JBS ENVIRONMENTAL

0 100m

Approximate scale

Figure 10 **Location of Receptors in Proximity of Site**

Department of Lands (2010)
Note- All locations shown are approximate only

Figure 11 **Adopted Boundaries for Assessment of Odour Impacts**

Appendix A

Meteorological Data

Site-Specific Input Meteorological data file for AUSPLUME

Macdonaldtown-2007/08

This file was exclusively compiled for **JBS Group** By pDs Consultancy; Air Modelling and Meteorology Experts.

pDs Consultancy
@2010

Introduction

Some air quality assessments are demanding site-specific meteorological data to assess the impact using Gaussian plume models. This data should represent the area of concern (near source) and the meteorological parameters should characterise the transport and dispersion conditions.

Meteorological input is crucial in Gaussian plume modelling. Therefore compilation of input meteorological data files should be done meeting the procedures and algorithms set by environment regulators. It is always preferred to collect mandatory data such as wind speed, direction, sigamatheta (Calculated from Wind Direction measurements) and ambient temperature onsite. And again instrumentations and siting should meet Australian Standard (AS2923 -ambient air guide for measurement of horizontal wind for air quality applications).

Unfortunately, there were no meteorological data colleting stations in the vicinity of the location **Macdonaldtown in NSW**. So it was decided to generate AUSPLUME type meteorological data file running prognostic meteorological module in TAPM (The Air Pollution Model developed by CSIRO, Australia). Two year long data is requested and latest available 2007 and 2008 Synoptic (Source CSIRO/BoM) data were used to initialise the model for simulations.

LOCATION:


Location : Sydney(NSW)
Barangaroo,
Macdonaldtown,Chullora
Parramatta
Chatswood
Manly
North Sydney
Sydney
Fairfield
Bankstown

The AUSPLUME type meteorological data for **Macdonaldtown, NSW** was generated running TAPM in the following manner

- in 3 nested grids, inner most grid with 1000m resolution.
- with high resolution topography (9 second DEM).
- verifying vegetation and soil type match with interested area-**Macdonaldtown**.

-Strictly followed DECCW set procedure.

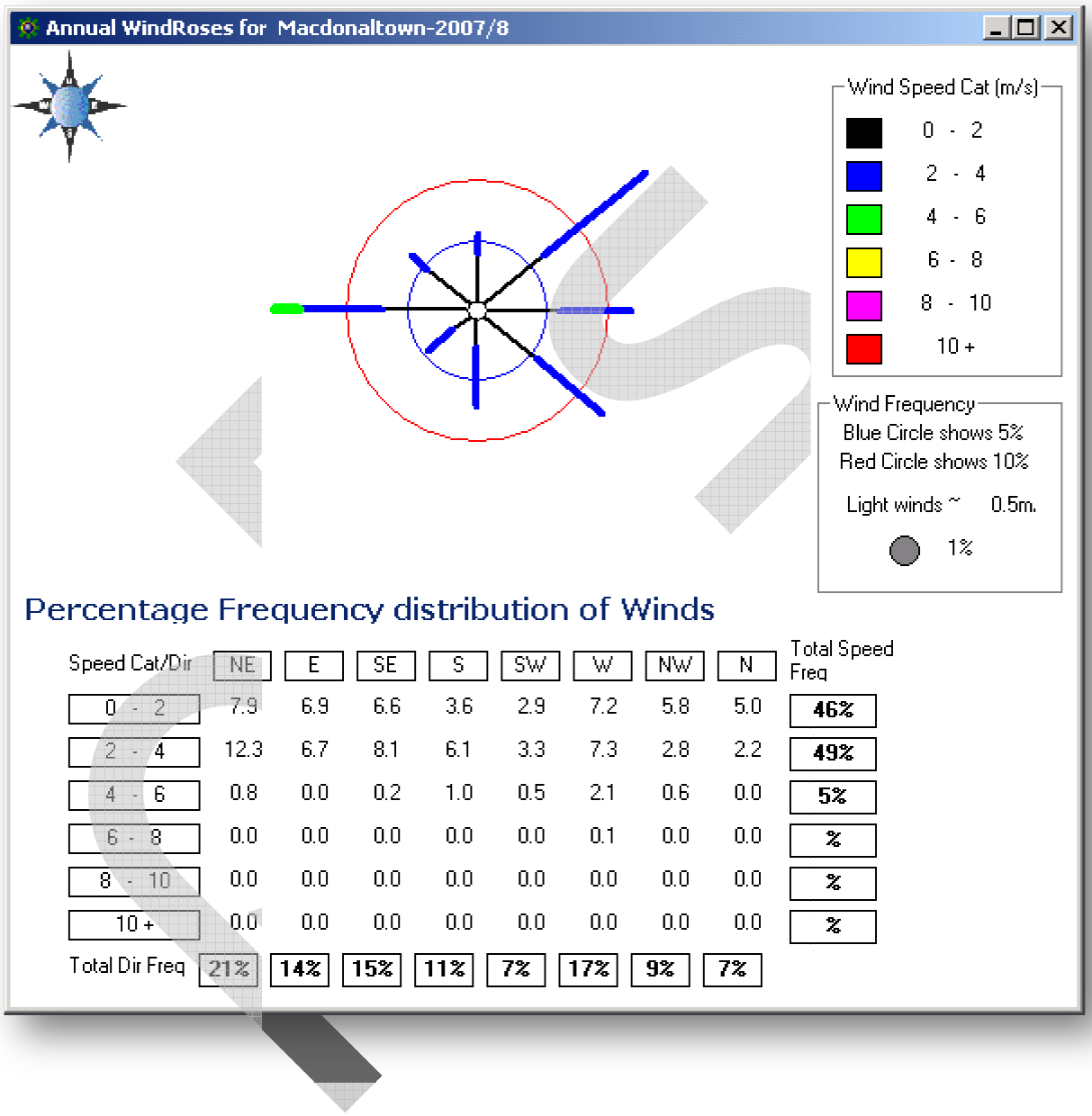
ANALYSIS

DATA COVERAGE

Season	No. of Days	Percentage
Summer (181 days)	181	100%
Autumn (184 days)	184	100%
Winter(184 days)	184	100%
Spring (182 days)	182	100%
Annual (365/6 days)	365/366	100%

All seasons are very well represented.

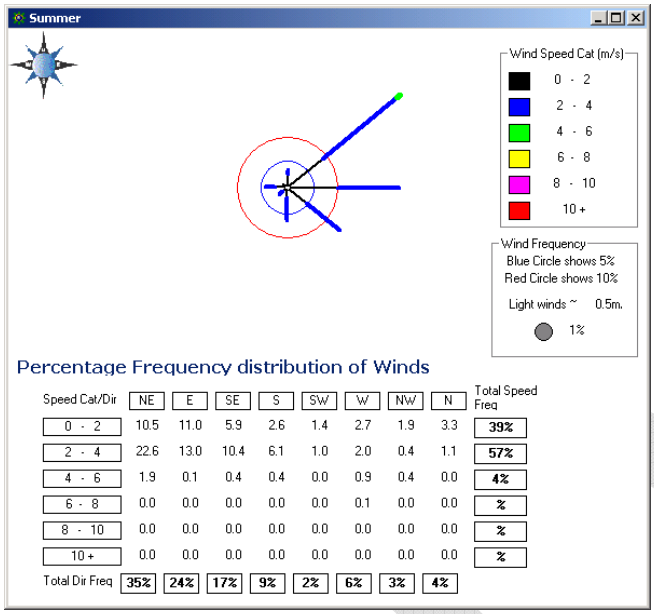
ANNUAL WINDROSES



Percentage Frequency distribution of Winds

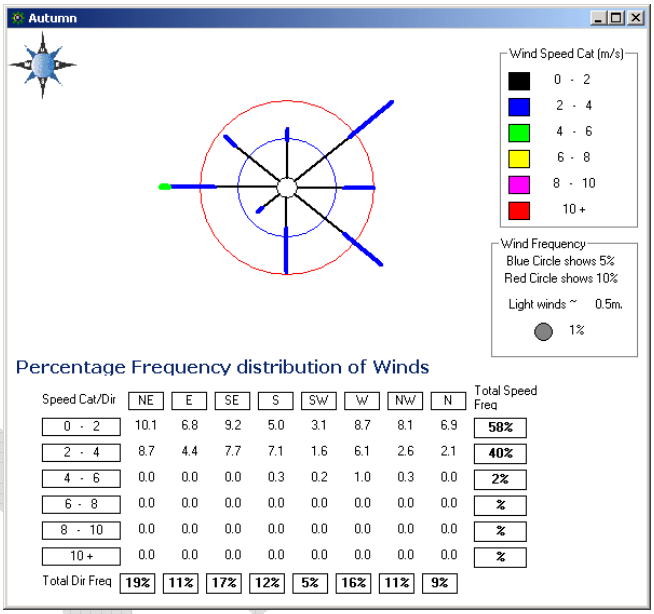
Speed Cat/Dir	NE	E	SE	S	SW	W	NW	N	Total Speed Freq
0 - 2	7.9	6.9	6.6	3.6	2.9	7.2	5.8	5.0	46%
2 - 4	12.3	6.7	8.1	6.1	3.3	7.3	2.8	2.2	49%
4 - 6	0.8	0.0	0.2	1.0	0.5	2.1	0.6	0.0	5%
6 - 8	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	%
8 - 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	%
10 +	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	%
Total Dir Freq	21%	14%	15%	11%	7%	17%	9%	7%	

SEASONAL WINDROSES



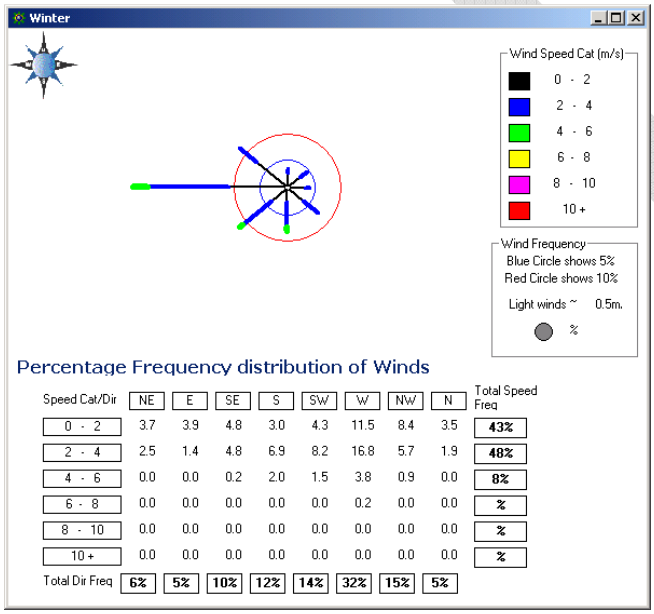
Percentage Frequency distribution of Winds

