



# Geraldton Community Air Quality Monitoring Program

## **MMG and Geraldton Port Authority**

Prepared by: Sheldrick, Mischke and Logue  
Date: 20 January 2012  
Revision: B

# Contents

<b>1</b>	<b>INTRODUCTION AND BACKGROUND</b>	<b>3</b>
1.1	Air Quality Licence Requirements	3
1.2	Elevated Lead Results – October 2010	3
<b>2</b>	<b>PROGRAM OVERVIEW</b>	<b>5</b>
2.1	Program Objectives	5
2.2	Scope	5
2.3	Program Duration	5
2.4	Locations	5
2.5	High Volume Air Samplers	5
<b>3</b>	<b>SAMPLING DESIGN AND METHODOLOGY</b>	<b>6</b>
3.1	Guiding Standards	6
3.2	HVAS Sampling Frequency and Duration	6
3.3	HVAS Process for Sampling	6
<b>4</b>	<b>MONITORING PROGRAM ROLES</b>	<b>7</b>
4.1	Laboratory	7
4.2	Sampling Personnel	7
4.3	Three month rolling average calculation	7
4.4	Data Assessment and Publication	7
<b>5</b>	<b>QUALITY ASSURANCE</b>	<b>8</b>
5.1	Laboratory	8
5.2	Equipment calibration and maintenance	8
5.3	Field Blanks	8
5.4	Blanks	8
<b>6</b>	<b>DATA INTEGRITY AND MANAGEMENT</b>	<b>9</b>
6.1	Quality Check	9
6.1	Laboratory Retest	9
6.2	Exceedance of Environmental Licence Limit or Target	9
<b>7</b>	<b>REFERENCES</b>	<b>10</b>

# Introduction and Background

## 1.1 Air Quality Licence Requirements

Under the *Environmental Protection Act 1986* Geraldton Port is a prescribed premise. The Ports prescribed activities fall under Category 58 of Schedule 1 in the *Environmental Protection Regulations 1987* – “Bulk material loading or unloading: premises on which clinker, coal, ore, ore concentrate or any other bulk granular material is loaded onto or unloaded from vessels by an open materials loading system”. Accordingly, Geraldton Port operates under a Licence for Prescribed Premises, Licence number L4275/1982/13, issued by Department of Environment and Conservation (DEC).

In 2009 DEC amended the licence conditions, introducing a requirement to implement an air quality monitoring programme and to report to DEC results of air quality monitoring for the period of all ship loading events where metal concentrates are loaded. The current licence stipulates ambient air emission concentration for a three month rolling average limit as shown in Table 1.

**Table 1 – 3 month rolling average limit**

<b>Emission</b>	<b>3 month rolling average</b>
Lead as TSP	0.5 µg/m <sup>3</sup>

## 1.2 Elevated Lead Results – October 2010

Under the 2009 amended licence, the first shipment of lead concentrate from the Geraldton port occurred in October 2010; about 5,000 tonnes were loaded. During this shipment one of the high volume monitors (representing the seaward, northern boundary of the port), detected lead at an average concentration of 4.2 µg/m<sup>3</sup> over a 24 hour sampling period. Monitors on the land side of the port did not detect elevated levels. A formal investigation followed and a number of improvements were made to the loading method and operational practices.

To determine whether there had been any significant change in the level of lead and other metal levels within the community, a survey was conducted by the Department of Health (DOH), the DEC Pollution Response Unit and Department of Transport (DOT) in January 2011. A report on the findings was prepared by DOH; in summary the survey outcomes were:

- 31 community soil samples were taken from 23 locations; none were above Health Investigational Levels (HILs).
- 60 rainwater tank samples were taken from 27 domestic tanks, only one sample exceeded the Australian Drinking Water Guideline for lead and one sample for zinc – the Port was discounted as a source in both situations.
- 21 surface dust samples were taken from 21 locations; there was no evidence of accumulation over time.

- 11 soil samples were taken from 11 locations within the Geraldton port operational area. Copper and zinc results were assessed against HILs for commercial industrial sites while lead results were assessed against HILs for residential sites. Exceedances for copper, lead and zinc were found in the immediate shiploading areas. No exceedances were found at the port perimeter.
- Heavy metals detected in the community were well below respective health guidelines and do not pose a health risk to the residents.
- The levels of lead at the Port boundary had decreased with respect to a previous study in 2007 indicating improved hygiene practices at the port.

As an outcome of the community survey, DoH recommended air quality monitoring for metals outside the Port in community areas to monitor and manage community exposure.

## 2.1 Program Objectives

The objective of the community air quality monitoring program is to provide scientific data on air quality within the Geraldton community, in particular levels of lead to determine whether there is any potential for air quality impacts related to Geraldton Port operations. Metal concentrate shipments generally occur once in every 2-3 weeks, although this can vary depending on wind and weather conditions which can delay scheduled shipments.

