

New M5

Environmental Impact Statement

Alexandria Landfill closure management plan

Appendix F





Alexandria Landfill Closure Management
Plan
Roads and Maritime Services
18-Nov-2015
Doc No. 60327128_RPT01_20151109

WestConnex New M5

Alexandria Landfill Closure Management Plan

This page has been left blank intentionally.

WestConnex New M5

Client: Roads and Maritime Services

ABN: 76 236 371 088

Prepared by

AECOM Australia Pty Ltd

Level 21, 420 George Street, Sydney NSW 2000, PO Box Q410, QVB Post Office NSW 1230, Australia

T +61 2 8934 0000 F +61 2 8934 0001 www.aecom.com

ABN 20 093 846 925

18-Nov-2015

Job No.: 60327128

AECOM in Australia and New Zealand is certified to the latest version of ISO9001, ISO14001, AS/NZS4801 and OHSAS18001.

© AECOM Australia Pty Ltd (AECOM). All rights reserved.

AECOM has prepared this document for the sole use of the Client and for a specific purpose, each as expressly stated in the document. No other party should rely on this document without the prior written consent of AECOM. AECOM undertakes no duty, nor accepts any responsibility, to any third party who may rely upon or use this document. This document has been prepared based on the Client's description of its requirements and AECOM's experience, having regard to assumptions that AECOM can reasonably be expected to make in accordance with sound professional principles. AECOM may also have relied upon information provided by the Client and other third parties to prepare this document, some of which may not have been verified. Subject to the above conditions, this document may be transmitted, reproduced or disseminated only in its entirety.

Quality Information

Document	WestConnex New M5
Ref	60327128
Date	18-Nov-2015
Prepared by	Kate Pigram, Kate McGrath
Reviewed by	Anthony Davis
Authorised	Caitlin Bennett

Table of Contents

1.0	Introduction	1
1.1	Background	1
1.2	Objective	2
1.3	Purpose and scope	2
1.4	Relevant guidelines	3
1.5	Consultation	3
2.0	Site description	5
3.0	Site history	7
4.0	Site conditions and surrounding environment	11
5.0	Existing site features, monitoring and management	13
5.1	Landfill cap	13
5.2	Leachate management system	13
5.2.1	Existing leachate management system	13
5.2.2	Leachate characterisation	13
5.3	Leachate treatment plant	15
5.4	Surface water and stormwater management system	15
5.5	Groundwater management	16
5.5.1	Groundwater management system and monitoring network	16
5.5.2	Groundwater quality	17
5.6	Landfill gas and air monitoring	18
5.6.1	Landfill gas management system	18
5.6.2	Landfill gas characterisation	19
5.7	Existing monitoring and management requirements	23
6.0	Proposed final landform and land use	25
6.1	Final landform	25
6.2	Final land use	26
7.0	Landfill closure and rehabilitation	27
7.1	Closure and stabilisation of the landfill	27
8.0	Site closure – Key components	29
8.1	Final landfill cap design	29
8.1.1	Growing media establishment following installation of cap	30
8.1.2	Revegetation	30
8.2	Landfill gas management	31
8.3	Landfill Fire Management	31
8.4	Leachate drainage layer	32
8.5	Leachate management	33
8.5.1	Leachate treatment plant	33
8.5.2	Stormwater and leachate pump station	33
8.6	Surface water drainage management	34
8.7	Asbestos management	34
9.0	Proposed management and monitoring	35
9.1	Landfill closure phase monitoring and management requirements	35
9.2	Post closure phase monitoring and management requirements	47
10.0	Operational responsibilities and reporting requirements	49
10.1	Operational responsibilities	49
10.2	Reporting frequency	50
11.0	Closure phase communications and reporting	51
11.1	Communications protocols	51
11.2	Environmental audit schedule	51
11.3	Annual document review	51
12.0	Certified Statement of Completion	53
13.0	References	55
Appendix A		
	Figures and Design Drawings	A

Appendix B		
SEARs		B
Appendix C		
Existing EPLs and TWA		C
Appendix D		
Technical Memos and Diagrams		D
Appendix E		
Asbestos Management Plan		E
Appendix F		
Proposed Groundwater and Leachate Monitoring Plan		F
Appendix G		
Proposed Leachate Extraction Management Plan		G
Appendix H		
Proposed Landfill Gas Extraction Management Plan		H

List of Figures

Figure 1	Reported location of existing gas mitigation system	19
Figure 2	Composition of landfill gases (AECOM, 2015)	20