Speed Cat/Dir	NE	E	SE	S	SW	W	NW	N	Total Speed Freq
0 - 2	10.5	11.0	5.9	2.6	1.4	2.7	1.9	3.3	39%
2 - 4	22.6	13.0	10.4	6.1	1.0	2.0	0.4	1.1	57%
4 - 6	1.9	0.1	0.4	0.4	0.0	0.9	0.4	0.0	4%
6 - 8	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	%
8 - 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	%
10 +	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	%
Total Dir Freq	35%	24%	17%	9%	2%	6%	3%	4%	



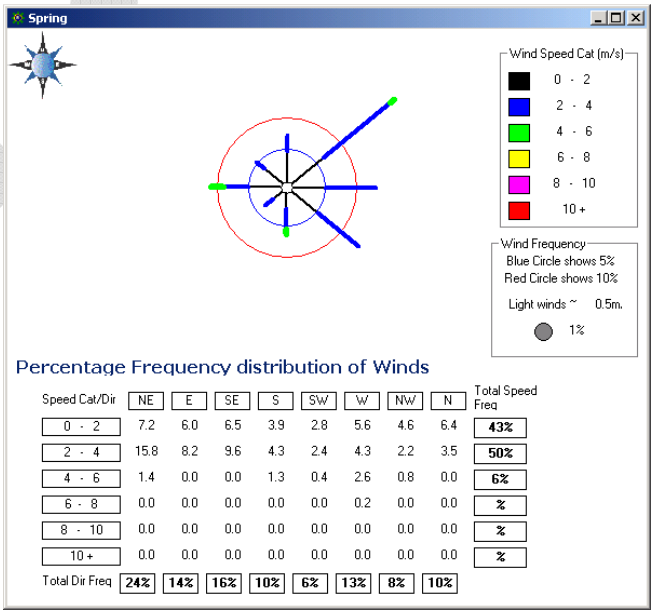
Percentage Frequency distribution of Winds

Speed Cat/Dir	NE	E	SE	S	SW	W	NW	N	Total Speed Freq
0 - 2	10.1	6.8	9.2	5.0	3.1	8.7	8.1	6.9	58%
2 - 4	8.7	4.4	7.7	7.1	1.6	6.1	2.6	2.1	40%
4 - 6	0.0	0.0	0.0	0.3	0.2	1.0	0.3	0.0	2%
6 - 8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	%
8 - 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	%
10 +	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	%
Total Dir Freq	19%	11%	17%	12%	5%	16%	11%	9%	



Percentage Frequency distribution of Winds

Speed Cat/Dir	NE	E	SE	S	SW	W	NW	N	Total Speed Freq
0 - 2	3.7	3.9	4.8	3.0	4.3	11.5	8.4	3.5	43%
2 - 4	2.5	1.4	4.8	6.9	8.2	16.8	5.7	1.9	48%
4 - 6	0.0	0.0	0.2	2.0	1.5	3.8	0.9	0.0	8%
6 - 8	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	%
8 - 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	%
10 +	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	%
Total Dir Freq	6%	5%	10%	12%	14%	32%	15%	5%	



Percentage Frequency distribution of Winds

Speed Cat/Dir	NE	E	SE	S	SW	W	NW	N	Total Speed Freq
0 - 2	7.2	6.0	6.5	3.9	2.8	5.6	4.6	6.4	43%
2 - 4	15.8	8.2	9.6	4.3	2.4	4.3	2.2	3.5	50%
4 - 6	1.4	0.0	0.0	1.3	0.4	2.6	0.8	0.0	6%
6 - 8	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	%
8 - 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	%
10 +	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	%
Total Dir Freq	24%	14%	16%	10%	6%	13%	8%	10%	

ANNUAL STABILITY DISTRIBUTION

Stability Category	% Distribution	Avg Wind Speed	Avg Temperature	Avg Mixing Height
A	13	2.6	21.7	670
B	18	3.	20.5	628
C	14	2.6	18.2	556
D	29	1.8	16.5	252
E	14	1.8	15.8	202
F	11	2.1	17.9	247

STATISTICS OF MACDONALDTOWN (NSW) INPUT METEOROLOGICAL DATA FILE-2007/08

STAB Cat	Stat	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
A	Max of Temp	34.0	29.0	32.0	25.0	26.0	20.0	19.0	23.0	28.0	31.0	29.0	33.0	34.0
	Min of Temp	21.0	21.0	18.0	17.0	15.0	13.0	12.0	12.0	13.0	14.0	18.0	19.0	12.0
	Average of Temp	25.0	25.2	25.3	21.9	20.0	16.9	15.1	16.8	19.2	21.9	23.1	24.9	22.9
	Max of WS	3.4	3.4	3.4	3.3	3.3	1.9	3.4	3.4	3.4	3.4	3.4	3.4	3.4
	Min of WS	0.5	1.0	0.5	0.5	0.5	0.5	0.9	0.6	0.5	0.5	1.0	0.5	0.5
	Average of WS	2.9	2.8	2.6	2.0	1.5	1.4	1.8	2.1	2.4	2.5	2.8	2.7	2.5
	Max of MixH	1995	1496	1995	1496	1496	1437	1413	1978	1953	1553	1995	2494	2494
	Min of MixH	183	179	150	258	344	477	335	199	173	150	184	163	150
	Average of MixH	667	679	650	746	717	790	850	992	843	595	619	705	698
B	Max of Temp	37.0	29.0	34.0	26.0	27.0	22.0	21.0	26.0	31.0	34.0	29.0	33.0	37.0
	Min of Temp	17.0	18.0	16.0	11.0	12.0	10.0	9.0	9.0	11.0	11.0	16.0	18.0	9.0
	Average of Temp	24.1	23.1	22.8	20.3	19.2	16.2	15.0	16.2	18.5	21.0	21.4	22.9	20.6
	Max of WS	4.8	4.6	4.4	4.9	4.8	4.9	4.9	4.9	4.9	4.8	4.9	4.9	4.9
	Min of WS	0.5	0.6	0.5	0.6	0.5	0.5	0.7	0.5	0.6	0.5	0.5	1.0	0.5
	Average of WS	3.2	2.8	2.6	2.3	2.2	2.4	2.6	2.9	2.9	2.9	3.1	3.1	2.8
	Max of MixH	2992	1340	1995	1995	1496	1481	1995	1995	1995	2494	2317	2992	2992
	Min of MixH	86	77	79	87	97	137	134	124	93	63	78	92	63
	Average of MixH	586	544	679	735	654	695	836	947	800	560	563	644	673
C	Max of Temp	37.0	26.0	33.0	28.0	26.0	22.0	22.0	26.0	31.0	35.0	28.0	31.0	37.0
	Min of Temp	16.0	17.0	14.0	9.0	10.0	9.0	7.0	7.0	9.0	10.0	15.0	16.0	7.0
	Average of Temp	21.7	21.0	21.2	18.7	17.4	15.0	13.5	14.8	16.3	19.8	18.8	20.8	18.1
	Max of WS	4.2	3.7	4.0	5.3	5.0	5.3	6.5	5.3	5.8	5.8	6.4	6.0	6.5
	Min of WS	0.6	0.7	0.5	0.5	0.5	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.5
	Average of WS	2.4	2.2	2.1	2.2	2.0	2.6	2.6	2.7	2.6	2.6	2.5	2.7	2.5
	Max of MixH	2504	1570	1550	1995	1574	1995	1642	1995	2494	2494	2047	2992	2992
	Min of MixH	58	50	50	50	50	50	71	57	50	50	50	52	50
	Average of MixH	302	284	349	422	394	510	646	621	606	574	494	465	478
D	Max of Temp	34.0	26.0	32.0	26.0	25.0	21.0	21.0	25.0	30.0	33.0	28.0	29.0	34.0
	Min of Temp	15.0	15.0	13.0	9.0	9.0	8.0	6.0	7.0	8.0	10.0	12.0	15.0	6.0
	Average of Temp	20.6	20.4	19.7	17.7	15.4	13.9	11.9	12.4	14.6	17.0	17.7	19.1	16.5
	Max of WS	4.1	3.0	5.2	4.4	4.6	5.5	6.3	6.7	5.5	5.0	6.1	4.8	6.7
	Min of WS	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
	Average of WS	1.8	1.6	1.6	1.6	1.4	2.2	2.0	2.0	1.9	1.8	1.8	1.7	1.8
	Max of MixH	909	997	1072	1995	1352	1995	1539	1995	2269	2523	2028	1730	2523
	Min of MixH	50	50	50	50	50	50	50	50	50	50	50	50	50
	Average of MixH	184	177	179	175	162	288	325	300	280	252	229	190	228
E	Max of Temp	29.0	24.0	27.0	21.0	22.0	18.0	18.0	20.0	22.0	25.0	23.0	25.0	29.0
	Min of Temp	17.0	16.0	14.0	13.0	11.0	10.0	7.0	9.0	10.0	11.0	13.0	16.0	7.0
	Average of Temp	20.6	20.2	20.0	18.0	16.2	14.1	12.3	12.4	14.2	16.2	17.7	19.5	16.4
	Max of WS	3.7	3.8	4.6	3.3	4.5	5.0	5.0	4.9	4.8	4.5	5.0	4.8	5.0
	Min of WS	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
	Average of WS	1.8	1.7	1.7	1.6	1.6	2.5	2.3	2.1	1.7	1.8	1.7	1.9	1.9

	Max of MixH	394	371	553	1673	997	997	1247	1417	866	1138	997	1042	1673
	Min of MixH	50	66	50	50	50	50	50	50	50	50	63	50	50
	Average of MixH	173	159	162	160	174	256	364	279	198	213	192	204	217
F	Max of Temp	29.0	25.0	25.0	23.0	22.0	19.0	18.0	22.0	27.0	28.0	24.0	26.0	29.0
	Min of Temp	17.0	16.0	18.0	16.0	15.0	11.0	10.0	11.0	12.0	11.0	14.0	17.0	10.0
	Average of Temp	22.1	20.0	20.7	18.8	17.7	14.2	13.7	15.0	16.9	18.8	18.6	20.9	17.2
	Max of WS	3.5	3.5	3.1	3.1	3.5	3.5	3.5	3.4	3.5	3.5	3.5	3.5	3.5
	Min of WS	1.1	1.4	1.3	1.3	1.1	1.5	1.3	1.1	1.0	1.1	1.3	1.3	1.0
	Average of WS	2.3	2.4	2.3	2.3	2.1	2.6	2.4	2.1	2.2	1.9	2.3	2.1	2.2
	Max of MixH	493	702	371	299	997	1107	1236	1247	1496	1195	585	956	1496
	Min of MixH	100	174	100	100	50	100	100	50	100	50	150	100	50
	Average of MixH	233	301	201	192	282	324	394	280	289	206	218	246	272

DISCLAIMER

Compilation of input meteorological data file for AUSPLUME was done under the supervision of qualified and experienced meteorologists. Although all due care has been taken, we cannot give any warranty, nor accept any liability (except that required by law) in relation to the information given, its completeness or its applicability to a particular problem. These data and other material are supplied on the condition that you agree to indemnify us and hold us harmless from and against all liability, losses, claims, proceedings, damages, costs and expenses, directly or indirectly relating to, or arising from the use of or reliance on the data and material which we have supplied.

