



**AIR QUALITY MONITORING REPORT OF
BULK NICKEL SULFIDE SHIP-LOADING ON**

MARINE VESSEL MAPLE PIONEER

27-28TH APRIL 2011

Revision	Prepared	Reviewed	Approved	Date	Description
1	C. Field	A. Leonard		12/5/2011	Draft 1
2	C.Field	A.Leonard		16/5/2011	Final

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1. INTRODUCTION

1.1 Licence Reporting Conditions

This document reports the air quality monitoring for the loading of the Marine Vessel (MV) Maple Pioneer between 1355 hrs on 27th April 2011 to 1135 hrs on 28th April 2011 at the Esperance Port. This report is compiled and issued in compliance with Condition 17 and includes data analysis consistent with requirements of Condition 14 of the Government of Western Australia Department of Environment and Conservation (DEC) Licence L5099/1974/13 ('the licence'). The licence was issued to Esperance Ports Sea and Land (EPSL) on the 24th February 2011.

1.2 Location of Monitoring Stations

As required by the licence, ambient monitoring is undertaken at five sites; four in close proximity to the port boundary and one 1.6 km from the port within the town of Esperance (**Figure 1**). The monitor locations were chosen in consultation with the DEC and the Government of Western Australia Department of Health (DoH).

The EPSL has an Australian Standards-compliant meteorological station adjacent to E-Sampler 7, located on the port premises adjacent to Berth 3 (**Figure 1**). This meteorological station records both wind speed and direction. Data from this station has been used for this report.

1.3 Assessment Criteria

The following ambient concentration targets are used in this assessment, as adapted from Table 1 in the licence:

Table 1: Pollution Concentration Targets from Table 1 in Licence L5099/1974/13

Parameter	Target
Nickel in air	0.14 µg/m ³
Dust as PM ₁₀	50 µg/m ³
Dust as TSP	90 µg/m ³



Figure 1: Location of EPSL Monitoring Sites

2. ANALYSIS OF BULK NICKEL SHIP LOADING

2.1 Port Activities

The Maple Pioneer was berthed at Esperance Port from 0935 hours on 27/04/2011 to 1418 hours on 28/04/2011. The 'loading period' began at **1355 on 27/04/2011 and finished at 1135 hours on 28/04/2011.**

There were no delays relating to wind being in the red zone during bulk loading of the 6944 tonnes of BHP Billiton Nickel West nickel sulphide concentrate.

The following activities were also occurring in port during the loading period:

- Marine Vessel Tiansheng, was alongside in Berth 3 between 0718 hours on 25 April 2011 to 0125 hours on 28 April 2011 and was loaded with 16,500 tonnes of iron ore
- 35,942 tonnes of iron ore was delivered by 6 trains; and
- 327 tonnes of nickel concentrate (from Mount Keith) was delivered in containers by 5 trucks.

2.2 Meteorological Conditions

All wind speeds and directions described in this section are limited to the loading period.

- The wind direction was variable and was spread from WSW to NNE (20% W, 30% WNW, 22% NW, 9% NNW and 16% N (**Figure 2**).
- The maximum hourly wind speed recorded was 8.3 m/s (30km/hr) from the W direction (green zone), which occurred between 0400 hours and 0500 hours on 28/04/2011.
- The average wind speed during the loading periods was 5.52 m/s (19.8 km/h). described as 'light' winds by the 'Beaufort Wind Force Scale' (BOM, 2011).

2.3 Odour and Dust Monitoring

Pre-loading determination of the Nickel West concentrate was undertaken in accordance with the EPSL Procedure 'Environmental Considerations for Nickel Ship-loading: PR088' (EPSL, 2009a). It was determined that the blended Nickel West concentrate was classified as 'very weak', and had a low dust potential indicated by the average moisture of 8.7%. The nickel concentrate was therefore loaded as per Section 3 of the procedure (EPSL, 2009b). The odour and moisture content record sheet is included in **Appendix A**.