List of Tables

Table 1	Application of NSW EPA (2015) Draft Environmental Guidelines: Solid Waste Landfills	2
Table 2	Outcomes of consultation with the EPA	3
Table 3	Site description – Alexandria Landfill	5
Table 4	Alexandria Landfill site history summary	7
Table 5	Alexandria Landfill - site condition and surrounding environment summary	11
Table 6	Summary of most recent leachate monitoring results (AECOM, 2015)	14
Table 7	Surface Water / Stormwater Drainage System	15
Table 8	Groundwater Infrastructure Summary	16
Table 9	Summary of most recent groundwater monitoring results (AECOM, 2015)	17
Table 10	Air Monitoring and Landfill Gas Infrastructure Summary	19
Table 11	Summary of most recent landfill gas monitoring results (AECOM, 2015)	20
Table 12	Trace gas detections - summary of most recent landfill gas monitoring results (AECOM, 2015)	21
Table 13	Landfill closure works and indicative timing	27
Table 14	Monitoring and management requirements stipulated in EPL 4,627 (prior to landfill closure works)	37
Table 15	Monitoring and management requirements stipulated in EPL 12,594	41
Table 16	Existing monitoring and management requirements as stipulated in TWA 29304	45
Table 17	Proposed post closure monitoring and management summary	47
Table 18	Current operational responsibilities	49
Table 19	Current reporting responsibilities	50

1.0 Introduction

AECOM Australia Pty Ltd (AECOM) has been engaged by the Roads and Maritime Services (Roads and Maritime) to prepare a Landfill Closure Management Plan (LCMP) for Alexandria Landfill, St Peters in New South Wales (the site). The site comprises Lot 2 in Deposited Plan (DP) 1168612, 10-16 Albert Street, St Peters, NSW; refer **Figure 1** (Site location) and **Figure 2** (Site layout) in **Appendix A**. Thus LCMP forms part of the environmental impact statement (EIS) for the project.

The site was acquired by the NSW Government in December 2014 to facilitate the development of the St Peters interchange and the operations of the previous landowner ceased at that time. Activities consistent with the existing planning approvals are continuing on site however, the site no longer operates commercially as a landfill.

This LCMP provides a landfill closure and environmental management and monitoring framework to be implemented both during and post landfill closure. For the purpose of this document, the term closure refers to the cessation of waste disposal and material recycling activities within the existing landfill and associated waste recycling and transfer facility. This LCMP documents the proposed final landform, capping detail, leachate, gas management and monitoring protocols proposed to be adopted as part of the landfill closure process.

This LCMP does not document construction and/or environmental management protocols associated with the future construction and development of the St Peters interchange. It is anticipated that these protocols would be produced under separate cover by the landfill/remediation contractor engaged by Roads and Maritime to undertake these works and would include but not be limited to:

- Material tracking;
- Occupation health and safety requirements (OH&S);
- Environmental and community engagement;
- Odour and dust;
- Asbestos;
- Leachate and gas;
- Stormwater; and
- Outstanding clean-up notices.

1.1 Background

The site was historically owned by The Austral Brick Company Proprietary Limited (Austral) and operated as a quarry and brickworks between 1908 and 1988. Following the closure of the brickworks and quarry, part of the site was converted into a landfill, which was operated by the City of Sydney Council until it was acquired by Dial-A-Dump Industries Pty Ltd (DADI) in 2002. The site is currently licensed by the NSW Environment Protection Authority (EPA) as a solid waste landfill and waste storage and recycling facility.

Roads and Maritime is proposing the construction and operation of the New M5 (the project), which would comprise a new, tolled multi-lane road link between the M5 East Motorway east of King Georges Road and St Peters. The project would also include an interchange at St Peters and connection to the existing road network. Chapter 5 and Chapter 6 of the EIS for a full description of the project.

The area encompassed by the Alexandria Landfill is planned to form part a major component of the St Peters interchange. The design for the St Peters interchange includes roads, tunnel portals, overpasses and associated infrastructure. The remainder of the site is planned to be redeveloped as public open space comprising a mixture of parkland and pathways. Surplus land surrounding the St Peters interchange may also be redeveloped for commercial/light industrial land use.

The redevelopment also means that the site would need to be closed and managed in accordance with the *Protection of the Environment Operations Act 1997* (POEO Act 1997). The closure process includes the preparation of this LCMP for the site.

Due to the nature of the former land uses within the site, AECOM completed a *Phase 1 Environmental Site Assessment, Alexandria Landfill Acquisition Area, St Peters, NSW* (Phase 1 ESA) (AECOM, 2014a) for the site and several of the surrounding properties. The Phase 1 ESA findings concluded that there was a high potential for contaminated soil, groundwater, landfill leachate and hazardous landfill gases to be present as a result of historical land uses. As such it was recommended that a Phase 2 ESA be undertaken to investigate soil, groundwater, leachate and ground gas conditions within the site and assess suitability of the site for the proposed SPI redevelopment.

The *Phase 2 Environmental Site Assessment Alexandria Landfill, 10-16 Albert Street, St Peters* (AECOM, 2015 draft) identified concentrations of contaminants of potential concern (CoPC) within the site variably exceeding the adopted human-health and ecological based assessment criteria for both the open space and commercial/industrial land use scenarios. The main contaminants of concern identified as an outcome of the assessment were lead, carcinogenic polycyclic aromatic hydrocarbons (CPAHs), total recoverable hydrocarbons (TRH) and asbestos. Contamination was mainly confined to the fill and appears randomly distributed both laterally and throughout the full depth of the landfill. Contamination exceeding the adopted human health and ecological assessment criteria was not identified in underlying natural soils. Natural soils were however assessed as likely to contain potential acid sulfate soils (PASS). Landfill gas and leachate were also identified as management issues at the site.