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Appendix B

Air Quality Monitoring Plan

Air Quality Management Plan

Incoll Management Pty Ltd

On behalf of
Rail Corporation NSW

Former Macdonaldtown Gasworks

August 2011
JBS 40913 – 15972 Revision C

Air Quality Management Plan

Incoll Management Pty Ltd
On behalf of
Rail Corporation NSW

Former Macdonaldtown Gasworks

August 2011
JBS 40913 – 15972 Rev C
JBS Environmental Pty Ltd

Table of Contents

Figures

Appendices

List of Abbreviations

A list of the common abbreviations used throughout this report is provided below.

- As Arsenic
- Cd Cadmium
- Cr Chromium
- Cu Copper
- BTEX Benzene, Toluene, Ethylbenzene and Xylenes
- B(a)P Benzo (a) pyrene
- DECCW NSW Department of Environment, Climate Change and Water
- DQO Data Quality Objectives
- DP Deposited Plan
- EPA New South Wales Environment Protection Authority
- Hg Mercury
- HIL Health Based Investigation Level
- LOR Limit of Reporting
- MAH Monocyclic Aromatic Hydrocarbon
- Ni Nickel
- OCP Organochlorine Pesticide
- SAR Site Audit Report
- SAS Site Audit Statement
- PAH Polycyclic Aromatic Hydrocarbons
- Pb Lead
- PIL Phytotoxicity Based Investigation Level
- PCB Polychlorinated Biphyenyls
- PQL Practical Quantitation Limit
- QA/QC Quality Assurance/Quality Control
- RPD Relative Percentage Difference
- TPH Total Petroleum Hydrocarbons (C_6-C_9 and C_{10}-C_{36})
- Zn Zinc

1 Introduction

1.1 Introduction and Objectives

JBS Environmental Pty Ltd was engaged by Incoll Management Pty Ltd (Incoll) to prepare an Air Quality Management Plan (AQMP) for the proposed remediation works on the site of the former Macdonaldtown Gasworks, Erskineville, NSW (**Figure 1**). The AQMP is required to monitor and control potential air emissions from the proposed works. The provisions of the AQMP has been incorporated into the Environmental Management Plan (EMP) prepared for the project.

An Air Quality Assessment[1] (AQA) has been prepared for the remediation program at the former gasworks site. The AQA assessed a range of potential sources for air emissions into the surrounding area. It was assessed that unacceptable levels of air pollutants will not occur at the surrounding areas during the site works where a range of control and monitoring provisions are implemented on the site. The AQMP has been prepared to document the recommended control and monitoring works as identified by the AQA.

This AQMP is solely for remedial works undertaken at the former Macdonaldtown Gasworks. Treatment works undertaken at the designated off site facility at the Chullora Railway Workshops are discussed in a separate report as follows '*Air Quality Management Plan, Former Macdonaldtown Gasworks – Chullora Materials Receipt Facility*' JBS Environmental Pty Ltd 40913-16613 Revision C, August 2011.

1.2 Site Identification

The site undergoing remediation (the Site) is located on Burren St, Erskineville NSW. The Site location is shown in **Figure 1** and details provided in **Table 1**. The Site details are summarised below and described in more detail in the following sections.

Table 1 Site Details

Lot/DP	Part Lot 50 in DP 1001467
Address	Burren Street, Erskineville, NSW
Local Government Authority	City of Sydney
Site Zoning	'Railways Zone' in Sydney Regional Environmental Management Plan 26
Current Use	Vacant Land
Geographical Co-ordinates	Lat: -33.917° North, Long: 151.199° East (southern corner)
Site Area	7,732m^2

A Site layout plan is provided as **Figure 2**. This plan has been adopted from previous CH2M HILL studies completed on the Site.

The Site has been previously delineated into eight areas by CH2M Hill (March 2007) '*Delineation & Characterisation Sampling and review of Remedial Options*' (CH2M Hill 2007a). These areas are shown on **Figure 3** and include:

[1] *Air Quality Assessment– Former Macdonaldtown Erskineville, NSW* JBS Environmental Pty Ltd August 2011 (JBS 2011)

- Gasholders: encompasses both Gasholder structures adjoining the western boundary. The Southern Gasholder remains intact with the superstructure standing approximately 12 metres above the ground surface. The above ground structure of the Northern Gasholder has been demolished, however the brick annulus structure remains intact beneath the ground;
- Retort: encompasses the footprint of the former Retort House, Tar Wells, Condensers, Coal and Shale Storage areas and other building structures associated with the gasworks operations (office, amenities, etc). These buildings and structures have been demolished and associated structures are no longer visible above the ground surface. However some underground structures remain in place, including the two Tar Wells, pipework, brick flooring and foundations and concrete slabs;
- Gas Purifier: encompasses the footprint of the former Purifier Beds, Scrubbers and Gas Meters. Similar to the Retort Area, structures only remain buried below the ground surface, with no above ground structures remaining;
- Northeast: includes the majority of the northeast section of the Site;
- South Central: includes the portion along the central southeast boundary;
- Southwest: includes the majority of the southern area of the Site;
- Retaining Wall: includes the filled area embankment along the northern Site boundary; and
- Western Lot: includes the small rectangular section of land that extends west to Burren Street.

A site inspection was completed by JBS on the 25th March 2010. The Site was found to be overgrown with vegetation. Several stockpiles of predominantly soil and railway ballast based materials were located over the eastern portion of the Site, which were being removed during the site inspection. It was reported by RailCorp representatives that the observed works were being undertaken to remove all stockpiled materials. The northernmost former gasholder was observed as a circular area of exposed brickwork. The southernmost gasholder was observed to be substantially intact. Brick and metallic debris presumably associated with the former operation of the Site as a gasworks was distributed throughout the remainder of the property.

1.2.1 Surrounding Landuse

Surrounding land-uses include:

- North – Covered rail sidings are present adjoining the northern boundary of the former gasworks. Further north is Macdonaldtown station and associated rail corridor;
- South-east – A noise barrier and access roadway is located adjoining the south-eastern boundary of the Site. Further south is the rail corridor associated with the Illawarra and south-west rail corridor; and
- West – Residences fronting Burren St, Erskineville are located adjoining the western boundary of the Site. Residences consist of detached and semi-detached low and medium density dwellings and small yard areas. The residential area of Erskineville is located further west.

1.3 Purpose

This AQMP has been designed to ensure, that the risk to the remediation workforce on the former gasworks site, adjoining railway and residential properties, and the surrounding environment is acceptable. This will be achieved by the implementation of a number of ongoing monitoring and management measures pertaining to the proposed demolition and earthworks and associated environmental management works.

The AQMP is intended to form part of the EMP being prepared for the site.

1.4 Responsibilities

The remediation works on the site shall be undertaken under the guidance of a Principal Contractor who is yet to be appointed. The Principal Contractor will be responsible for the implementation of the majority of procedures provided in the AQMP and EMP. It is noted that where the specific procedures are technical or complex in nature then the Remediation Consultant as appointed to the project shall fulfil the requirements of the procedure, or advise the appropriate implementation of the procedure.

A formal list of procedures is provided to the AQMP based on an assessment of potential environmental emissions from anticipated site works required for the demolition, earthworks and building works. Specific responsibilities are nominated for the implementation of these procedures within the relevant procedure.

1.5 Proposed Demolition and Earthworks on the Site

The demolition and earthworks are proposed to be undertaken in distinct stages as described following:

- Demolition component of the works including the removal of any former gasworks buildings and infrastructure not considered items of significant heritage and archaeological potential, and includes the connection Shed, former tar wells, condensate pits and existing concrete pavement overlying areas of contaminated soils.
- Excavation component of the works consisting of the installation of excavation support as required and excavation of soils identified as contaminated.
- Dewatering of proposed area of excavation by the installation of dewatering spears to allow excavation of soils below the depth of the water table.
- Stockpiling of the soils within a controlled location on the Site to facilitate remediation of the material, or later backfilling, dependent on the contaminated status of the soils. Where the proposed remediation works required on soils involve treatment, either on or off site, the remediation process may require licensing under the *Protection of the Environment Operations* (POEO) Act 1997; and
- Backfilling of excavations with fill materials characterised as being environmentally and geotechnically suitable for placement within the Site sub-surface.

The works are being undertaken to facilitate remediation works.

1.5.1 Demolition

The demolition stage of the works will be the initial stage of the works. The demolition works will include the removal of all above ground infrastructure on site that is assessed to be:

- not an item of significant heritage or archaeological potential; and
- an on-going source of contamination.

In undertaking demolition works RailCorp shall only use WorkCover accredited contractors. All demolition works shall be undertaken as per relevant statutes and Australian and International Standards.

The majority of the demolished materials will be transported off-site for recycling. This will include the concrete and masonry wastes from removal of Site pavements. All other wastes shall be transported to an appropriately licenced facility for processing.

1.5.2 Earthworks

The proposed earthworks are designed to allow the associated remediation activities to be undertaken.

Substantial environmental data are available for the Site to characterise the extent of contaminated soils and groundwater. The areas of the Site which are known to be contaminated and have been identified in the proposed earthworks program include:

- The central part of the northern Site boundary;
- The central part of the western Site boundary;
- The centre of the Site, including an apparent 'primary tar source zone', approximately 10 m east of the Southern Gas Holder; and
- Shallow areas potentially across the remainder of the Site.

The earthworks shall include:

- Installation of soil retention structures (i.e. shoring) as required to protect adjoining properties and heritage items during proposed excavation works;
- In areas of impacted soil, excavation of overlying non-impacted material, if present, and stockpiling separately on the Site;
- Dewatering of areas of proposed excavation of impacted soils. The water accumulated during dewatering may require treatment;
- Excavation of impacted soils in source zones within a purpose built tented enclosure;
- Excavation of impacted soils external to the tented enclosure and transport into the enclosure as required;
- Treatment of suitable excavated impacted soil by bioremediation within the tented enclosure;
- Filling of excavations with the bioremediated soil or with clean, validated fill material assessed as suitable for use on the Site.