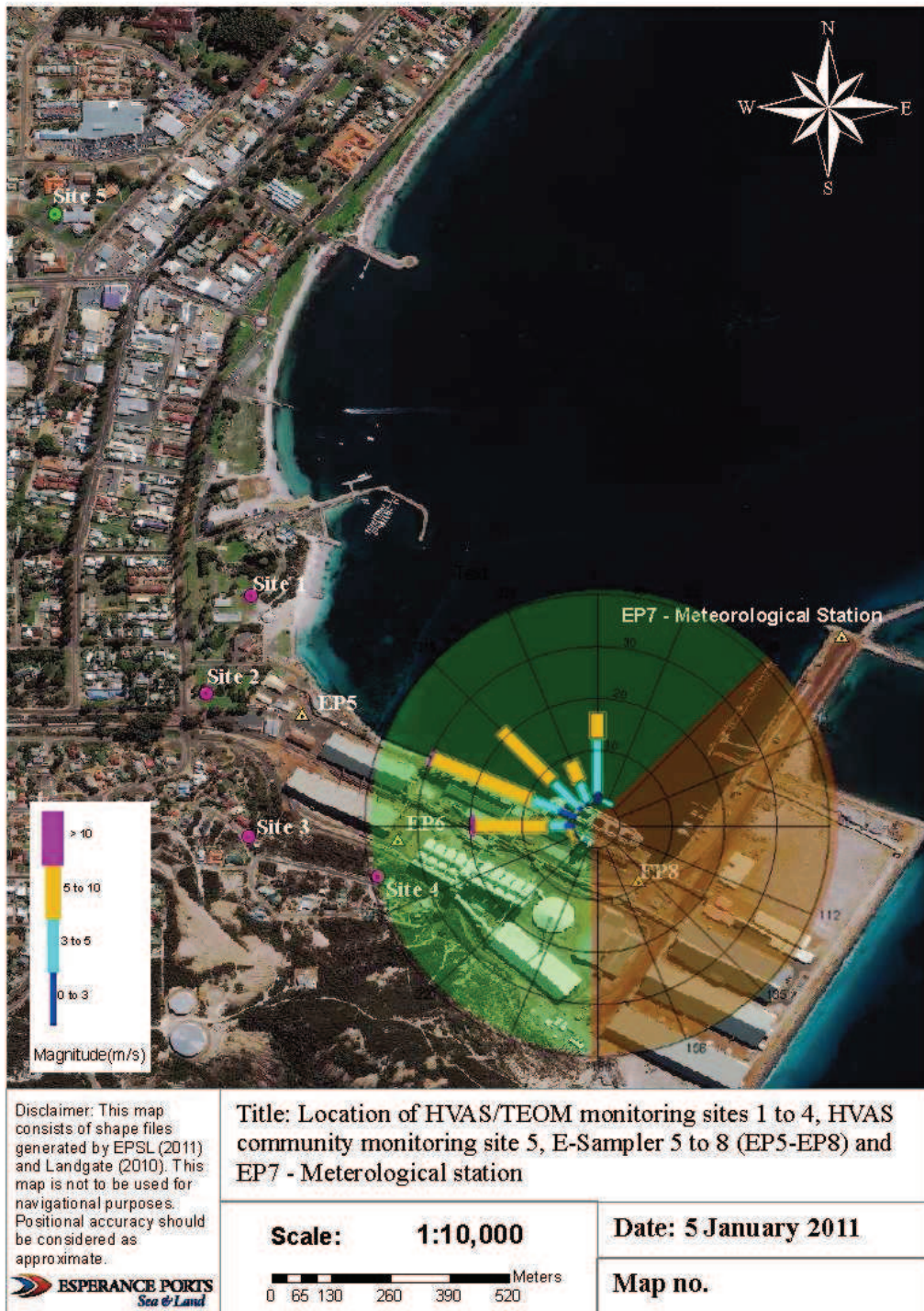


Figure 2: Wind arc zones, where 'red zone' is 45° to 180 ° and 'green zone' is 180 ° to 45° (EPSL, 2009a), showing loading wind rose data measured at the meteorological station adjacent to E-Sampler 7 from 1355 on 27/04/2011 to 1135 on 28/04/2011.

2.4 Compliance to Loading Protocol

The bulk nickel sulphide loading was compliant with the EPSL loading procedure which documents maximum loading rates, percentage moisture of the product and in what wind directions the concentrate may or may not be loaded (green and red respectively) (EPSL, 2009a). The wind direction arc is illustrated *Figure 2* and the loading rates (below 1000tph) are illustrated in **Figure 3**. The effectiveness of these procedures has been demonstrated in the absence of any exceedences since implementation of the wind arc procedure in December 2008.

These conditions are in place to minimise nickel particulate emitted from the Port to the community which is more sensitive than the marine environment. This is due to air breathing animals having a higher exposure to the nickel particulates which become trapped in lung cavities. Marine animals are less exposed, since only a low proportion (less than 6%), of the nickel sulphide particulates dissolve in seawater based on dilute acid extractions of marine sediments (refer to Oceanica, 2008). Uptake via gills is the primary uptake route in marine biota. Aquatic organisms are likely to actively regulate dissolved nickel since at low levels as nickel is an essential element (Muysen *et al.*, 2004).