1.2 Objective

The overarching objective of this LCMP is to set out a program for reducing environmental harm after closure. The specific objective of the LCMP is to outline the overarching framework of key closure requirements. These requirements would be implemented to mitigate environmental harm during the closure and post closure phase of operations in accordance with the requirements outlined in the NSW EPA (2015) *Draft Environmental Guidelines Solid Waste Landfills*.

1.3 Purpose and scope

This LCMP has been developed to provide a guidance document to inform landfill closure activities at the site that form part of the project. The purpose of the document is to ensure that adequate landfill closure and rehabilitation measures are implemented and monitoring procedures continue as necessary following the closure of the site. This LCMP incorporates the key requirements referenced in NSW EPA (2015) *Draft Environmental Guidelines: Solid Waste Landfills*, which are summarised in **Table 1**.

Table 1 Application of NSW EPA (2015) Draft Environmental Guidelines: Solid Waste Landfills

Goal	Relevant section(s) of LCMP
Identification of proposed future use of the site	- Chapter 6.0
Closure and stabilisation of the landfill (including indicative time frames)	- Chapter 7.0 - Chapter 8.0
Development of a final capping designs (and landform) for implementation at the site	- Section 8.1
Specification of post-closure management and monitoring measures for leachate, stormwater, landfill gas, odour, dust, litter and final cap integrity	- Leachate: Section 8.3; Chapter 9.0; Appendix F; and Appendix G - Stormwater: Section 5.4 and Section 8.2.3 - Landfill gas: Section 8.2; Chapter 9.0 and Appendix H - Odour: Chapter 9.0 - Dust: Chapter 9.0 - Litter: Chapter 9.0 - Final cap integrity: Section 8.1 and Chapter 9.0
Consideration of and consistency with applicable conditions of the development consent or other planning approvals that apply to the premises	- Section 1.4, - Chapter 9.0, - Appendix B - Appendix C
Development of a contact register of persons in the event of site issues (for example, odour emissions)	- Section 11.1

This document is an organic structure document which is designed to be revised and updated as site conditions evolve and roles and responsibilities change during the landfill closure phase and future development of the site.

1.4 Relevant guidelines

This LCMP has been prepared with reference to the following guidance and legislation:

- NSW EPA 2015. *Draft Environmental Guidelines Solid Waste Landfills*. Second Edition, March 2015.
- POEO Act 1997. No 156, Section 76. *Post-closure requirements for waste facilities or other licensed premises*. January 2015.
- EPA Victoria *Closed Landfill Guidelines* Publication number 1490, December 2012.
- NSW Department of Planning and Environment (2015) Secretary's Environmental Assessment Requirements for the New M5, issued on 5 March 2015 and updated on 26 August 2015 – Section 115Y of the *Environmental Planning and Assessment Act 1979* (refer **Appendix B**).
- Existing Environment Protection Licences (EPLs) and Trade Waste Agreement (TWA) (refer **Appendix C**):
 - EPL 4627: WestConnex Delivery Authority, Alexandria Landfill Pty Ltd, 10 Albert Street, St Peters, dated 23 March 2015: Waste disposal by application to land. The licence allows for acceptance of: general solid waste (non-putrescible) (application to land); waste tyres (application to land); asbestos waste (application to land); and any waste below the licensing thresholds in Schedule 1 of the POEO Act 1997.
 - EPL 12594: WestConnex Delivery Authority, Alexandria Recycling Centre 10-16 Albert Street St Peters, dated 24 March 2015: Recovery of general waste and waste storage (other types of waste).
 - Sydney Water (TWA No. 29304) for the discharge of treated leachate to a sewer discharge point in Albert Street.

WestConnex Delivery Authority was dissolved on 1 October 2015. An application has been made to formally transfer existing EPLs (4627 and 12594) from WestConnex Delivery Authority to Roads and Maritime.

1.5 Consultation

During the preparation of the LCMP, the EPA was consulted on an earlier draft of the LCMP. The EPA advised that the direction proposed for the landfill closure is acceptable based on the following key elements identified in **Table 2**, subject to a more detailed review of the LCMP during the display of the EIS. **Table 2** details the relevant sections where the LCMP addresses the comments received by the EPA.

Table 2 Outcomes of consultation with the EPA

EPA comment	Section(s) where addressed in this LCMP
A capping system comprising a clay sealing layer or a composite clay/GCL sealing layer overlaid by a 500 millimetre thick revegetation layer	Section 8.1
A leachate collection and conveyance system beneath the proposed new containment cell generally in accordance with benchmark technique 2 of the Environment Guidelines: Solid Waste Landfills, 1996	Section 8.5.2
Develop and implement a Construction Quality Assurance Plan generally in accordance with the Draft Environmental Guidelines Solid Waste Landfills, 2 nd edition 2015	Section 8.1

EPA comment	Section(s) where addressed in this LCMP
EPA has been advised that, regarding the existing basal leachate collection system, it was unpractical to undertake a pipe loading assessment, however should that system become unserviceable, contingency measures such as leachate bores and extraction could be implemented	The requirement for contingency measures is noted in Section 8.1
The LCMP adequately addresses slope stability, landfill gas and leachate disposal	<ul style="list-style-type: none">- Slope stability: Section 6.1- Landfill gas management: Section 8.2- Leachate disposal: Section 8.4

2.0 Site description

The site description details are provided in **Table 3**.