## 2.2 Scope

The scope of the Geraldton community air quality monitoring program is to monitor ambient air through a gravimetric method of high volume air samplers in the Geraldton community. There are four monitoring stations; three to represent potential community exposure and one control site; refer Appendix A. The control site is used to represent background concentrations in the Geraldton community. Results will be owned by Geraldton Port Authority (GPA) and Minerals and Metals Group (MMG) and available to the community via the internet once validated. Responsibility for supervision and implementation of the program rests with GPA.

## 2.3 Program Duration

The program will run for a period of 12 months. After this time results will be reviewed and a determination made as to whether the program will continue.

## 2.4 Locations

The location of each air quality monitoring site has been chosen to represent an area of Geraldton Community that could potentially be affected by dust from the Port operations; refer Appendix A. This is based on preliminary site investigations and a dust modelling study by GHD. A control monitoring location is used to compare results from monitoring sites with background levels.

## 2.5 High Volume Air Samplers

High volume air samplers (HVAS) are used to collect dust samples. The sampling methodology used is consistent with GPA's air quality monitoring program. Over a 24 hour period, these samplers take a controlled volume of air based on temperature and pressure, and pass it through a prepared filter paper. The volume is determined by flow rate and duration. The concentration of dust is determined by dividing the mass of collected particulate matter by the sample volume.

Two samplers, with a hood to prevent large debris and precipitation from falling onto filters, will be located at each air quality monitoring site;

- One with a TSP inlet to collect total suspended dust particles; and
- One with a PM<sub>10</sub> size selective inlet to collect the fraction with an equivalent aerodynamic diameter (EAD) of less than 10µm, this fraction is often considered to be respirable dust.

## 3.1 Guiding Standards

The monitoring program is to be conducted with reference to the following standards:

- AS/NZS 3580.1.1: 2007 – Methods for sampling and analysis of ambient air – Part 1.1: Guide to siting air monitoring equipment;
- AS/NZS 3580.9.3:2003 Methods for sampling and analysis of ambient air – Part 9.3: Determination of suspended particulate matter – Total suspended particulate matter (TSP) – High volume sampler gravimetric method;
- AS/NZS 3580.9.6:2003 Methods for sampling and analysis of ambient air – Method 9.6: Determination of suspended particulate matter – PM<sub>10</sub> high volume sampler with size selective inlet – Gravimetric method; and
- AS/NZS 2800-1985 Ambient air – Determination of particulate lead – High volume sampler gravimetric collection – Flame atomic absorption spectrometric method

## 3.2 HVAS Sampling Frequency and Duration

Twenty four hour sample periods will commence at 12 noon as follows:

- background monitoring – every six days;
- ship loading event – daily when concentrate shipments are being loaded;
- post-shipment monitoring – the day after concentrate ship loading completes.

## 3.3 HVAS Process for Sampling

High volume sampling is to be conducted in accordance with GPA's operational procedures. In summary this involves:

1. Pre-weighted, numbered filter papers are installed in the sampler.
2. Pre-sampling checks are made to verify the instrument is working correctly.
3. The sampler is programmed to commence at the required time and run for a 24 hour period.
4. Post-sampling checks are made to verify the instrument is working correctly and the sample volume and run time are recorded.
5. The filter paper is carefully removed and sealed in a bag.
6. A chain of custody form is completed and returned with the sample to the laboratory for analysis as soon as possible.

Any problems that occur with the equipment or filter papers will be documented by the sampling personnel and an investigation will be conducted. If any damage to sample filters occurs the filter papers will be photographed and the photo will be included in the investigation report.

## 4.1 Laboratory

The analysing laboratory conducts all analysis as per the relevant Australian Standards and is required to be NATA certified for all analysis performed. The analysing laboratory will be responsible for providing pre-weighted filter papers for the monitoring program.

## 4.2 Sampling Personnel

All sampling personnel will be adequately trained to conduct sampling. All issues or sampling errors will be reported to MMG and GPA.

## 4.3 Three month rolling average calculation

The three month rolling average will be calculated in accordance with the GPA license, see section 1.1 For each calendar month the average lead as TSP will be calculated using the following formula:

$$\frac{(A \times B) + C}{\text{No. Days in Month}}$$

Where:

A= The average concentration of lead as TSP calculated from all 24 hour background samples collected during the month.

B= The number of 24 hour periods in the month where concentrate sampling was not required.

C= The sum of lead as TSP calculated from all 24 hour heavy metal concentrate loading samples collected during the month.

The three month rolling average will then be calculated based on the monthly average using the following formula:

$$\frac{\text{Monthly Average} + \Sigma(\text{Previous 2 Monthly Averages})}{3}$$

## 4.4 Data Assessment and Publication

Results from the community monitoring program will be published via the community web page as they become available.

Prior to publication quality assurance and quality control (QA/QC) checks will be made as described in Section 5. If QA/QC checks fail, an investigation will be conducted by an appropriately qualified person and the investigation report will be made available on the community web page.