The bar chart in **Figure 3** shows tonnes of nickel loaded in tonnes per hour (tph) in relation to hourly averages of wind direction (line plot) and the red/green loading zones (background). During the loading of MV Maple Pioneer the wind direction was in the green zone between 180° to 45° during the entire loading period.

As a further restriction to minimise dust emissions, EPSL has committed to not load more than 1000 tph nominal ship-loading rate as part of its '*Heavy Metals Ship Loading Procedure: PR026*' in Section 8 (EPSL, 2009b). Loading rates, however, do not appear to be critical in controlling dust emissions from the Berth 2 ship loader based on recent ship loading events since the ship loader upgrades include a telescopic extension. The EPSL ship loading procedure was adhered to during the loading of the MV Maple Pioneer

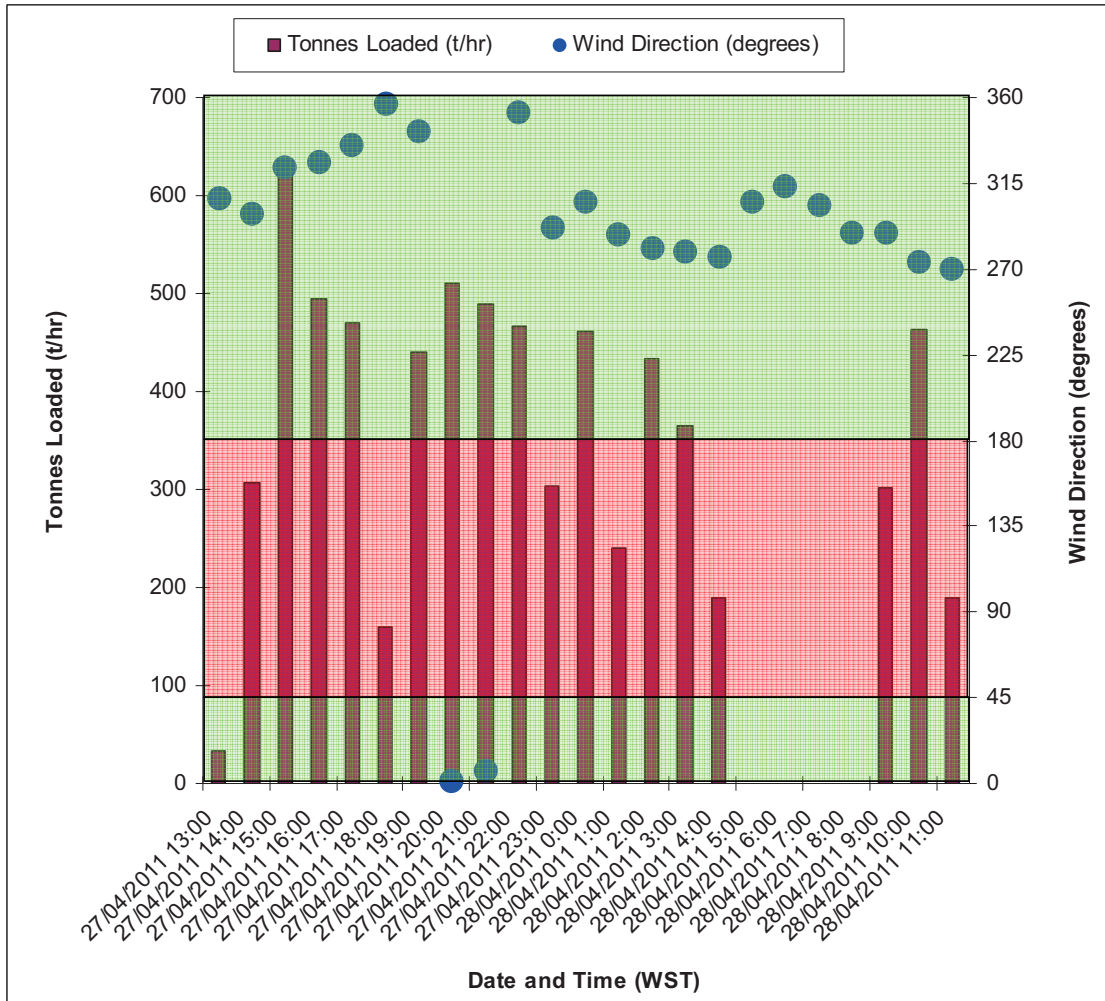


Figure 3: Wind Direction and Loading Rate of MV Maple Pioneer

Note: loading occurred for 22 hours from 1355 hours 27/04/2011 to 1135 hours on 28/04/2011.

2.5 TEOM PM₁₀ Monitoring

The hourly PM₁₀ concentration (µg/m³) and average wind speed (m/s) has been plotted against the date and hour that the MV Maple Pioneer was being loaded (refer to **Figure 4**).

