As	0.2	<0.1	1.4	0.3	<0.1
Barium	µg/m2/day Ba	5.7	3.4	39	12	1.3
Beryllium	µg/m2/day Be	<0.1	<0.1	<0.1	<0.1	<0.1
Boron	µg/m2/day B	89	102	107	167	94
Cadmium	µg/m2/day Cd	0.2	<0.1	<0.1	<0.1	<0.1
Chromium	µg/m2/day Cr	0.3	0.2	0.2	0.3	0.3
Cobalt	µg/m2/day Co	0.1	0.9	<0.1	0.5	0.2
Copper	µg/m2/day Cu	22	9.1	9.9	19	7.3
Iron	µg/m2/day Fe	107	123	227	198	470
Lead	µg/m2/day Pb	0.8	2.0	4.7	3.9	0.6
Manganese	µg/m2/day Mn	15	9.7	<6.5	8.6	<6.5
Mercury	µg/m2/day Hg	<0.1	<0.1	<0.1	<0.1	<0.1
Molybdenum	µg/m2/day Mo	0.2	0.2	0.2	0.2	0.2
Nickel	µg/m2/day Ni	0.6	0.5	0.4	0.5	0.7
Selenium	µg/m2/day Se	0.7	0.7	0.5	0.8	0.5
Thallium	µg/m2/day Tl	0.2	<0.1	0.2	<0.1	<0.1
Tin	µg/m2/day Sn	0.5	0.3	0.5	0.3	0.3
Uranium	µg/m2/day U	<0.1	<0.1	<0.1	<0.1	<0.1
Vanadium	µg/m2/day V	0.4	0.2	0.3	0.5	<0.1
Zinc	µg/m2/day Zn	470	110	146	705	261
Dustfall						
Total Solids mg/m2/day		0.117	0.092	0.074	0.09	0.061

Note

Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

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A Report to:

Tipperary N County Council.
Attn. Mr. Karl Cashen, Director of Services

Date of Report 08/03/2013

Six Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.

along with a sample of rainwater run-off from the Tailings Pond

Analyses for Trace Metals and Total Dust Deposition

Sampling Period: **28 Novemer 2011 – 27th January 2012 (60 days)**

Samples taken by: **Harry Hickey, Tipperary North Co. Co.**
Received in the laboratory on 31st January 2012

The dust samples were collected in Kilner jars (glass jars with 8.8 cm diameter openings and internal height = 20cm, collection area = 0.00608 m^2). The jars were located and exposed for the sampling period. A description and the appearance of each sample, including the depth of water in each jar (rain minus evaporation) is given in the table below.

Analysis Procedure for the Dust Samples:

The objective of the analysis procedure is:
(a) to measure the metals deposited in the dust (as **µg/m^2/day**) and
(b) to measure the total dust deposition (as **mg/m^2/day** - excluding any insects or leaves, etc.).

1. **Removal of insects, leaves etc**. The sample jars may contain rainwater along with algae, dust, dead insects, leaves, etc. (the appearance of each sample is reported below). Therefore each sample as received is filtered through a 1.12 mm sieve (to remove insect parts and leaves, etc.) and the liquid is collected in a beaker. The liquid (after sieving) is transferred back into the collection jar. A wash bottle with distilled water is used to assist with the sieving process.
   Note: If the sample as received is dry – then add 150 ml of deionised water to the jar and swirl around in order to dislodge dust and debris (leaves, insects, moulds, etc.) – before continuing with the filtration process and analysis as described.

2. **Determination of Total Dust Deposition (Total Solids mg/m^2/day)**: The volume of the sample is adjusted to approx. 150 ml - by evaporation or by adding distilled water as appropriate - evaporation is by heating the open Kilner jar containing the sample on a low temperature hotplate (sample at approx. 80°C) - heat and cool the glass Kilner jars slowly in order to avoid cracking. Transfer the sample to a 250 ml beaker that has been washed, dried and pre-weighed. Dry the beaker+sample overnight in the oven set at 180°C – cool in the desiccator and weigh. Calculate the total solids as mg/m^2/day.