The results will also be reviewed by MMG and GPA prior to publication. If any elevated dust levels are detected the appropriate authorities will be notified and an investigation conducted prior to publishing the results and the investigation report on the internet. This process is described in more detail in Section 6.

## 5.1 Laboratory

A NATA accredited laboratory will be selected and a supply of pre-weighed and numbered filters ordered. Filter type is to be as recommended by the laboratory for particle sampling and chemical analyses taking into account chemicals to be analysed and analysis method.

Filter papers are sent back to the laboratory after sampling for analysis as detailed in Table 2. The laboratory will analyse as per relevant Australian Standards and report a random duplicate from each chain of custody batch, certified reference material and all blanks. The laboratory will produce a report on the results.

**Table 2** - Filter paper analysis

TSP	PM <sub>10</sub>
Dust	Dust
Lead	

## 5.2 Equipment calibration and maintenance

All air quality monitoring equipment is to be maintained and calibrated in accordance with the relevant AS/NZS. Calibration and maintenance shall only be undertaken by an appropriately qualified technician and a certificate of calibration provided. Certificates of calibration will be available on the community monitoring webpage.

## 5.3 Field Blanks

Field blank filters will be conducted during every second sampling event to ensure filter handling and transport are not biasing results.

## 5.4 Blanks

Laboratory blanks will be conducted as required in accordance with the relevant AS/NZS.



Laboratory results and quality assurance data will be provided by the testing laboratory to GPA and MMG. Once quality assurance and data integrity checks are made by GPA and MMG, data will be posted on the internet.

## 6.1 Quality Check

The results will be quality checked before being externally distributed. Quality checking includes ensuring field blank returns negligible results, duplicates are within 10% of each other, certified reference material is within 10%, information not matching chain of custody and any other points of concern. In the event of results failing a quality check, an investigation is to occur and is to be recorded as an incident in GPA's and MMG's incident reporting system.

Where results do not meet quality requirements, they will be recorded on the internet site as 'invalid' and a reason provided.

## 6.1 Laboratory Retest

A laboratory retest and resubmission of report including reason for error will be requested in the event of:

- a field blank returns substantial result;
- duplicates are not within 10% of each other;
- certified reference material is not within 10%;
- information not matching chain of custody; and
- any other reason which could be at fault by the laboratory.

## 6.2 Exceedance of Environmental Licence Limit

Results will be compared with GPA's environmental licence values. Where results for lead exceed licence values a formal investigation will occur to determine the likely source. It should not be automatically assumed that the results are related to port operations as there can be many sources of these metals in the environment.

In the event of a result exceeding GPA's environmental licence limit for lead, the following process will apply:

- A quality assurance check will be conducted of sample collection, handling and testing.
- The sample will be retested by the laboratory.
- The result will be reported to DEC.
- Isotopic testing will be conducted to determine if the source is from product handled at Geraldton port, unless there is clear evidence that the result does not relate to port operations or is due to a quality assurance issue.
- A formal investigation will occur and a report on the findings provided to DEC, CGG and made publicly available.

In the event of an elevated result for lead the results will not be posted on the community website until they have been verified as true and correct. Once results have been verified as being accurate, they will be posted on the internet along with advice that an investigation is in progress and it should not be assumed that results necessarily relate to the port operations.

Department of Environment and Conservation (2009), *Draft State Environmental (Ambient Air) Policy 2009 - Draft policy for public and stakeholder comment*, viewed 8 June 2011 at [http://www.epa.wa.gov.au/docs/2970\\_draftAmbientAirSEPandExDoc.pdf](http://www.epa.wa.gov.au/docs/2970_draftAmbientAirSEPandExDoc.pdf)

Department of Environment and Conservation (2008), *Draft – A guideline for the development and implementation of a dust management program*, May 2008.

Department of Environment & Conservation (2009), *Licence for prescribed premises – Licence Number L4275/1982/13*.

Ministry for the Environment (2009), *Good Practice Guide for Air Quality Monitoring and Data Management 2009*, Ministry for the Environment, Wellington NZ.

SAI Global Limited (2007), *AS/NZS 3580.1.1: 2007 – Methods for sampling and analysis of ambient air – Part 1.1: Guide to siting air monitoring equipment*, Standards Australia & Standards New Zealand, Sydney.

SAI Global Limited (2003), *AS/NZS 3580.9.3:2003 Methods for sampling and analysis of ambient air – Part 9.3: Determination of suspended particulate matter – Total suspended particulate matter (TSP) – High volume sampler gravimetric method*, Standards Australia & Standards New Zealand, Sydney.

SAI Global Limited (2003), *AS/NZS 3580.9.6:2003 Methods for sampling and analysis of ambient air – Method 9.6: Determination of suspended particulate matter – PM<sub>10</sub> high volume sampler with size selective inlet – Gravimetric method*, Standards Australia & Standards New Zealand, Sydney.

## APPENDIX A