For the entire loading period of MV Maple Pioneer, the wind was in the green zone and a maximum PM₁₀ of 39.5 µg/m³ was recorded at Site 4 at 2100 hours on 27 April 2011. The wind direction was mostly in a W to NW direction but shifted briefly into N direction between 2000 hours and 2100 hours on 27 April 2011 but did not go into the red zone. During the loading period levels of PM₁₀ seemed to have no correlation with wind speed (refer to **Appendix B** raw data). The recorded PM₁₀ concentrations, are therefore likely to be from sources other than nickel loading operations.

The 24-hour average PM₁₀ concentrations for the monitoring period are presented in **Table 2** as calculated at 1200 hours each date to coincide with the approximate time when TSP filter papers are changed. The 24-hour average licence target concentration of 50µg/m³ was not exceeded at any of the sites. The maximum daily average PM₁₀ concentration of 10.4 µg/m³ was recorded at Site 1 between 1200 hours on 27/03/2011 and 1200 hours on 28/03/2011 and represents 20.8% of the assessment criterion (50 µg/m³).

Table 2: Daily 24-hr average TEOM results for PM₁₀ for 27/04/2011 to 28/04/2011

Sampling Start	Sampling Finish	Site 1 (µg/m ³)	Site 2 (µg/m ³)	Site 3 (µg/m ³)	Site 4 (µg/m ³)
1200 27/04/2011	1200 28/04/2011	10.4	9.1	9.6	8.5
Assessment Criterion (µg/m³)		50			

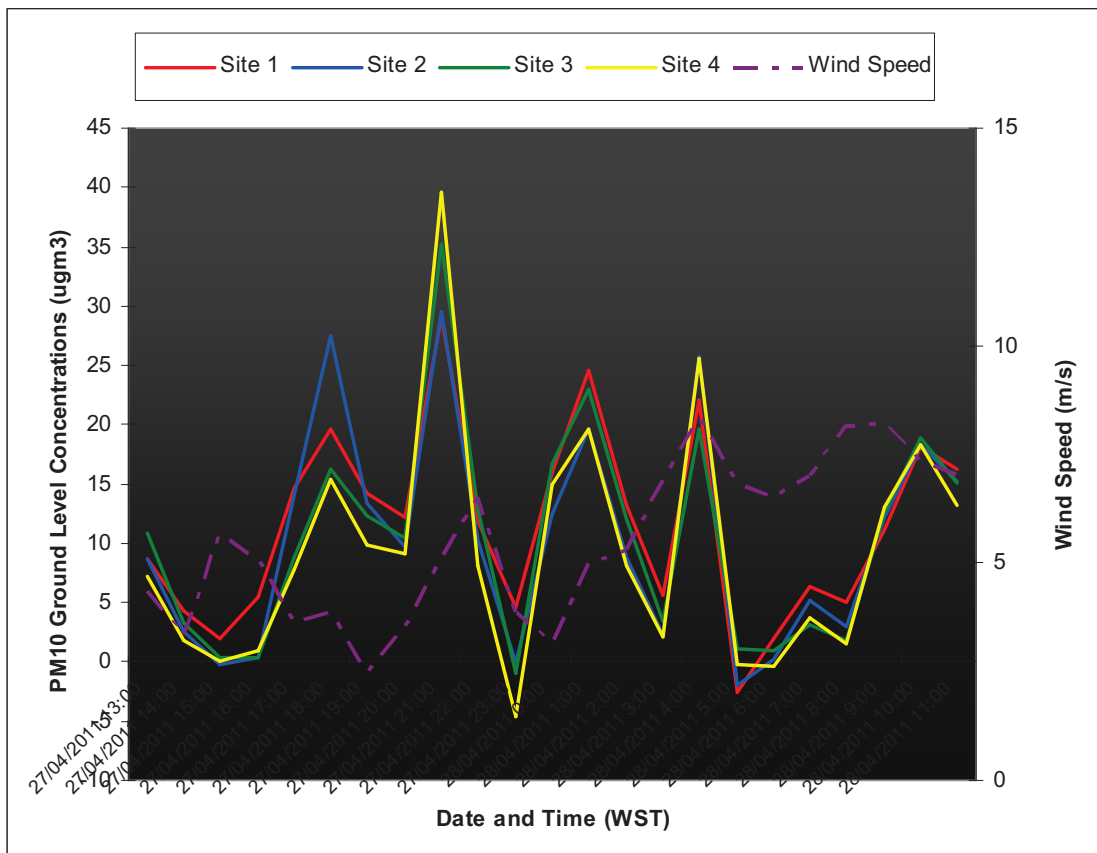


Figure 4: Hourly PM10 concentrations and wind speed between 1355 hours on 27/04/2011 to 1135 hours on 28/04/2011