1.6 Proposed Treatment Works Off Site

Given the significant area restrictions on the Site , RailCorp has advised that a section of land contained within the Chullora Railway Workshops, located on Worth Street, Chullora, NSW is available for treatment of soil excavated from the site. The location of the treatment site is displayed in **Figure 4**. The potential treatment area is provided in **Figure 5**. A separate AQMP has been prepared for the proposed works at Chullora as follows '*Air Quality Management Plan, Former Macdonaldtown Gasworks – Chullora Materials Receipt Facility*' JBS Environmental Pty Ltd 40913-16613 Revision C, August 2011.

1.6.1 Proposed Treatment Works

The activities proposed to be completed on the Chullora treatment site are as follows:

- Receipt of contaminated soils / materials from the Macdonaldtown former gasworks remediation;
- Storage of contaminated soils / materials within stockpiles or similar;
- Treatment of contaminated soils / materials by immobilisation;

1.7 Excavation, Filling and Land Formation

Excavation, filling and land formation will involve reinstatement of the site with treated material validated as suitable for reuse on the site, or imported clean, fill material certified as VENM in accordance with the Remedial Action Plan (RAP) for the site.

The proposed filling will involve placement of up to 22 000m^3 of fill with reinstatement of to restore the pre-remediation levels.

1.8 Identification of Potential Air Emissions

Several potential sources of air emissions have been identified in the AQIA's prepared for the proposed works. These are briefly listed following in **Table 1.3**.

Table 1.3: Summary of Air Emissions

Stage	Task	Potential Emissions
Preliminary	Project planning and licensing	-
Site Establishment I	Setup of site offices, sediment and erosion controls	-
Remediation Stage I	1A – assessment/soil sampling of northern boundary retaining wall 1B- construction of internal turning circle, vegetation removal	Particulates
	1C – excavation/validation of the top 0.5m of fill material of the entire site surface. Transfer of excavated soil to Chullora for treatment prior to disposal to landfill	Particulates, Air Toxins
	1D – excavation/validation of four hotspots to depths of 1-2m	Particulates, Air Toxins
Site Establishment II	Installation of temporary enclosure, associated air extraction/treatment system and water treatment system	-

Stage	Task	Potential Emissions
Remediation Stage II	2A- commission air and water treatment system 2B – excavate/validate areas within enclosure. Transfer of excavated soil to Chullora for treatment prior to disposal to landfill 2C – reinstate enclosure excavation with imported Virgin Excavated Natural Material (VENM) or Excavated Natural material (ENM)	Particulates, air toxins, odours
Remediation Stage III	3A – excavate/validate areas external the enclosure. Excavated material unsuitable for onsite bioremediation within enclosure to be transferred to Chullora for treatment prior to disposal to landfill 3B –Material assessed as suitable for remediation by bioremediation to be stockpiled for treatment within enclosure 3C – reinstatement of site using VENM or ENM, landscaping as required	Particulates, air toxins, odours
Disestablishment	Decommissioning of air and water treatment plants, disestablishment of enclosure and site offices	-

The most significant potential emissions have been identified as occurring from:

- Particulate, chemical and odour emissions from soil excavation activities;
- Particulate, chemical and odour emissions from soils stockpiling and handling; and
- Particulate, chemical and odour emissions from the receipt and handling of fill materials.

1.9 Environmental Procedures

A number of environmental control and monitoring provisions have been recommended in the AQIA's prepared for the remediation program. These have been prepared as outline air quality management procedures, are provided in **Appendix A**, and are summarised in **Table 1.4** following.

Table 1.4: Summary of Air Quality Management Procedures

Procedure No.	Name
01	Dust and Airborne Hazard Control
02	Odour Prevention and Control
03	Odour Masking
04	Handling of Environmentally Impacted Material
05	Air Monitoring – Odours
06	Air Monitoring – Volatile Organic Compounds
07	Air Monitoring – Particulates
08	Air Monitoring – Asbestos
10	AQMP Review
11	Training

2 Limitations

This report has been prepared for use by the client who commissioned the works in accordance with the project brief only and has been based in part on information obtained from other parties. The advice herein relates only to this project and all results conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose.

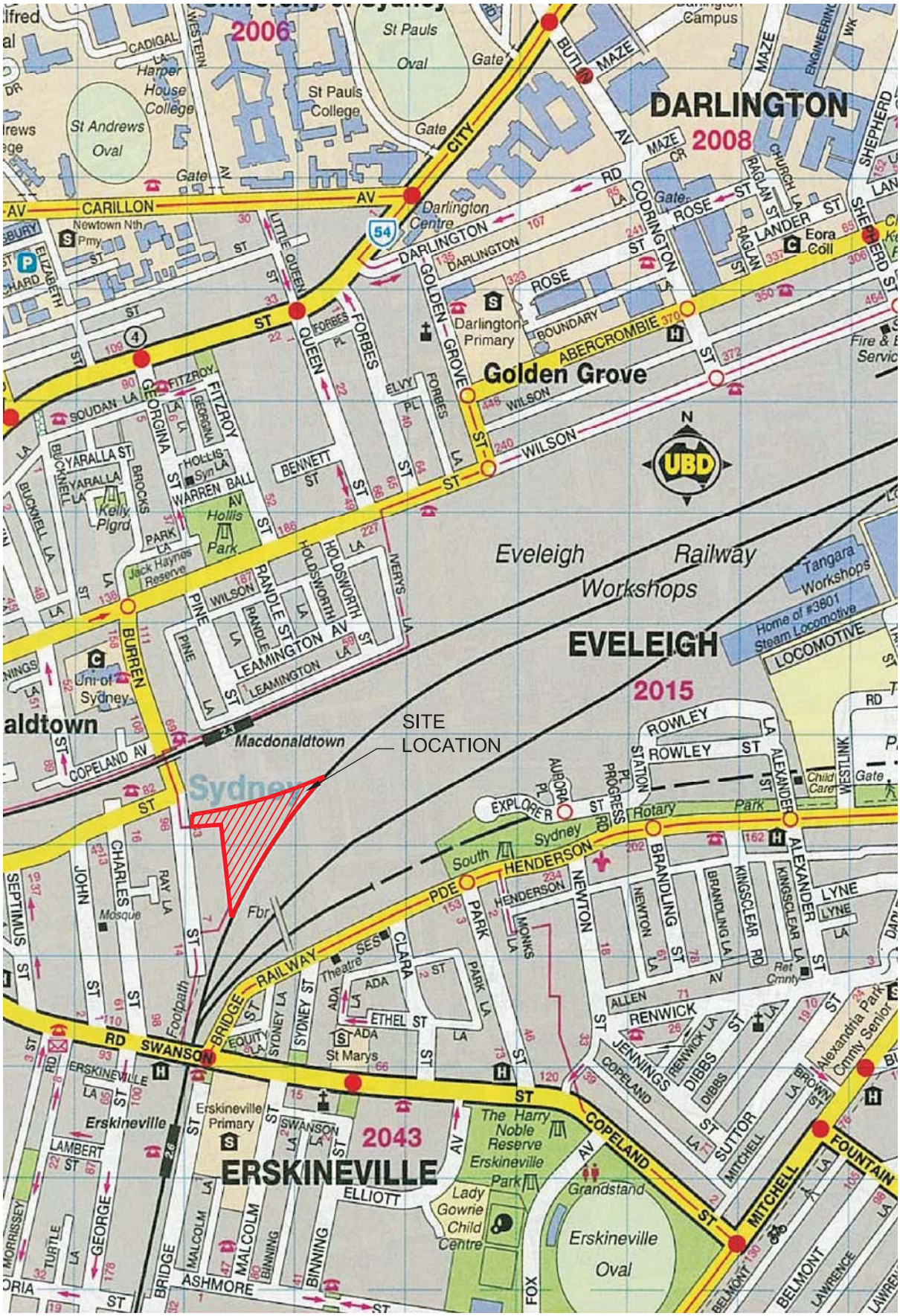
JBS Environmental Pty Ltd accepts no liability for use or interpretation by any person or body other than the client. This report should not be reproduced without prior approval by the client, or amended in any way without prior approval by JBS Environmental Pty Ltd, and should not be relied upon by other parties, who should make their own enquires.

Sampling and chemical analysis of environmental media is based on appropriate guidance documents made and approved by the relevant regulatory authorities. Conclusions arising from the review and assessment of environmental data are based on the sampling and analysis considered appropriate based on the regulatory requirements and site history, not on sampling and analysis of all media at all locations for all potential contaminants.

Changes to the subsurface conditions may occur subsequent to the investigations described herein, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this report are based on the information obtained at the time of the investigations.

This report does not provide a complete assessment of the environmental status of the site, and it is limited to the scope defined herein. Should information become available regarding conditions at the site including previously unknown sources of contamination, JBS Environmental Pty Ltd reserves the right to review the report in the context of the additional information.