3. **Digestion Procedure for Trace Metals**: Add 100 ml of 10% HNO_3 to each beaker (containing the dried sample) and cover the beaker with a clock glass. Place the beaker on the hotplate for 1 hour at 100°C followed by 1½ hours at approx. 122°C. Cool and make the volume back up to 100 ml. The digested samples are analysed for trace metals analysis by ICP/MS (Inductively Coupled Plasma/Mass Spectrometry) at the Dublin EPA Laboratory.

4. The laboratory results (as either µg/l or mg/l) are used to calculate the metals deposition in the dust samples and these are expressed as **µg/m^2/day** – results are given in the attached table.

Dust Samples - Description and Appearance

Kilkenny Lab Number	Sample Description	Appearance	Water cm (rain–evaporation)
1043	North	Clear, slightly green coloured liquid. Large amount of algal matter present.	10.5
1044	East Boundary	Clear, colourless liquid. Small amount of particulate and associated algal matter present.	15.7
1045	East 150 m	Clear, green coloured liquid. Small amount of algal matter present.	8.5
1046	West	Clear, colourless liquid. Small amount of particulate and associated algal growth present.	13.7
1047	Silvermines School	Clear, greenish coloured liquid. Amount of algal growth present.	9.5
1048	Control	Clear, greenish coloured liquid. Small amount of vegetative matter and associated algal growth present.	8.0

The results of analyses are given in the attached table.

Signed : Adrienne Turner

Adrienne Turner
Office of Environmental Assessment

Six Dust Samples (plus control) from the Vicinity of the Mogul Tailings Pond at Silvermines, Co. Tipperary.
- along with a sample of rainwater run-off from the tailings Pond
Sampling Period: 28 Nov 2011 to 27 Jan 2012 (60 days).

		Results of Analyses µg per m2 per day					
Laboratory Number		**1043**	**1044**	**1045**	**1046**	**1047**	**1048**
Sample Description		**North**	**East Bound**	**East 150**	**West**	**S-mines School**	**Control**
Analyte	**Units**						
Calcium	µg/m2/day Ca	4112	4660	<137	3289	1563	1672
Magnesium	µg/m2/day Mg	1316	2522	630	630	439	329
Sodium	µg/m2/day Na	12336	27412	8224	8498	7675	6579
Potassium	µg/m2/day K	5208	2248	302	274	356	1535
Aluminium	µg/m2/day Al	134	200	140	137	137	110
Antimony	µg/m2/day Sb	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Arsenic	µg/m2/day As	<0.1	0.5	<0.1	1.1	<0.1	<0.1
Barium	µg/m2/day Ba	4.7	8.8	3.0	19	4.9	2.2
Beryllium	µg/m2/day Be	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Boron	µg/m2/day B	101	66	71	58	110	63
Cadmium	µg/m2/day Cd	<0.1	3.8	<0.1	<0.1	<0.1	<0.1
Chromium	µg/m2/day Cr	0.3	0.4	-0.1	0.2	0.2	0.1
Cobalt	µg/m2/day Co	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Copper	µg/m2/day Cu	17	148	27	22	18	13
Iron	µg/m2/day Fe	175	850	167	236	195	112
Lead	µg/m2/day Pb	1.6	12	1.6	7.4	4.4	1.2
Manganese	µg/m2/day Mn	52	22	<6.9	12	<6.9	<6.9
Mercury	µg/m2/day Hg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Molybdenum	µg/m2/day Mo	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	µg/m2/day Ni	0.6	0.9	0.7	0.5	0.4	0.3
Selenium	µg/m2/day Se	<0.1	0.7	<0.1	<0.1	<0.1	<0.1
Thallium	µg/m2/day Tl	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Tin	µg/m2/day Sn	2.2	2.7	2.2	2.2	2.2	2.2
Uranium	µg/m2/day U	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Vanadium	µg/m2/day V	1.3	0.9	0.7	1.1	1.7	1.1
Zinc	µg/m2/day Zn	167	822	713	263	74	93
Dustfall							
Total Solids mg/m2/day		0.102	0.138	0.042	0.047	0.05	0.061

Note:

Results highlighted in yellow are approaching or exceeding the T.A.Luft limits.