2.6 TSP HVAS Data

The results from the laboratory analysis of the TSP filter papers are presented in **Table 3** and the laboratory reports are provided in **Appendix C**. There were no exceedences of the 90 µg/m³ 24-hour average concentration target for TSP during the monitoring period. The maximum recorded daily average TSP concentration of 29 µg/m³ recorded at Site 4 between 1200 hours on 27/04/2011 and 1200 hours on 28/04/2011 represents 32.2% of the assessment criterion (90 µg/m³). This is a typical value for background dust levels, and is within the TSP concentration criteria.

The 24-hour average licence target of 0.14 µg/m³ for nickel was not exceeded during the monitoring period. The highest 24-hour average nickel concentration recorded during the monitoring period was 0.003 µg/m³ which occurred at Site 2 between 1200 hours 27/4/2011 to 1200 hours 28/4/2011 representing 2% of the assessment criterion (0.14 µg/m³).

Table 3: Daily HVAS monitoring results for TSP and Nickel for 27/04/2011 to 28/04/2011

Sampling Start ¹	Sampling Finish ¹	Site 1 (µg/m ³)		Site 2 (µg/m ³)		Site 3 (µg/m ³)		Site 4 (µg/m ³)		Site 5 (µg/m ³)	
		TSP	Ni	TSP	Ni	TSP	Ni	TSP	Ni	TSP	Ni
1200 27/04/2011	1200 28/04/2011	24	<0.002	28	0.003	24	<0.002	26	<0.002	29	<0.002
Assessment Criterion (µg/m ³)		90	0.14	90	0.14	90	0.14	90	0.14	90	0.14

¹ These times are approximate for all five monitoring sites.

Bold - exceedance of the 90µg/m³ 24-hour average concentration target for TSP
0.001 µg/m³ is the limit of detection for the analysis of nickel.

3. CONCLUSIONS

Loading of the MV Maple Pioneer was consistent with EPSL operational procedures (PR088 and PR026). Ship-loading only occurred when the wind was blowing from within the green zone over the 22 hour loading period

The loading rates were less than 1,000 tph therefore the potential for dust and odour impacts were significantly reduced.

No odour complaints were reported to EPSL during this period consistent with the 'No perceptible' product odour assessment result. There have been no odour complaints reported to EPSL since December 2008 that are attributable to operational activities.

The licence targets for PM₁₀, TSP and nickel were not exceeded at any of the four monitoring sites during the berthing or loading periods of the MV Maple Pioneer. None of these parameters significantly increased during the loading period.

These results warranted no further emission reduction measures.

4. REFERENCES

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B.T.A. Muysen, K.V. Brix, D.K. DeForest, and C.R. Janssen, (2004). Nickel Essentiality and Homeostasis in Aquatic Organisms In: *Environmental Reviews* 2004, Volume 12: 113–131, NRC Research Press.

Standards Australia, (2008). *Methods for Sampling and Analysis of Ambient Air, Method 9.8: Determination of Suspended Particulate Matter – PM10 Continuous Direct Mass Method Using a Tapered Element Oscillating Microbalance Analyser*, AS 3580.9.8-2008, Accessed online 6 February 2009, <http://www.saiglobal.com/online/autologin.asp?br=true&userid=7439352104>.

Appendix A Odour Record Sheet

 ESPERANCE PORTS <i>Sea & Land</i>	Form No : FM239
	Revision: 2
Title: Odour Record Sheet	Issue Date: 8/12/2009
	Page: 1 of 1
	Reference: PR089

ODOUR INTENSITY	6
Extremely Strong	5
Very Strong	4
Strong	3
Distinct	2
Weak	1
Very Weak	0
Not Perceptible	0

Ship Name: MV MAPLE FLOWER Sampled by: Alex KENNEDY

Odour Assessor(s)	Date	Time	Sample#	Location	Temperature (°C)	pH	%moisture	Odour intensity (Rate 1 to 6)
AK	27/4/11	7:30	1	Black Swan shed	50.5	7.2	81	1
			2		46.6	8.0	8.3	1
			3		41.1	8.3	8.6	1
			4		43.5	6.3	8.7	1
			5		39.9	7.2	9.6	1
			6		46.7	6.8	8.1	1