Figures



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0 500m

Approximate scale

Figure 1 **Site Location (Macdonaldtown)**

CH2M Hill (2007)
Note- All locations shown are approximate only

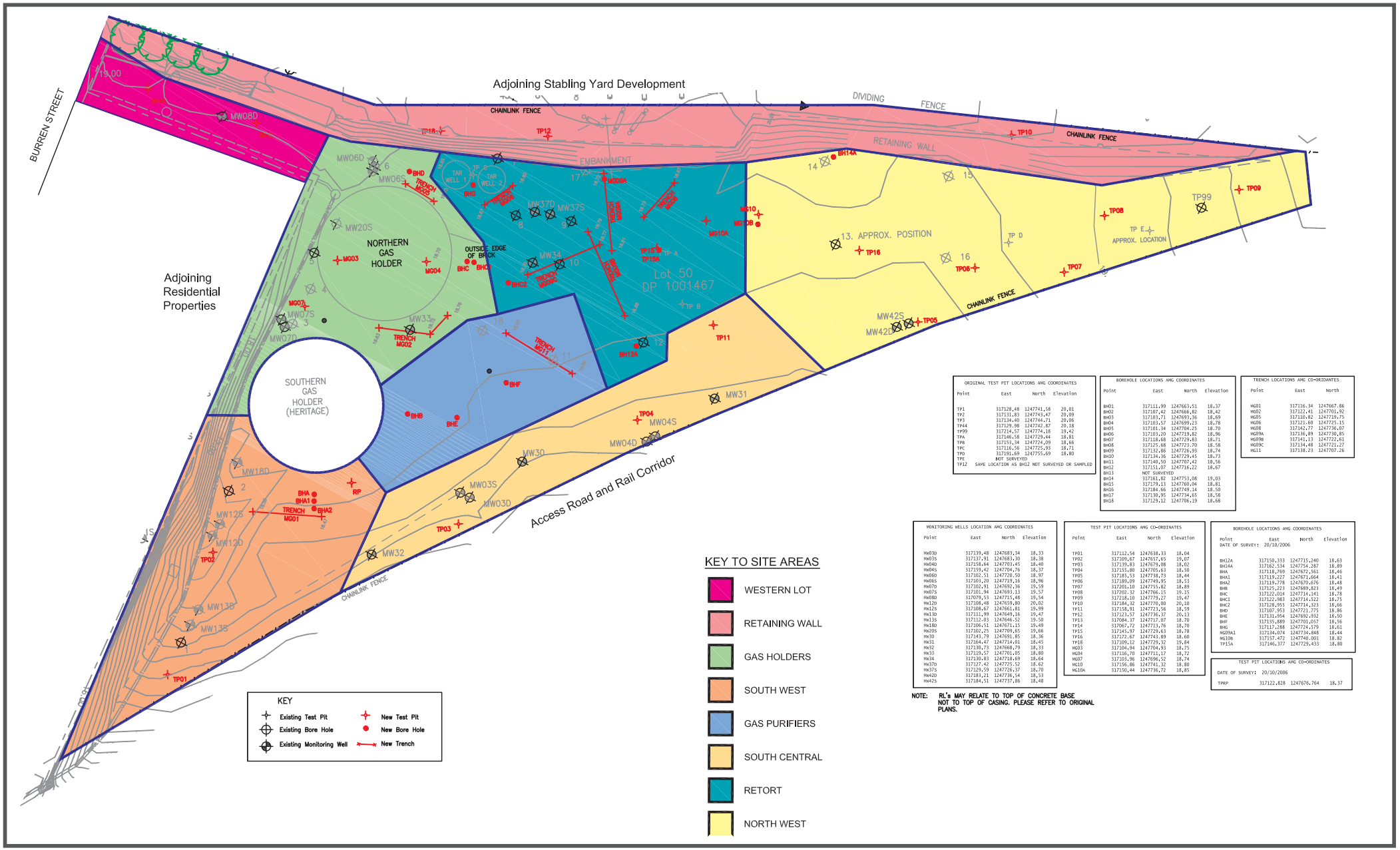
JBS ENVIRONMENTAL

0 100m

Approximate scale

Figure 2 **Current Macdonaldtown Site Plan**

CH2M Hill (2007)
Note- All locations shown are approximate only



ORIGINAL TEST PIT LOCATIONS AMG COORDINATES

Point	East	North	Elevation
TP1	317128.48	1247741.58	20.01
TP2	317131.83	1247743.47	20.09
TP3	317134.40	1247744.71	20.06
TP44	317129.98	1247742.87	20.18
TP99	317214.57	1247774.18	19.42
TP4	317146.58	1247729.44	18.81
TP8	317153.34	1247724.09	18.66
TPC	317116.56	1247725.93	18.71
TPD	317191.69	1247755.69	18.80
TPE	NOT SURVEYED		
TP12	SAME LOCATION AS BH12 NOT SURVEYED OR SAMPLED		

BOREHOLE LOCATIONS AMG COORDINATES

Point	East	North	Elevation
BH01	317111.99	1247663.51	18.37
BH02	317107.42	1247666.82	18.42
BH03	317103.71	1247693.36	18.69
BH04	317103.57	1247699.23	18.78
BH05	317101.34	1247704.25	18.70
BH06	317103.20	1247719.82	18.96
BH07	317118.68	1247729.83	18.71
BH08	317125.68	1247723.70	18.58
BH09	317132.86	1247726.93	18.74
BH10	317134.36	1247729.45	18.73
BH11	317140.50	1247707.42	18.56
BH12	317151.07	1247716.22	18.67
BH13	NOT SURVEYED		
BH14	317161.82	1247753.08	19.03
BH15	317179.13	1247760.04	18.81
BH16	317184.66	1247749.14	18.50
BH17	317130.95	1247734.65	18.58
BH18	317129.12	1247706.19	18.68

TRENCH LOCATIONS AMG CO-ORDINATES

Point	East	North
MG01	317116.34	1247667.86
MG02	317122.41	1247701.92
MG05	317110.82	1247719.75
MG06	317121.60	1247725.15
MG08	317142.77	1247736.07
MG09A	317136.89	1247730.85
MG09B	317141.13	1247722.61
MG09C	317134.48	1247721.27
MG11	317138.23	1247707.26

MONITORING WELLS LOCATION AMG COORDINATES

Point	East	North	Elevation
MW03D	317139.48	1247683.34	18.33
MW03S	317137.91	1247683.30	18.38
MW04D	317158.64	1247703.45	18.40
MW04S	317159.42	1247704.76	18.37
MW08D	317102.51	1247720.50	18.97
MW06S	317103.20	1247719.16	18.96
MW07D	317102.91	1247692.36	19.59
MW07S	317101.94	1247693.13	19.57
MW08D	317079.53	1247715.48	19.54
MW12D	317108.48	1247659.80	20.02
MW12S	317108.67	1247661.81	19.99
MW13D	317111.99	1247649.16	19.67
MW13S	317112.03	1247646.52	19.50
MW18D	317106.51	1247671.15	19.49
MW20S	317102.25	1247709.65	19.66
MW30	317143.79	1247691.85	18.36
MW31	317164.47	1247714.01	18.45
MW32	317130.73	1247668.79	18.33
MW33	317119.57	1247701.05	18.80
MW34	317130.83	1247718.69	18.64
MW37D	317127.42	1247725.52	18.62
MW37S	317129.59	1247726.37	18.70
MW42D	317183.21	1247736.54	18.53
MW42S	317184.51	1247737.86	18.48

TEST PIT LOCATIONS AMG CO-ORDINATES

Point	East	North	Elevation
TP01	317112.54	1247638.33	18.04
TP02	317109.67	1247657.65	19.07
TP03	317139.83	1247679.08	18.02
TP04	317155.80	1247705.63	18.50
TP05	317185.53	1247738.73	18.44
TP06	317189.09	1247749.95	18.53
TP07	317201.10	1247755.82	18.89
TP08	317202.32	1247766.15	19.15
TP09	317218.10	1247779.27	19.47
TP10	317184.32	1247770.00	20.10
TP11	317158.91	1247723.56	18.59
TP12	317123.57	1247736.37	20.13
TP13	317084.37	1247717.07	18.70
TP14	317067.72	1247713.76	18.70
TP15	317145.97	1247729.63	18.78
TP16	317172.67	1247743.89	18.60
TP18	317109.12	1247729.32	19.84
MG03	317104.94	1247704.93	18.75
MG04	317116.70	1247711.17	18.72
MG07	317103.96	1247696.52	18.74
MG10	317156.86	1247741.32	18.80
MG10A	317150.44	1247736.72	18.85

BOREHOLE LOCATIONS AMG COORDINATES

Point	East	North	Elevation
DATE OF SURVEY: 20/10/2006			
BH12A	317150.333	1247715.240	18.63
BH14A	317162.534	1247754.287	18.89
BHA	317118.769	1247672.161	18.46
BHA1	317119.227	1247671.664	18.41
BHA2	317119.778	1247670.676	18.48
BHB	317125.223	1247689.823	18.49
BHC	317122.014	1247714.141	18.78
BHC1	317122.983	1247714.522	18.75
BHC2	317128.955	1247714.323	18.66
BHD	317107.953	1247721.775	18.86
BHE	317131.954	1247692.932	18.50
BHF	317135.689	1247701.057	18.56
BHG	317117.288	1247724.579	18.61
MG09A1	317134.074	1247734.848	18.44
MG10B	317157.472	1247740.001	18.82
TP15A	317146.377	1247729.433	18.80

TEST PIT LOCATIONS AMG CO-ORDINATES

Point	East	North	Elevation
DATE OF SURVEY: 20/10/2006			
TPRP	317122.828	1247676.764	18.37

NOTE: RL's MAY RELATE TO TOP OF CONCRETE BASE NOT TO TOP OF CASING. PLEASE REFER TO ORIGINAL PLANS.

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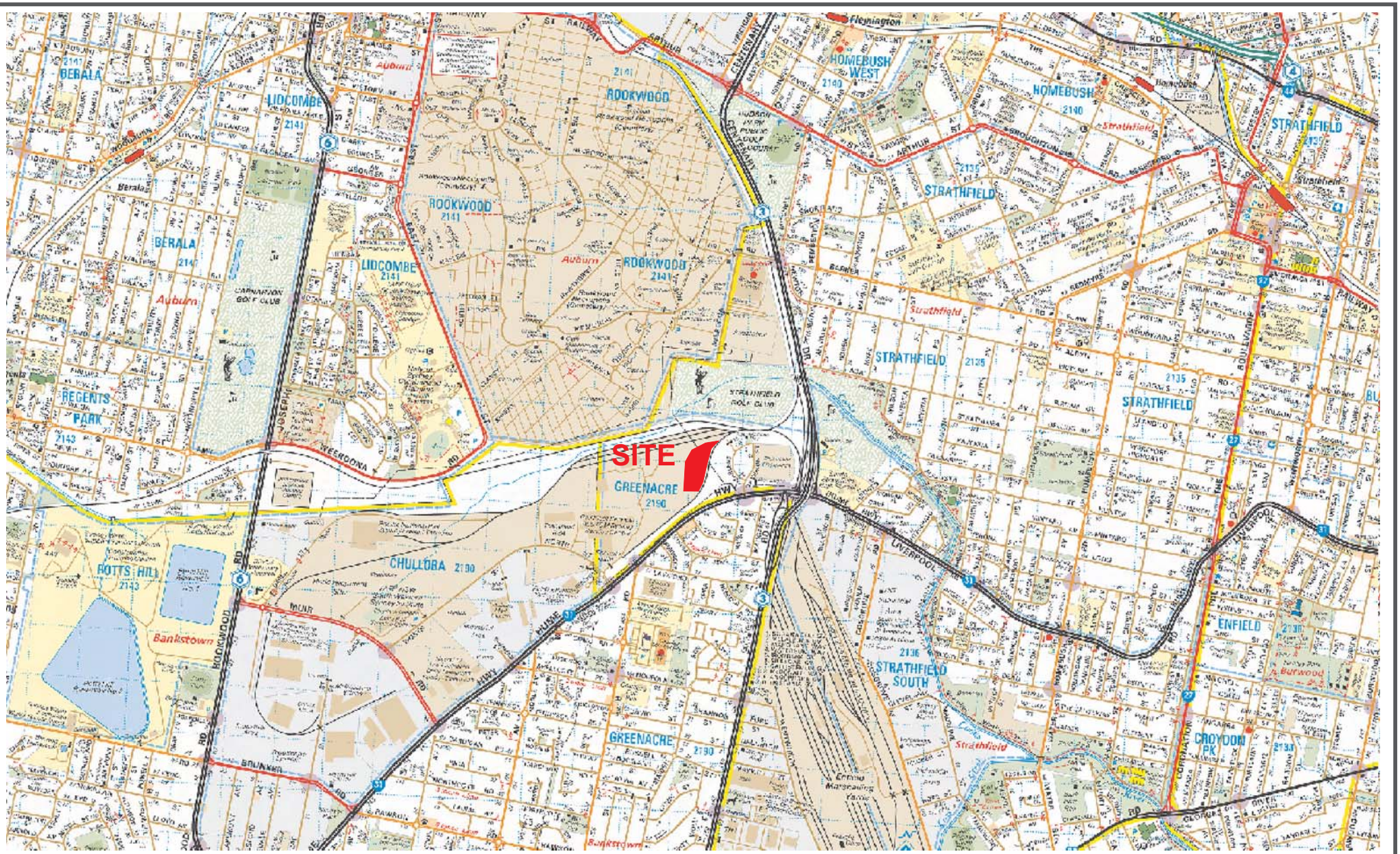
0 50m