Table 3 Site description – Alexandria Landfill

Item	Description
Site owner	Roads and Maritime Services
Site address	10-16 Albert Street, St Peters, NSW
Legal description	Lot 2 DP1168612
Local government authority	Marrickville Council and City of Sydney Council
Current zoning	IN1 General Industrial (City of Sydney Council and Marrickville Council) and SP2 Classified Road (City of Sydney Council)
Current land use	Landfill and waste recycling premises
Proposed land use	Motorway interchange and open space parkland
Site elevation	-12 to 12 metres AHD
Site area (Total)	15.71 hectares
Site layout plan	Figure 2 (Appendix A)

This page has been left blank intentionally.

3.0 Site history

The site history is detailed in the Phase 1 ESA (AECOM, 2014a). A summary of historical information is provided below in **Table 4**.

Table 4 Alexandria Landfill site history summary

Item	Description
Present land use	The site is a licensed non-putrescible landfill and waste recycling and storage facility that was operating as commercial landfill until December 2014. The site is presently occupied and maintained by Roads and Maritime. Current activities at the site are in accordance with the provisions of the EPLs and the applicable development consents.
Past land use	<p><u>December 2014 to present:</u> Non-operational landfill and waste recycling and storage facility occupied and managed by SMC</p> <p><u>2002 to December 2014:</u> Non-putrescible landfill and waste recycling and storage facility operated by DADI</p> <p><u>1988 to 2002:</u> Inert solid waste landfill operated by City of Sydney Council</p> <p><u>1962 to 1988:</u> Abandoned brick works quarry and potential small scale non-licensed landfilling activities</p> <p><u>1908 to 1962:</u> Brick works quarry operated by Austral</p> <p><u>Prior 1908:</u> Unknown but likely agricultural land use</p>
Historical use of adjacent land	<p>The former historical land uses adjacent to the site are summarised below.</p> <p>North-east of the site:</p> <ul style="list-style-type: none"> - A steel mesh fence surrounding the Roads and Maritime owned land incorporating a large, primarily sandstone stockpile identified as Bradshaw Mountain. - Brick works quarries, brick works operations later used as council landfills and then redeveloped into open space parkland (Sydney Park). - Various industrial properties including chemical manufacture, gasholders, metal works, small workshops, large manufacturing factories. - Market gardens. <p>South-east of the site:</p> <ul style="list-style-type: none"> - Manufacturing including a large factory previously occupied by Rheem Pty Ltd and a flexible plastic manufacturing company. - Logistics and storage/junk yards, including drum storage. - A former small timber mill and market gardens. - Various industrial properties between Alexandra Canal and Burrows Road. <p>South-west of the site:</p> <ul style="list-style-type: none"> - A former metal smelter and waste recyclers located between the site and Canal Road. - Former brick works manufacturing sites. - Rail siding and logistics terminal (Cooks River Rail Terminal). - A former petrol station located on the corner of Princes highway and Canal Road. - Various commercial/industrial properties. <p>North-west of the site:</p> <ul style="list-style-type: none"> - Commercial dry cleaners on the north-western boundary (Princes Highway). - Former brick works manufacturing. - Former workshops and general commercial/industrial land use between the site and the Princes Highway.