APPENDIX B HOURLY AVERAGE PM10 CONCENTRATION

Date and Time	Hourly Average PM10 ($\mu\text{g}/\text{m}^3$)				Hourly Averaged Wind Speed (m/s)	Hourly Averaged Wind Vector ($^\circ$)	Hourly Average Product Loaded (tph)
	Site 1	Site 2	Site 3	Site 4			
27/04/2011 13:00	8.7	8.7	10.9	7.2	4.3	307	33
27/04/2011 14:00	4.2	2.5	3.3	1.9	3.3	299	308
27/04/2011 15:00	1.9	-0.2	0.4	0.0	5.7	323	625
27/04/2011 16:00	5.4	0.4	0.4	0.9	5.1	326	495
27/04/2011 17:00	14.6	14.1	8.9	7.9	3.6	335	470
27/04/2011 18:00	19.7	27.5	16.3	15.4	3.8	356	160
27/04/2011 19:00	14.2	13.4	12.4	9.9	2.5	342	440
27/04/2011 20:00	12.2	9.7	10.4	9.1	3.5	1	510
27/04/2011 21:00	29.0	29.6	35.2	39.5	5.1	6	490
27/04/2011 22:00	12.0	10.3	12.9	8.1	6.5	352	467
27/04/2011 23:00	4.6	-0.1	-1.0	-4.6	3.8	291	303
28/04/2011 0:00	15.9	12.5	16.8	14.9	3.2	305	461
28/04/2011 1:00	24.6	19.5	23.0	19.5	5.0	288	241
28/04/2011 2:00	13.2	8.8	12.1	8.1	5.3	281	433
28/04/2011 3:00	5.6	2.2	3.4	2.1	6.9	279	365
28/04/2011 4:00	22.1	25.8	19.7	25.5	8.3	276	190
28/04/2011 5:00	-2.5	-1.9	1.0	-0.2	6.8	305	0
28/04/2011 6:00	1.9	0.2	0.9	-0.4	6.5	313	0
28/04/2011 7:00	6.4	5.1	3.1	3.7	7.0	303	0
28/04/2011 8:00	5.1	3.0	1.8	1.6	8.2	289	0
28/04/2011 9:00	11.2	12.2	12.6	13.0	8.2	289	301
28/04/2011 10:00	18.2	18.3	18.9	18.3	7.3	273	464
28/04/2011 11:00	16.3	15.2	15.1	13.3	7.0	270	189

APPENDIX C

MPL LABORATORY REPORTS



Part of the Envirolab Group



16 - 18 Hayden Court, Myaree, Western Australia 6154
PO Box 4023 Myaree BC, Western Australia 6960
Tel: +61 8 9317 2505 / Fax: +61 8 9317 4163
email: laboratory@mpl.com.au
www.envirolabservices.com.au
Envirolab Services (WA) Pty Ltd ABN 53 140 099 207

CERTIFICATE OF ANALYSIS 110970

Client:

Esperance Ports - Sea and Land
PO Box 35
Esperance
WA 6450

Attention: N Norish

Sample log in details:

Your Reference:
No. of samples:
Date samples received:
Date completed instructions received:
Location:

Dust Analysis

30 High Volume Filters
3/05/11
3/05/11
NA

Analysis Details:

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.

Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: 10/05/11
Date of Preliminary Report: Not issued
Issue Date: 10/05/11

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Tests not covered by NATA are denoted with *.

Results Approved By:



Dr Monika Buerger
Supervisor – Micro, Asbestos, Dust

MPL Reference: 110970
Revision No: R 00

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Client Reference: Dust Analysis

Metals in High Volume Filters	UNITS	PQL	110970-1	110970-2	110970-3	110970-4	110970-5
Our Reference:	--	--	PAE11	PAE12	PAE13	PAE14	PAE15
Your Reference	--	--	Site 4	Site 3	Site 2	Site 1	Site 5
Location	--	--	23/04/11	23/04/11	23/04/11	23/04/11	23/04/11
Date Sampled							
Dust	mg/filter	0.1	53	50	58	49	57
Dust in Air	µg/m ³	0.1	33	31	36	31	35
Iron	µg/filter	5	1,400	1,100	2,100	1,500	1,400
Iron in Air	µg/m ³	0.005	0.90	0.70	1.3	0.95	0.90
Nickel	µg/filter	2	5	3	7	3	3
Nickel in Air	µg/m ³	0.002	0.003	<0.002	0.004	<0.002	<0.002
Lead	µg/filter	5	<5	<5	<5	<5	<5
Lead in Air	µg/m ³	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Lithium	µg/filter	2	3	3	3	3	3
Lithium in Air	µg/m ³	0.001	0.002	0.002	0.002	0.002	0.002
Sulfur	µg/filter	50	1,900	1,700	1,500	1,600	1,500
Sulfur in Air	µg/m ³	0.02	1.2	1.0	0.92	0.96	0.96
Zinc	µg/filter	5	262	242	260	266	249
Zinc in Air	µg/m ³	0.002	0.16	0.15	0.16	0.16	0.15