Approximate scale

Figure 3 **Site Areas**

CH2M Hill (2007)
Note- All locations shown are approximate only



JBS ENVIRONMENTAL

0 1000m

Approximate scale

Figure 4 **Chullora (Treatment) Site Location**

Department of Lands (2010)
Note- All locations shown are approximate only

JBS ENVIRONMENTAL

0 50m
Approximate scale

Figure 5 **Chullora Site Plan**

Department of Lands (2010)
Note- All locations shown are approximate only

Appendix A

Air Quality Management Procedures

Odour Prevention and Control	AQMP01
Responsibility:	Head Contractor Environmental Consultant
Frequency:	Disturbance of potentially malodorous / impacted soils
Location:	All areas on site
Objective:	To minimise potential odour impacts

Procedure

Malodorous materials will be disturbed during remediation of the site. Coal tar based impact has been identified in soils underlying the majority of the site with the greatest impacts in soil observed in the vicinity of former Northern Gasholder and Retort House. Areas containing free tar (i.e. the former tar wells, pipework etc.) are also likely have the potential to generate offensive odours if exposed and/or disturbed.

Extensive measures require to be undertaken to control potential odour generation and odour emissions from the site as detailed below. The measures require to be sufficient to prevent recognition of offensive odours at residential and commercial properties in proximity of the site.

The construction and operation of the tented enclosure will be the main method of odour control. Odour control measures shall be employed within the tented enclosure comprising:

- Maintenance of the interior of the enclosure at a negative pressure relative to the surrounding environment. Where a negative pressure is able to be effectively maintained there is a reduced importance of the sealing of the enclosure with the surrounding ground level; and
- Venting of all emissions from the tented enclosure through a granular activated carbon (GAC) filter.

Construction of GAC Odour Control Filters

GAC odour control filters are required as described in EMP11 Tented Enclosure and the water treatment plant as described in EMP17 Groundwater Treatment. GAC filters shall be installed and operated as per the following requirements:

- All GAC filters used for odour control shall consist of three distinct units connected in series. The first and second unit shall be identically sized and the third unit must be at least 25% of the capacity of the preceeding units;
- An air sampling port shall be installed between the first and second filter vessel;
- The sizing of the GAC filters will require to be determined at the commencement of the works. The GAC filters shall be sufficiently sized so that at commissioning stage (under actual project conditions) there is no recognisable odour between the first and second filters. The potential for odour emissions to increase during the works shall be considered (where applicable) and correction factors determined where necessary to ensure appropriate sizing of filters; and

GAC Filters will become saturated during the source of the works. Monitoring is required to assess when Filter saturation occurs. This shall be undertaken by daily monitoring of the air sampling port between the first and second GAC filter using a PID. Where the PID records a reading above 10ppm, an air sample shall be collected and assessed for a recognisable odour. Where a recognisable odour is detected the filter shall be considered to be saturated and replaced with new GAC media.

Odour Prevention Measures

Tented Enclosure of Excavation and Soil Handling Works

Any works involving the disturbance of free tar or areas of malodourous soils within the former gasworks area or Northern Gasholder will need to be undertaken within a tented enclosure. Disturbance of these materials includes excavation, stockpiling, handling, treatment and vehicle loading The tented enclosure shall be designed and operated such that atmospheric emissions comply with those identified in relevant environmental guidelines at all times. These guidelines include:

- NEPC (1998) 'National Environment Protection Measure for Ambient Air Quality';
- Environmental criteria provided to NSW DEC (August 2005) 'Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales'; and
- Ambient air criteria provided to US EPA (2004) 'Region IX Preliminary Remediation Goals' for constituents not available in local literature.

No recognisable odours shall be discharged from the tented enclosure. The tented enclosure shall be constructed of a metal clad structure sufficiently sized to allow the operation of tippers, excavators and associated equipment required for the excavation, stockpiling and handling of soils and any associated

equipment. Openings in the structure shall be minimised so as to reduce ventilation requirements.

Tippers and other heavy machinery shall be required to enter and exit the tented enclosure to allow the removal of soils. The following must apply to any tipper loads removing malodourous soil or other material from the tented enclosure:

- Tipper speeds when exiting the tented enclosure shall be minimised to the extent possible to prevent wake effects at the rear of the tipper causing uncontrolled release of odours. Where wake effects and associated discharge of recognisable odours are evident at tipper exit from the tented enclosure, then ventilation shall require to be increased; and
- Spraying of the exposed malodorous soil surface with an odour sealing solution. A mixture of 'Anotec 0307' (http://anotec.com.au/prod.htm) or similar and water may be suitable to be used for this purpose. Covering of the load to prevent particulate emissions.

Excavation of Malodorous Materials – Areas external to the Tented Enclosure

Any works involving the disturbance of free tar or areas of malodours soils external to the enclosure will require the following measures to be implemented to prevent odour emissions. These measures shall include (but are not limited to):

- Restriction of excavation areas in surface soils to no greater than 400m^2;
- Restriction of excavation areas in the northern retaining wall area to no greater than 25m^2;

Where larger sized excavations are required, area additional to above sizes shall be managed by:

- Tipping at the upwind portion of the site works to the extent possible to maximise dispersion distances to off-site properties (if possible); and / or
- Covering of all tipper loads; and / or
- Sealing of the malodorous stockpiled soil surface by covering. Appropriate sealing may include spraying of the malodorous surface with a hydromulch, or placement of a sufficient thickness of odourless soils over the malodorous materials; and/ or
- Spraying of the exposed malodorous soil surface with an odour sealing solution. A mixture of 'Anotec 0307' (http://anotec.com.au/prod.htm) or similar and water may be suitable to be used for this purpose. This may be prepared by the mixing of one 20L drum of Anotec 307 in 1,000L of water; and
- Continuous monitoring odours in accordance with **AQMP5.0 Odour Monitoring**.

Stockpiling of Soil – Areas external to the Tented Enclosure

Where stockpiles are to be left in place external to the tented enclosure they shall be covered in nonmalodourous materials, secured plastic sheeting or low permeability geofabric to prevent odourous emissions. If it is necessary for stockpiles to remain uncovered external to the tented enclosure then to prevent offensive odours at the site boundaries:

1. The uncovered stockpiles must not be placed in Zone 5 as shown on **AMP Fig1.1**;
2. The material must be demonstrated to contain concentrations below the following odour based criteria:

Contaminant	Odour Based Criteria for Uncovered Stockpiling (mg/kg)
Benzene	2.5
Ethylbenzene	5
Toluene	10
Xylene (total)	10
Cresols	_
Acenaphthene	35
Naphthalene	25
Phenol	40

Any materials stockpiled uncovered on site will remain subject to the management requirements of AQMP02 Odour Masking and AQMP03 Dust and Airborne Hazard Control;

Malodorous Materials Movement Scheduling – Areas external to the Tented Enclosure

Some malodorous materials will require removal from site without pre-treatment. Odour control measures may not be able to maintained when the material is in transit.

The Environmental Consultant appointed to the Project shall advise the most appropriate period of each day to undertake these works based on an assessment of meteorological conditions. Results of environmental monitoring as undertaken during these works, including odour and VOC assessment as per AQMP05 Air Monitoring – Odours and AQMP06 Air Monitoring – Volatile Organic Compounds, shall be used to confirm that the advised meteorological conditions are appropriate.

Conditions which maximise separation distances to downwind receptors and increase dispersion of emissions shall be favoured. Removal of malodorous materials from site shall be optimised during these periods to the extent possible. It is anticipated that this will typically comprise afternoon periods. The environmental consultant shall be aware that conditions that favour odour dispersion may not favour reduction in dust emissions.

Similarly where the environmental consultant advises that non favourable meteorological conditions are present, movement and handling of potentially malodorous materials outside the area of the tented enclosure will be prevented (where possible).

Handling / exposure of malodorous materials shall not occur during any periods where unacceptable levels of odour or VOC emissions are identified by AQMP05 Air Monitoring – Odours and / or AQMP06 Air Monitoring – Volatile Organic Compounds.

Odour Masking

All measures possible must be undertaken to prevent odour emissions prior to adopting odour masking measures as described in AQMP03 Odour Masking.

Odour Masking	AQMP02
Responsibility:	Head Contractor Environmental Consultant
Frequency:	Disturbance of potentially malodorous / impacted soils
Location:	All areas on site
Objective:	To minimise potential odour impacts

Procedure

Extensive measures are proposed to control odour emissions. The nature of the available odour controls means that they are not able to be immediately applied to sources of odour emissions. During some periods of the works momentary 'puffs' of odour may occur during the periods where odour controls are being implemented.

The degree of recognition of these odours will be able to be reduced by the operation of an odour masking system, however it is noted that the odour masking system shall not be used as a substitute for proper odour control technologies.

Odour Masking System

An odour masking system will require to be established along all site boundaries prior to the disturbance of potentially malodorous materials.

Once established, the odour masking system shall only be implemented where environmental monitoring identifies that all other odour control procedures have failed and odour emissions are unable to be prevented.