Item	Description
Wastes/fill	<p>Wastes that have been historically accepted be applied as landfill to the site include:</p> <ul style="list-style-type: none"> - Non-putrescible household waste. - Incinerator ash from the former Waverly Woollahra Process Plant. - Demolition and construction waste. - Solid industrial/commercial waste. - Incinerated and un-incinerated green waste. - Class 2 solid waste (non-putrescible) demolition and construction waste. - Shredded tyres. - Asbestos.
Current on-site contamination sources	<ul style="list-style-type: none"> - Landfill waste (consisting of controlled and uncontrolled waste). - Fuel storage, dispensing and use (diesel). - Potential use of pesticides and herbicides. - Recycling stockpiles.
Current off-site contamination sources	<ul style="list-style-type: none"> - Known heavy metals, PAH, TRH and PCB contamination in the former metal smelting and waste recyclers site located between Canal Road and the site (Lot A DP3917775, Lot B DP394647, Lot X in DP 421363 and Lot 14 DP606737). The subject lots are also subject to investigation by AECOM, but are being reported under separate cover. - Potential soil and groundwater contamination from the historical land uses listed above in <i>'Historical use of adjacent land'</i>.
Aboveground Storage Tanks (ASTs)/ Underground Storage Tanks (USTs)	<ul style="list-style-type: none"> - One 20,000 litre bunded diesel AST in the northern portion of the site. - No known USTs.
Chemical storage	<p>An inventory of chemicals stored within the site and provided in the Alexandria Landfill (2014a) <i>'Alexandria Landfill. Pollution Incident Response Management Plan'</i> included:</p> <ul style="list-style-type: none"> - 20,000 litres - diesel (stored in AST). - 900 litres – Top Dog Plus 10W/40 Product code 300138. - 800 litres - Gulf Harvester ISO68 Product Code 30072. - 20 x 450 gram tubes/2 x 25 litres - Gulf Western Super Blue Grease. - 600 litres - All fleet heavy duty diesel coolant 50 per cent premix. - 3,600 litres – diesel (stored in portable tank). - 217,000 litres – leachate (stored in tanks). <p>No other information on the historical storage of chemicals on the site was available.</p>
Trade waste agreements (TWA)	<p>The site has a trade waste agreement (TWA) with Sydney Water (TWA No. 29304) for the discharge of treated leachate to a sewer discharge point in Albert Street.</p>
Licences	<p>The site presently has the two following EPLs:</p> <ul style="list-style-type: none"> - EPL 4,627: WestConnex Delivery Authority, 10 Albert Street, St Peters, dated 23 March 2015: Waste disposal by application to land. The licence allows for acceptance of: general solid waste (non-putrescible) (application to land); waste tyres (application to land); asbestos waste (application to land); and any waste below the licensing thresholds in Schedule 1 of the POEO Act 1997. - EPL 12,594: WestConnex Delivery Authority, Alexandria Recycling Centre 10-16 Albert Street St Peters, dated 24 March 2015: Recovery of general waste and waste storage (other types of waste). <p>An application to formally transfer the EPLs to Roads and Maritime was made on 12 October 2015.</p>

Item	Description
Local groundwater use	<ul style="list-style-type: none"><li>- The site is within Zone 2 of the Botany Groundwater Management Zone. Residents within Zone 2 are advised that domestic groundwater use is banned. The ban includes use of the water for drinking, watering gardens, washing windows and cars, bathing, or to fill swimming pools.<li>- Groundwater/leachate is pumped and treated within Sydney Park and discharged to sewer. Sydney Park is located around 50 metres north to north-east of the site.<li>- No other groundwater uses are known but could be potentially used on surrounding industrial or commercial properties.

This page has been left blank intentionally.

4.0 Site conditions and surrounding environment

Site conditions and the surrounding environment are detailed in the Phase 1 ESA (AECOM, 2014a). A summary of key information is provided below in **Table 5**.

Site features are shown on **Figure 2** in **Appendix A**.

Table 5 Alexandria Landfill - site condition and surrounding environment summary

Item	Description
Topography	<p>As a result of historical quarrying activities and landfilling, the site surface contains a depression at a maximum depth of around – 12 metres AHD in the south-west portion of the site. The eastern extent of the site, outside the depression, is generally relatively level as a result of historical filling. The north-west portion of the Alexandria Landfill pit consists of gentler grades, sloping towards the deepest part of the depression in the south-west portion of the site.</p> <p>The highest point of the site is the stockpile on Bradshaw Mountain, where the highest elevation is 22 metres AHD. The stockpile slopes steeply on all sides and is relatively flat across the top of the mound.</p> <p>Vertical to steep quarry walls are present along the north-western boundary of the site.</p>
Site boundary	The site is bound by security fencing along all boundaries of the site except for the boundary between the Canal Road property and the site.
Signs of contamination	Observations of fragments of asbestos containing material (ACM) have been observed on the ground surface within the recycling premises and landfill premises.
Plant stress	Stressed vegetation was previously observed on the slope in the south-west of the Alexandria Landfill.
Odours	Leachate odours have been observed within the site, especially in close proximity to the leachate sump risers.
Buildings	<p>The Alexandria Landfill presently contains the following buildings:</p> <ul style="list-style-type: none"> - Weighbridge office. - Demountable office buildings on stilts along the Albert Street boundary. - The two storey site office located in the north-west corner of the site. The ground floor is constructed of brick and the first floor is a temporary/demountable structure. - A workshop is located in the north-west portion of the site adjacent to the leachate treatment plant. <p>Bradshaw Mountain contains no buildings, although the remnants of the old brick works walls remain on the street boundaries of the site.</p>
Roads	<p>A haul road runs from the site entry to the base of the landfill. The portion of the haul road descending into the landfill premises is unsealed.</p> <p>With the exception of a temporary access track on the stockpile, no roads are present within the Bradshaw Mountain portion of the site.</p>
Flood potential	The land is not affected by a policy adopted by the council that restricts the development of site because of flooding or tidal inundation, however due to the depression within the site, flooding within the site would likely occur if the current leachate system was not in operation or after periods of heavy rainfall.
Local receptors	<p>Surrounding sensitive receptors include:</p> <ul style="list-style-type: none"> - Workers and visitors within the site. - Workers and visitors in adjacent commercial and industrial properties on all sides of the site. - Residents in surrounding properties on the northeast and north western side of the site. The closest residential properties are 10 metres north of the site. - Workers accessing service pits and trenches in the surrounding area. - Alexandra Canal located 165 metres east of the site. - Sydney Park artificial wetlands located 135 metres northeast of the site.