Metals in High Volume Filters	UNITS	PQL	110970-6	110970-7	110970-8	110970-9	110970-10
Our Reference:	--	--	PAE16	PAE29	PAE30	PAE31	PAE32
Your Reference	--	--	Blank	Site 4	Site 3	Site 2	Site 1
Location	--	--	26/04/11	26/04/11	26/04/11	26/04/11	26/04/11
Date Sampled							
Dust	mg/filter	0.1	3.0	48	32	35	36
Dust in Air	µg/m ³	0.1	[NA]	30	20	22	23
Iron	µg/filter	5	180	2,600	860	550	480
Iron in Air	µg/m ³	0.005	[NA]	1.6	0.54	0.35	0.30
Nickel	µg/filter	2	<2	4	3	<2	<2
Nickel in Air	µg/m ³	0.002	[NA]	0.003	0.002	<0.002	<0.002
Lead	µg/filter	5	<5	<5	<5	<5	<5
Lead in Air	µg/m ³	0.005	[NA]	<0.005	<0.005	<0.005	<0.005
Lithium	µg/filter	2	2	3	2	2	3
Lithium in Air	µg/m ³	0.001	[NA]	0.002	0.001	0.002	0.002
Sulfur	µg/filter	50	830	2,100	2,000	1,500	1,500
Sulfur in Air	µg/m ³	0.02	[NA]	1.3	1.2	0.93	0.95
Zinc	µg/filter	5	237	263	256	255	257
Zinc in Air	µg/m ³	0.002	[NA]	0.16	0.16	0.16	0.16

Client Reference: Dust Analysis

Metals in High Volume Filters Our Reference: Your Reference Location Date Sampled	UNITS	PQL	110970-11 PAE33 Site 5 26/04/11	110970-12 PAE34 Blank	110970-13 PAE35 Site 4 27/04/11	110970-14 PAE36 Site 3 27/04/11	110970-15 PAE37 Site 2 27/04/11
Dust	mg/filter	0.1	27	3.1	38	36	42
Dust in Air	µg/m ³	0.1	17	[NA]	26	24	28
Iron	µg/filter	5	590	180	790	820	920
Iron in Air	µg/m ³	0.005	0.37	[NA]	0.53	0.55	0.62
Nickel	µg/filter	2	<2	<2	2	2	5
Nickel in Air	µg/m ³	0.002	<0.002	[NA]	<0.002	<0.002	0.003
Lead	µg/filter	5	<5	<5	<5	<5	<5
Lead in Air	µg/m ³	0.005	<0.005	[NA]	<0.005	<0.005	<0.005
Lithium	µg/filter	2	2	2	2	3	2
Lithium in Air	µg/m ³	0.001	0.001	[NA]	0.002	0.002	0.002
Sulfur	µg/filter	50	1,300	890	1,200	1,200	1,100
Sulfur in Air	µg/m ³	0.02	0.84	[NA]	0.80	0.81	0.73
Zinc	µg/filter	5	256	246	242	255	248
Zinc in Air	µg/m ³	0.002	0.16	[NA]	0.16	0.17	0.17

Metals in High Volume Filters Our Reference: Your Reference Location Date Sampled	UNITS	PQL	110970-16 PAE38 Site 1 27/04/11	110970-17 PAE39 Site 5 27/04/11	110970-18 PAE40 Blank	110970-19 PAE41 Site 4 28/04/11	110970-20 PAE42 Site 3 28/04/11
Dust	mg/filter	0.1	35	43	3.4	42	41
Dust in Air	µg/m ³	0.1	24	29	[NA]	27	26
Iron	µg/filter	5	620	950	190	370	430
Iron in Air	µg/m ³	0.005	0.41	0.64	[NA]	0.24	0.27
Nickel	µg/filter	2	<2	2	<2	<2	<2
Nickel in Air	µg/m ³	0.002	<0.002	<0.002	[NA]	<0.002	<0.002
Lead	µg/filter	5	<5	<5	<5	<5	<5
Lead in Air	µg/m ³	0.005	<0.005	<0.005	[NA]	<0.005	<0.005
Lithium	µg/filter	2	2	3	2	2	2
Lithium in Air	µg/m ³	0.001	0.002	0.002	[NA]	0.001	0.001
Sulfur	µg/filter	50	1,100	1,100	910	1,300	1,300
Sulfur in Air	µg/m ³	0.02	0.72	0.75	[NA]	0.84	0.82
Zinc	µg/filter	5	242	253	252	215	225
Zinc in Air	µg/m ³	0.002	0.16	0.17	[NA]	0.14	0.14