This system shall comprise the following:

- Provision of odour control solution consisting of a mixture of 'Anotec 0307' (http://anotec.com.au/prod.htm) or similar and water. This shall be prepared by the mixing of one 20L drum of Anotec 307 in 1,000L of water (or as per manufacturer's instructions for other products);
- Provision of an odour control solution spray system consisting of raised irrigation line (at least 1.5m above ground level) provided with sprinkler heads at a frequency of:
    - One head per 5m on the northern, eastern and southern boundaries; and
    - One head per 1.5m for the western site boundary;
- Sprinkler heads should be capable of delivering a fine mist of odour control solution with no discernible droplets; and
- Continuous supply of odour control solution to the raised irrigation line at a sufficient frequency to supply at least 100ml/minute to each sprinkler head included in the irrigation line.

Given the proximity of neighbouring residents along the western boundary, installation and operation of the odour masking system must be designed so that the odour masking solution does not affect the adjacent properties. This may require trials prior to the commencement of excavations and/or programming of works such that excavation of malodours soils does not occur during unfavourable conditions.

System Operation

The odour masking system shall not be used as a substitute for proper odour control technologies. The odour masking system shall only be used during periods where short duration puffs of odour may occur and only where all odour control technologies, as described in AQMP01 Odour Prevention and Control are being implemented.

The odour masking system shall operate for a maximum of four hours on any day. The operation of the Odour Masking System shall be recorded on Form AQMP02.1.

Odour Masking System Operation	**Form AQMP02.1**

Date	Commenced Operation	Ceased Operation	Wind Speed and Direction	Comments

Dust and Airborne Hazard Control	AQMP03
Responsibility:	Head Contractor
Frequency:	All site works
Location:	Site Areas External to the Tented Enclosure
Objective:	To minimise dust emissions from demolition and earthworks.

Procedure

Dust and Asbestos Risk

Excavation and handling of soils has the potential to generate dust emissions.

Asbestos containing materials have been found to be potentially present in fill materials located across the site in the vicinity of the former Northern Gasholder. Previous environmental assessments have identified that asbestos occurs within the bonded matrix of fibre cement fragments. At the time of assessment of these areas no testing was undertaken to identify the presence of free asbestos.

Addison et. al. ('The Release of Dispersed Asbestos from Soil', Institute of Occupational Medicine Report No. TM/88/14, September 1988) have found that very high levels of respirable dust must be generated before significant airborne concentrations of asbestos fibres were produced from soils contaminated with respirable asbestos fibres. It is considered that fibre cement sheet fragments must be subjected to intensive mechanical processes to cause the release of asbestos fibres.

Asbestos containing fibre cement fragments present in the site sub-surface on the site are not considered to pose a risk. However where the fragments are disturbed by excavation works asbestos fibres will potentially be released. Measures to control dust emissions will be sufficient to control potential asbestos emissions.

Standards

All operations on site are to be conducted so that concentrations of dust and other hazardous substances satisfy those stipulated in NSW DECCW published and endorsed guidelines. These guidelines include:

- NEPC (1998) 'National Environment Protection Measure for Ambient Air Quality' and
- Environmental criteria provided to NSW DEC (August 2005) 'Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales'.

Control

Measures shall be undertaken to reduce airborne emissions from site activities including:

- Water sprays used for dust suppression across unsealed areas of the site, stockpiles and other dust generating areas. All potential dust generating areas (i.e. areas of exposed soils) require to be watered on an hourly basis during periods of site operation or significant dust generation;
- A water misting system will be established on site boundaries of areas of soil handling in close proximity of residential properties;
- Stockpile heights shall be minimised where possible;
- Where stockpiles are to be left in place for significant periods of time, they shall be covered, or seeded to promote vegetation growth, to prevent dust emissions; and
- Where unfavourable meteorological conditions exist (i.e. strong winds directed at residential properties) site works shall be restricted to those with low potential for atmospheric emissions. This shall also include consideration of reduced production rates during these periods to minimise dust emissions.

Regular maintenance shall be undertaken of sprinkler heads, as used for dust control throughout the site, to prevent clogging.

It is noted that additional specific requirements have been developed for soils which are identified as potentially malodorous as detailed in AQMP01 Odour Control and AQMP04 Handling of Environmentally Impacted Soil which shall also reduce dust and potential asbestos emissions. The requirements of this procedure should be reviewed in accordance with the additional requirements of these other procedures.

Handling of Environmentally Impacted Soil	AQMP04
Responsibility:	Head Contractor Environmental Consultant
Frequency:	Handling of environmentally impacted soils, including stockpiled soils and receipt of impacted materials
Location:	Areas of site containing environmentally impacted soils
Objective:	To control potential environmental emissions from contaminated soils

Procedure

Potential hazardous emissions (dust, odour and vapours) may be released during the handling of environmentally impacted materials on the site. Measures shall be put in place to minimise such emissions. These measures shall include:

- Measures detailed in AQMP01 Odour Control;
- Measures detailed in AQMP02 Odour Masking;
- Measures detailed in AQMP03 Dust and Airborne Hazard Control;
- Transport of all impacted soils as per designated and marked 'impacted' and 'non-impacted' haul routes throughout the site. These routes shall be clearly identified on a site plan as posted within the Site. A heavy vehicle decontamination area shall be clearly marked on this plan. All persons engaged on the site shall be aware of the preferred haulage routes. The identification of preferred routes will assist in the appropriate placement and ready deployment of odour control methods, and prevent transport of impacted materials along site boundaries (where possible).

Where air quality management provisions are insufficient to allow compliance with monitoring criteria as detailed in AQMP05 Air Monitoring – Odours and/or AQMP06 Air Monitoring – Volatile Organic Compounds and/or AQMP07 Air Monitoring – Particulates and/or AQMP08 Air Monitoring – Asbestos, then the relevant works shall be ceased until more favourable meteorological conditions or more appropriate work methods are available. The Environmental Consultant shall advise more appropriate meteorological conditions.

Air Monitoring – Odours	AQMP05
Responsibility:	Head Contractor Site Auditor Environmental Consultant
Frequency:	Handling / excavation of malodorous materials
Location:	Site boundaries and nearby residential areas
Objective:	To assess compliance with environmental standards for works

Procedure

A program of atmospheric monitoring shall be undertaken throughout the earth works. The extent of required monitoring is described following:

Odour

Odour monitoring shall be undertaken by an appropriately qualified consultant at the downwind boundaries of the site. Odour monitoring shall be commenced prior to subsurface disturbance on the site. Odour monitoring shall be undertaken at three locations as a minimum spaced no greater than 20m along the downwind boundary at a frequency of:

- Hourly during periods of handling of potentially malodorous materials external to the tented enclosure; and
- A minimum of twice daily during other periods.

Odour monitoring shall further be undertaken at least once daily at the receptors nearest to the site, as shown on Figure AQMP5.1. This consists of the nearest residential locations.

Odour monitoring shall be undertaken using a 'Nasal Ranger' field olfactometer. A single odour measurement shall be undertaken at each monitoring location. Where an odour strength of 2-4 odour units or greater is recorded, an additional four odour measurements shall undertaken on a 1 minute basis. Odour measurements shall be recorded on Form AQMP05.1.

Where three (or more) of the total five readings record an odour strength of or in excess of 2-4 odour units (based on coal tar recognition):

- the odour masking system as described in AQMP02 Odour Masking shall be activated (where appropriate);
- monitoring shall be increased to an hourly frequency until the odour strengths recorded at all locations on the downwind boundary do not exceed 2 – 4 odour units over two consecutive hours. Once achieved the monitoring frequency may be returned to the minimum twice daily requirement; and
- the measures prescribed in AQMP01 Odour Prevention and Control shall be reviewed for adequacy in relation to site activities. Improvements or recommendations arising out of the review shall be incorporated into a revised AQMP for the site as per AQMP09 Review.

Personnel who undertake odour monitoring shall be non-smokers and shall be free of any nasal / sinus conditions that may affect the ability to detect / recognise odours.

Receptor No.	Description	Distance from Site	Easting	Northing
1	1 Leamington St Erskineville	100m North	332244	6247859
2	Railway Offices, within Stabling Shed	20m North	332263	6247744
3	Railway Workshops, nearest to site	60m East	332269	6247645
4	95 Railway Pde Erskineville	100m South	332342	6247537
5	15 Burren St Erskineville	10m West	332265	6247624
6	31 Burren St Erskineville	10m West	332252	6247669

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0 100m

Approximate scale

Figure 5.1 **Locations of Monitoring Locations**

Department of Lands (2010)
Note- All locations shown are approximate only

Air Monitoring – Odours	Form AQMP05.1

Date:_____

Downwind Locations (complete as per monitoring periods)

7-8am ◇ No Malodorous Materials Handled

Boundary Assessed:_____

Wind Direction and Velocity:_____ _____m/s

Measurements: 1._____OU 2._____OU 3._____OU

Additional Measurements:_____

_____

8-9am ◇ No Malodorous Materials Handled

Boundary Assessed:_____

Wind Direction and Velocity:_____ _____m/s

Measurements: 1._____OU 2._____OU 3._____OU

Additional Measurements:_____

_____

9-10am ◇ No Malodorous Materials Handled

Boundary Assessed:_____

Wind Direction and Velocity:_____ _____m/s

Measurements: 1._____OU 2._____OU 3._____OU

Additional Measurements:_____

_____

10-11am ◇ No Malodorous Materials Handled

Boundary Assessed:_____

Wind Direction and Velocity:_____ _____m/s

Measurements: 1._____OU 2._____OU 3._____OU

Additional Measurements:_____

_____

11-12am ◇ No Malodorous Materials Handled

Boundary Assessed:_____

Wind Direction and Velocity:_____ _____m/s

Measurements: 1._____OU 2._____OU 3._____OU

Additional Measurements:_____

_____

12am-1pm ◇ No Malodorous Materials Handled

Boundary Assessed:_____

Wind Direction and Velocity:_____ _____m/s

Measurements: 1._____OU 2._____OU 3._____OU

Additional Measurements:_____

_____

1-2pm ◇ No Malodorous Materials Handled

Boundary Assessed:_____

Wind Direction and Velocity:_____ _____m/s

Measurements: 1._____OU 2._____OU 3._____OU

Additional Measurements:_____

_____

2-3pm ◇ No Malodorous Materials Handled

Boundary Assessed:_____

Wind Direction and Velocity:_____ _____m/s

Measurements: 1._____OU 2._____OU 3._____OU

Additional Measurements:_____

_____

3-4pm ◇ No Malodorous Materials Handled

Boundary Assessed:_____

Wind Direction and Velocity:_____ _____m/s

Measurements: 1._____OU 2._____OU 3._____OU

Additional Measurements:_____

_____

4-5pm ◇ No Malodorous Materials Handled

Boundary Assessed:_____

Wind Direction and Velocity:_____ _____m/s

Measurements: 1._____OU 2._____OU 3._____OU

Additional Measurements:_____

_____

5-6pm ◇ No Malodorous Materials Handled

Boundary Assessed:_____

Wind Direction and Velocity:_____ _____m/s

Measurements: 1._____OU 2._____OU 3._____OU

Additional Measurements:_____

_____

Static Locations

Time:_____

Wind Direction and Velocity:_____ _____m/s

Measurements: 1._____OU 2._____OU 3._____OU

4._____OU 5._____OU 6._____OU

Additional Measurements:_____

_____

Completed by: _____

Air Monitoring – Volatile Organic Compounds	AQMP06
Responsibility:	Head Contractor Site Auditor Environmental Consultant
Frequency:	Handling / receipt / storage of malodorous materials
Location:	All site works external to the tented enclosure
Objective:	To assess compliance with environmental standards for works