This page has been left blank intentionally.

5.0 Existing site features, monitoring and management

Following acquisition by the NSW Government in December 2014, commercial landfilling and waste recycling activities have ceased. Roads and Maritime is currently operating the landfill in accordance with the provisions of the EPLs and the conditions of development consent previously provided for the premises by City of Sydney Council and by Marrickville Council.

A summary of the relevant existing site layout including leachate, surface water, stormwater, groundwater, landfill gas and air monitoring systems and infrastructure at the site is provided in the sections below. The existing site layout and infrastructure has been considered as part of the landfill closure planning for the site.

5.1 Landfill cap

As the site has been actively used for landfilling and waste recycling and transfer, no final landfill cap has been historically constructed. It is understood that interim day cover may have been used to cover landfilled waste as part of the historic landfill capping regime.

5.2 Leachate management system

5.2.1 Existing leachate management system

The main leachate management system (LMS) appears to comprise a subsurface herringbone drainage network which drains to the main leachate riser located at the south-western portion of the site. Drawing M5-AJV-SKT-700-320-DR-7801 in **Appendix A** shows the indicative location of the subsurface drainage system and the main leachate riser. Based on the design plans, the herringbone system incorporated a main leachate drain of 375 millimetre diameter reinforced concrete pipe (RCP) with feeder herringbone drains constructed of 150 millimetre diameter slotted polyvinyl chloride (PVC).

Leachate generated by the infiltration of groundwater and surface water into Alexandria Landfill is pumped out of the main leachate extraction riser. The extracted leachate is discharged to sewer under a trade waste agreement (TWA) with Sydney Water Corporation (Sydney Water). Waste Assets Management Corporation (WAMC) has provided an updated process flow diagram for the leachate collection system, refer **Appendix D**. To protect surrounding groundwater and nearby Alexandra Canal from leachate contamination, the LMS is required to operate continuously to maintain the leachate level within the shale pit.

The design plans show that the herringbone drainage system drains into the main leachate riser. The main leachate riser also receives leachate from the leachate sump (via a 63 millimetre HDPE line) and the intermediate leachate riser via a 90 millimetre HDPE line. Leachate from the main leachate riser is currently transferred to the existing leachate treatment plant via a 110 millimetre HDPE line around the perimeter of the site located in the north eastern portion of the site. Leachate from the treatment plant is then pumped to a sewer discharge point in Albert Street under a Sydney Water TWA.

Design plans prepared by Maunsell Pty Ltd in 1996 indicate the main leachate riser was planned to be constructed of 2.1 metres diameter concrete vertical pipes, with the base of the sump installed at an elevation of -39 metres AHD. The design detailed two submersible pumps with an agitator at the base.

An intermediate leachate riser is located within the licenced landfill premises area and a secondary intermediate leachate riser is located between the main leachate riser and the intermediate leachate riser. The intermediate and secondary leachate riser feed into the main leachate riser.

Further information on the existing leachate extraction system is provided in Appendix D in *Northern Ramps – Landfill Closure Alexandria Landfill Leachate Management System Technical Memo 1* (AECOM, 2015b).

5.2.2 Leachate characterisation

Leachate quality has been monitored quarterly and/or annually since at least 1996 until the latest sampling round in February 2015.

The concentrations of ammonia in leachate sampled from the leachate sump (LP1) were reported as 250 milligrams per litre in 1996. From 1996 to 2015 the ammonia concentrations at the leachate extraction sump have fluctuated and have been typically been reported as between 100 and 300 milligrams per litre.

As part of the Phase 2 ESA (AECOM, 2015) eight monitoring wells were installed in the landfill to monitor leachate (MW304, MW305, MW306, MW307, MW308, MW311, MW313 and MW314). A summary of the range of

concentrations of key are summarised in **Table 6** below. Further details on the leachate monitoring wells installed are provided in the Groundwater and Leachate Management Plan in **Appendix F**.

As expected, concentrations of ammonia were lowest near the edges of the landfill pit and highest in the central portion and closest to the leachate sump (LP1).

A thin layer (less than five millimetres) of low non aqueous phase liquid (LNAPL) consisting of a substance identified as potentially a mixture diesel and oil was detected in MW306 in the central portion of the landfill. Dissolved concentrations of TRH were lowest at the edges of the landfill and highest in the centre of the landfill.