Client Reference: Dust Analysis

Metals in High Volume Filters Our Reference: Your Reference Location Date Sampled	UNITS	PQL	110970-21 PAE43 Site 2 28/04/11	110970-22 PAE44 Site 1 28/04/11	110970-23 PAE45 Site 5 28/04/11	110970-24 PAE46 Blank	110970-25 PAE47 Site 4 29/04/11
Dust	mg/filter	0.1	48	32	37	3.6	63
Dust in Air	µg/m ³	0.1	30	20	23	[NA]	39
Iron	µg/filter	5	1,000	450	530	180	410
Iron in Air	µg/m ³	0.005	0.67	0.29	0.33	[NA]	0.25
Nickel	µg/filter	2	6	<2	<2	<2	<2
Nickel in Air	µg/m ³	0.002	0.004	<0.002	<0.002	[NA]	<0.002
Lead	µg/filter	5	<5	<5	<5	<5	<5
Lead in Air	µg/m ³	0.005	<0.005	<0.005	<0.005	[NA]	<0.005
Lithium	µg/filter	2	2	2	2	2	<2
Lithium in Air	µg/m ³	0.001	0.001	0.001	0.001	[NA]	<0.001
Sulfur	µg/filter	50	1,100	1,100	1,200	900	1,500
Sulfur in Air	µg/m ³	0.02	0.71	0.72	0.73	[NA]	0.95
Zinc	µg/filter	5	224	228	233	258	196
Zinc in Air	µg/m ³	0.002	0.14	0.14	0.15	[NA]	0.12

Metals in High Volume Filters Our Reference: Your Reference Location Date Sampled	UNITS	PQL	110970-26 PAE48 Site 3 29/04/11	110970-27 PAE49 Site 2 29/04/11	110970-28 PAE50 Site 1 29/04/11	110970-29 PAE51 Site 5 29/04/11	110970-30 PAE52 Blank
Dust	mg/filter	0.1	50	59	69	53	2.0
Dust in Air	µg/m ³	0.1	31	37	42	33	[NA]
Iron	µg/filter	5	430	1,100	590	630	140
Iron in Air	µg/m ³	0.005	0.27	0.69	0.36	0.38	[NA]
Nickel	µg/filter	2	<2	4	4	4	<2
Nickel in Air	µg/m ³	0.002	<0.002	0.003	0.003	0.003	[NA]
Lead	µg/filter	5	<5	<5	<5	<5	<5
Lead in Air	µg/m ³	0.005	<0.005	<0.005	<0.005	<0.005	[NA]
Lithium	µg/filter	2	2	2	<2	3	<2
Lithium in Air	µg/m ³	0.001	0.001	0.001	<0.001	0.002	[NA]
Sulfur	µg/filter	50	1,400	1,400	2,700	2,500	640
Sulfur in Air	µg/m ³	0.02	0.86	0.89	1.7	1.6	[NA]
Zinc	µg/filter	5	212	233	191	980	699
Zinc in Air	µg/m ³	0.002	0.13	0.14	0.12	0.60	[NA]

Client Reference: Dust Analysis

Metals in High Volume Filters			
Our Reference:	UNITS	PQL	110970-31
Your Reference	--	--	Lab Blank
Location	--	--	
Date Sampled			
Iron	µg/filter	5	140
Nickel	µg/filter	2	<2
Lead	µg/filter	5	<5
Lithium	µg/filter	2	<2
Sulfur	µg/filter	50	640
Zinc	µg/filter	5	180

Client Reference: Dust Analysis

Method ID	Methodology Summary
DUST-004	Airborne samples analysed according to AS 2985 for Respirable Dust or AS 3640 for Inhalable Dust . Sample results based on volume data supplied by client. Samples tested as received, *accreditation does not cover sampling.
METALS-020	Metals in soil and water by ICP-OES.

Report Comments:

INS: Insufficient sample for this test; NT: Not tested; PQL: Practical Quantitation Limit; <: Less than; >: Greater than
RPD: Relative Percent Difference; NA: Test not required; LCS: Laboratory Control Sample; NR: Not requested
NS: Not specified; NEPM: National Environmental Protection Measure
DOL: Sample rejected due to particulate overload

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike: A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample): This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD a matrix spike recoveries for the sample batch were within laboratory acceptance criteria.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.

Matrix Spike and LCS: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and Speciated Phenols is acceptable.

Surrogates: 60-140% is acceptable for general organics and 10-140% for SVOC and Speciated Phenols.