Procedure

A program of atmospheric monitoring shall be undertaken at the site throughout the remediation works outside the Soil Enclosure Area. The extent of required monitoring is described following:

Volatile Organic Compounds (VOCs) – Photo-Ionisation Detector

Assessment for VOCs shall be undertaken using a photo-ionisation detector (PID) provided with a 10.6eV bulb. Prior to use and at least on a daily basis the calibration of the PID shall be checked by comparison to a fresh air and isobutylene standard. The calibration check shall be recorded as per the appropriate PID calibration forms.

VOC monitoring shall be undertaken at all times in the proximity of handling of malodorous materials. Contaminants identified on the project site which have potentially significant health impacts are considered to occur within malodorous materials. The identification of malodorous materials is an appropriate measure for the potential presence of significant levels of VOCs.

The PID shall be maintained by an attended operator within a distance of approximately 2m during all periods of handling malodorous materials. Where the operator is unable to safely remain within 2m of the works area (consequent of heavy equipment or otherwise) the PID may be affixed to an excavator or similar in proximity of the works. PID measurements shall be undertaken as one hour averages.

The action level to assess PID readings requires to be determined on the basis of the separation distance to the nearest potentially exposed receptor. Locations of nearest receptors and separation distances are shown on Figure AQMP6.1 attached. The separation distance to the nearest receptor requires to be calculated by estimating the distance from the area of the malodorous materials to the nearest receptor. This is the sum of the distance from the site boundary to the receptor, and the downwind distance from the malodorous materials to the site boundary. The PID screening criteria are summarised following:

Separation Distance (m)	PID Screening Criteria (ppm)
50	0.1
100	0.2
150	0.3
200	0.3
250	0.4
300	0.4
350	0.5
400	0.5
450	0.6
500	0.6
600	0.7
700	0.7
800	0.8
900	0.9
1000	0.9

Where the screening criteria are exceeded then measures as required by EMP02 Odour Control shall be implemented to reduce VOC emissions. It is noted measures identified as appropriate for odour emissions are also appropriate for control of VOC emissions.

Subsequent to implementation of odour control measures, an additional air sample shall be required to be collected using a Draeger Tube.

All PID monitoring results require to be recorded on Form AQMP6.1. The recording of repeated elevated reading will require a substantial review of work methods in accordance with AQMP09 review.

Volatile Organic Compounds (VOCs) – Draeger Tube

Draeger tube samples require to be collected where the PID screening level is exceeded and the maximum PID reading for the day has been recorded. Draeger tube samples require to be specific to benzene.

Draeger tube ID 81081841 shall be used for sampling. This tube is specific to benzene and has a benzene detection limit of 0.5ppm. Draeger tube samples shall be collected at a height of 1.5m immediately overlying the malodorous materials. Some works may require to be temporarily ceased to allow collection of the sample.

Draeger tubes shall be sampled in strict accordance with the manufacturer specifications. Sampling shall be undertaken using a Draeger Accuro Pump. It shall be ensured that the recommended number of strokes are undertaken with the collection of each sample.

All Draeger tube monitoring results require to be recorded on Form AQMP6.1. The recording of repeated elevated reading will require a substantial review of work methods in accordance with AQMP09 review.

The Draeger tube action level shall be set at a detection of benzene overlying the source (0.5ppm). Where a detection is recorded and odour controls have been implemented, works shall require to be modified. This shall include consideration of:

- Cessation of works until more favourable meteorological conditions are available; and/or
- Reduction in scale of works with VOC impacted / malodorous materials.

Proposed Site Area Available for Remediation Works

50m contours from site

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0 50m

Approximate scale

Figure 6.1 **Approximate Radial Distance from Remediation Site**

Department of Lands (2010)
Note- All locations shown are approximate only

Air Monitoring – VOCs	Form AQMP06.1

Date:_____

Sampling Locations at 2m Distance Downwind of Work Zone (complete as per monitoring periods)

7-8am ◇ No Malodorous Materials Handled

Wind Direction and Velocity:_____ _____m/s

Measurements (hourly average): _____ ppm

Drager Tube sample: ◇ No Sample ◇ No Benzene Detection ◇ _____ ppm

8-9am ◇ No Malodorous Materials Handled

Wind Direction and Velocity:_____ _____m/s

Measurements (hourly average): _____ ppm

Drager Tube sample: ◇ No Sample ◇ No Benzene Detection ◇ _____ ppm

9-10am ◇ No Malodorous Materials Handled

Wind Direction and Velocity:_____ _____m/s

Measurements (hourly average): _____ ppm

Drager Tube sample: ◇ No Sample ◇ No Benzene Detection ◇ _____ ppm

10-11am ◇ No Malodorous Materials Handled

Wind Direction and Velocity:_____ _____m/s

Measurements (hourly average): _____ ppm

Drager Tube sample: ◇ No Sample ◇ No Benzene Detection ◇ _____ ppm

11-12am ◇ No Malodorous Materials Handled

Wind Direction and Velocity:_____ _____m/s

Measurements (hourly average): _____ ppm

Drager Tube sample: ◇ No Sample ◇ No Benzene Detection ◇ _____ ppm

12am-1pm ◇ No Malodorous Materials Handled

Wind Direction and Velocity:_____ _____m/s

Measurements (hourly average): _____ ppm

Drager Tube sample: ◇ No Sample ◇ No Benzene Detection ◇ _____ ppm

1-2pm ◇ No Malodorous Materials Handled

Wind Direction and Velocity:_____ _____m/s

Measurements (hourly average): _____ ppm

Drager Tube sample: ◇ No Sample ◇ No Benzene Detection ◇ _____ ppm

2-3pm ◇ No Malodorous Materials Handled

Wind Direction and Velocity:_____ _____m/s

Measurements (hourly average): _____ ppm

Drager Tube sample: ◇ No Sample ◇ No Benzene Detection ◇ _____ ppm

3-4pm ◇ No Malodorous Materials Handled

Wind Direction and Velocity:_____ _____m/s

Measurements (hourly average): _____ ppm

Drager Tube sample: ◇ No Sample ◇ No Benzene Detection ◇ _____ ppm

4-5pm ◇ No Malodorous Materials Handled

Wind Direction and Velocity:_____ _____m/s

Measurements (hourly average): _____ ppm

Drager Tube sample: ◇ No Sample ◇ No Benzene Detection ◇ _____ ppm

5-6pm ◇ No Malodorous Materials Handled

Wind Direction and Velocity:_____ _____m/s

Measurements (hourly average): _____ ppm

Drager Tube sample: ◇ No Sample ◇ No Benzene Detection ◇ _____ ppm

Comments:

_____

_____

_____

_____

_____

_____

_____

_____

_____

Completed by: _____

Air Monitoring – Particulates / Dust	AQMP07
Responsibility:	Head Contractor Site Auditor Environmental Consultant
Frequency:	Duration of earth works
Location:	Site boundaries
Objective:	To assess compliance with environmental standards for works

Procedure

A program of atmospheric monitoring shall be undertaken throughout the earth works. The extent of required monitoring is described following:

Dusts – Realtime Particulate Monitoring

Assessment of realtime levels of dusts shall be undertaken by appropriately qualified personnel observing site boundaries. Where visible dusts are observable on the site boundaries then actual site measurements shall be undertaken by a 'DUSTTRAK' Aerosol Monitor at the downwind site boundary. The averaged level of PM_{10} (particulate matter less than 10 microns in diameter) over a period of 30s shall be required to be less than 50µg/m^3 at the downwind portion of the site boundary.

Where the acceptable level of dust is exceeded by real-time aerosol monitoring, then the measures prescribed in AQMP03 Dust and Airborne Hazard Control shall be reviewed for adequacy in relation to site activities. Improvements or recommendations arising out of the review shall be incorporated into a revised AQMP for the site as per AQMP08 AQMP Review.

All measurements shall be recorded in Form AQMP07.1.

Dusts – Deposition Monitoring

Dust deposition monitoring shall be undertaken by dust deposition gauges maintained permanently at three locations identified on Figure AQMP7.1. These locations have been determined on the basis of siting requirements in AS2922-1997 'Ambient Air – Guide for Siting of Sampling Units' to the extent possible. Collection and analysis of samples shall be undertaken in accordance with AS3580.10.1-2003 'Methods for sampling and analysis of ambient air – Determination of particulate matter – Deposited matter – Gravimetric method'. Samples shall be collected and analysed on a monthly basis throughout the works.

Where the level of dust deposition exceeds 2g/m^2/month the implementation of AQMP03 Dust and Airborne Hazard Control shall be reviewed.

Dusts – Laboratory Analysis of Particulates

Confirmatory sampling shall be undertaken of the realtime particulate measurements being generated by the monitoring. This shall be undertaken by the fortnightly collection of an ambient air sample by a high volume sampling method. A high volume sampler shall be operated for a minimum period of 8 hours during site operation at a downwind location on the site boundary. Sample collection and analysis shall be in accordance with AS3580.9.6-1990 'Ambient Air – Determination of Suspended Particulate Matter PM_{10} – High Volume Sampler with Size Selective Inlet Gravimetric Method'.

Realtime measurements shall be taken at hourly intervals adjoining the sampler. The laboratory reported result of the high volume sampler shall be compared to the average of the realtime measurements. Where a significant discrepancy is identified (RPD>50% as calculated in accordance with AS4482.1-2005) the calibration of the Dusttrak (dust monitor) shall be confirmed by manufacturer service.

Repeated significant discrepancies in measurements will require revision of the AQMP in accordance with AQMP9 Review.