Table 6 Summary of most recent leachate monitoring results (AECOM, 2015)

Parameter	Units	Leachate concentration ranges and averages		
		Minimum	Maximum	Average
Cations Total	meq/L	37	118	63
Anions Total	meq/L	35.2	112	67
Ionic Balance	%	0.72	10.2	4.6
Biological Oxygen Demand (BOD)	mg/L	5	41	20
Chemical Oxygen Demand (COD)	mg/L	192	610	360
Total Dissolved Solids (TDS)	mg/L	2030	6450	3958
Total Organic Carbon (TOC)	mg/L	45	144	96
Methane	mg/L	<0.01	11.1	6.5
Nitrate (as N)	mg/L	<0.01	11.9	2.9
Ferrous Iron	mg/L	<0.05	25	8.6
Sulphate as S	mg/L	<1	200	64
Dissolved oxygen	mg/L	0.15	1.91	1.02
Electrical conductivity (field)	µs/cm	4396	11076	7490
pH (field)	pH	5.63	7.15	6.65
Redox (field)	mV	-110.6	190.9	65.7
Temperature (field)	°C	20.6	37.4	28.7
Ammonia	mg/L	55.9	404	187
Nitrate	mg/L	<0.01	11.9	2.9
Nitrite	mg/L	<0.01	0.15	0.031
Nitrogen (Total Oxidised)	mg/L	<0.01	11.9	2.9
Reactive Phosphorus (as P)	mg/L	<0.01	0.84	0.2
Arsenic	µg/L	2	30	9.9
Cadmium	µg/L	<0.1	<0.1	<0.1
Chromium	µg/L	3	10	7.8
Copper	µg/L	<1	12	3.8
Lead	µg/L	<1	3	1.1
Mercury	µg/L	<0.1	<0.1	<0.1
Nickel	µg/L	6	156	55
Zinc	mg/L	0.11	0.088	0.036

Parameter	Units	Leachate concentration ranges and averages		
		Minimum	Maximum	Average
TRH C6 to C10	mg/L	<0.02	0.12	0.042
TRH> C16 to C34	mg/L	<0.1	2.87	0.88
TRH> C34 to C40	mg/L	<0.1	13	3.4
TRH> C34 to C40	mg/L	<0.1	0.7	0.16
Benzene	µg/L	<1	8	1.5
Ethyl benzene	µg/L	<2	4	1.3
Naphthalene	µg/L	<2	6	1.3
3-&4-methylphenol	µg/L	<4	6	2.4
Phenol	µg/L	<2	5	1.4
Carbon disulfide	µg/L	<5	8	3
Chlorobenzene	µg/L	<2.5	16	3.1
Bis(2-ethylhexyl) phthalate	µg/L	<10	10	7.5

5.3 Leachate treatment plant

The existing leachate treatment plant comprises a sequential biological reactor (SBR) system. It is understood that the primary function of the treatment system is to remove ammonia from incoming leachate. WAMC has confirmed that the existing leachate treatment plant has not been adequately designed to treat incoming leachate from the site and does not fully comply with existing Sydney Water TWA requirements for the treatment of ammonia. The existing leachate treatment system is currently being upgraded in accordance with an effluent improvement program agreed with Sydney Water. The former Sydney Water TWA (No. 29304) listed that the treatment plant contained the following components:

- 1 x 80 kilolitres biological treatment plant (batch discharge).
- 1 x 100 kilolitres biological treatment plant (batch discharge).
- 1 x Rainfall Sentinel MEA 2211.
- 1 x ABB Magmaster electromagnetic flow meter.

5.4 Surface water and stormwater management system

A summary of the existing surface water and stormwater network is provided in **Table 7**.

Table 7 Surface Water / Stormwater Drainage System

Area	Surface water / stormwater drainage details
Area A: Recycling Premises: weighbridge, workshops, offices, parking	Runoff drains to stormwater drains which discharge to a main subsurface stormwater drain (a 675 millimetre subsurface pipe) that connects to the off-site drain in Canal Road. There is a discharge monitoring point (SW3) at the Canal Road pipe junction. It is understood the same subsurface stormwater line also drains stormwater from off-site lots (located between the site and Princes Highway).
Area B and C: Recycling Premises: stockpiling and processing area	Surface water in the recycling premises and stockpiling area discharge to stormwater after sediment control and treatment. Monitoring occurs at SW1 and SW2.
Area D: Recycling Premises: waste transfer areas	Treatment and discharge to trade waste system.

Area	Surface water / stormwater drainage details
Area E: Landfill premises	Treatment and discharge to trade waste system.
Area F: Lower Recycling Premises: Capped & contoured stockpile area	<p>Collection by drain and sump with sediment control and pumped discharge to stormwater with treatment and monitoring (SW4). JPG inspected the area on 15 January 2015 and noted the following:</p> <ul style="list-style-type: none"> - A small stormwater pit with no power and appeared the level probe had been recently removed. - A main stormwater sump consisting of a concrete block sump with junction boxes in the pit filled with epoxy.

The above features are shown on **Figure 2** in **Appendix A**.

5.5 Groundwater management

5.5.1 Groundwater management system and monitoring network

The existing understanding of the groundwater management system is summarised in **Table 8**.

Table 8 Groundwater Infrastructure Summary

Item	Description
Groundwater Extraction Bores	<p>A Botany Sands groundwater extraction system (BS1) was installed around 20 metres from the southern Alexandria Landfill boundary and extends around 20 metres in a south-westerly direction, to a depth of -10 metres AHD and a width of two metres. The bottom of the trench was installed into low permeability clays present below the permeable Botany Sands stratum. A 300 millimetres inside diameter (ID) heavy duty PVC slotted pipe was placed in the base of the trench and wrapped in geotextile to minimise blockages. The trench was subsequently backfilled with coarse brick, sand and gravel. At the northern end of the trench a concrete sump was constructed using interlocking precast sections, founded on the clay stratum. The sump was perforated to allow ingress of water from the trench, and wrapped in geotextile fabric. The location of BS1 is shown on Figure 2 in Appendix A.</p> <p>Extraction of groundwater from the Botany Sands aquifer to the east of the landfill pit began in approximately 2001/2002. Extracted groundwater is reportedly stored in 50,000 litre capacity tanks and has historically been used for dust suppression by water cart. Excess groundwater is understood to discharge to the stormwater drainage system on Canal Road.</p> <p>Significant inflows of groundwater from the Botany Sands Aquifer flow in to Alexandria Landfill. To limit the inflow of groundwater entering Alexandria Landfill from the Botany sands aquifers (over 45,000 litres per day), two interceptor sump systems (BS1 and BS2) have been installed between the landfill and Alexandria Canal to intercept and reduce the inflow of groundwater into the pit (refer to Figure 2 in Appendix A). The extracted water from BS1 and BS2 has historically been used for dust suppression purposes.</p> <p>The second interception and extraction system (BS2) is understood to comprise a sump that pumps to one 45 kilolitres and two 27 kilolitres storage tanks with an overflow to the existing stormwater drain.</p>
Groundwater Monitoring Wells	<p>The following groundwater monitoring were monitored and sampled as part of the EPL compliance and existing ICCG (2012) SWLMP and were installed between 1997 and 2005:</p> <ul style="list-style-type: none"> - MW1, MW2d, MW3 and MW4c which are screened in bedrock - One monitoring well MW2s screened in the botany sands - Botany sands extraction systems - BS1 and BS2 <p>The additional four groundwater monitoring wells were installed as part of the Phase 2 ESA (AECOM, 2015): MW309/MW310, MW312 and MW315 screened in Botany Sands</p> <p>Further details on the above existing monitoring wells are provided in the Groundwater and Leachate Management Plan in Appendix F.</p>

Item	Description
Management of the Botany Sand Beds aquifer	Groundwater flow into site from the Botany Sand Beds aquifer would be minimised by the construction of a cut-off wall around the southern perimeter of the landfill. The construction of the wall would minimise groundwater flow into the site, significantly reduce leachate generation within the site and maintain groundwater in the aquifer.

5.5.2 Groundwater quality

Based on available records, groundwater monitoring has been undertaken around the perimeter of the landfill since 1997.

The latest round of groundwater gauging and sampling was completed in February 2015 as part of the Phase 2 ESA (AECOM, 2015). A summary of the analytical data sampled and analysed from the botany sands and bedrock screened groundwater monitoring wells is provided in **Table 9** below.

Groundwater in the leachate, Botany Sands and up-gradient bedrock was found to be flowing on an inward gradient towards the main leachate sump in the southwest of the site. It is unclear if groundwater is flowing towards or away from the sump in the bedrock aquifer in the southeast of the site (at MW2D).

Concentrations of cobalt, copper, nickel and zinc exceeded ANZECC (2000) 95 per cent trigger values for marine ecosystems criteria in the bedrock aquifer and were at similar or higher concentrations as detected in the leachate.

Lead slightly exceeded the ANZECC (2000) 95 per cent trigger values for marine ecosystems in the Botany Sands in southern corner of the site.

Concentrations of ammonia slightly exceeded the ANZECC (2000) 95 per cent trigger values for marine ecosystems criteria in the wells screened in the Botany Sands and bedrock aquifers.

Concentrations of TRH, BTEX, volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) were not detected in the Botany Sands or bedrock aquifer.

Table 9 Summary of most recent groundwater monitoring results (AECOM, 2015)

Parameter	Units	Groundwater concentration ranges and averages					
		Botany Sands			Bedrock		
		Minimum	Maximum	Average	Minimum	Maximum	Average
Cations Total	meq/L	11.6	55.1	23	43.8	179	110.6
Anions Total	meq/L	12	54.5	24	43	181	115
Ionic Balance	%	0.5	6.34	2.6	0.56	5.2	2.23
BOD	mg/L	<2	4	1.8	<2	<2	<2
COD	mg/L	31	272	95	<50	52	33
TDS	mg/L	722	3580	1516	3360	11200	7300
TOC	mg/L	4	29	12	6	24	13.67
Methane	mg/L	0.794	9.24	3	<0.01	<0.01	<0.01
Nitrate (as N)	mg/L	<0.01	0.09	0.022	0.15	0.23	0.14
Ferrous Iron	mg/L	0.46	7.96	3.3	<0.05	2.24	1.79
Sulphate as S	mg/L	66	250	152	498	836	643
Dissolved oxygen(field)	mg/L	0.03	1.65	1.32	0.42	0.96	0.61
Electrical conductivity	µs/cm	4	5392	1888	4845	15926	10282
pH (field)	pH	6.28	7.8	6.92	5.02	5.73	5.31
Redox (field)	mV	-121.4	145.2	29.46	226.7	494.6	339
Temperature (field)	°C	20.2	21.6	20.7	20.8	22.8	21.8

Parameter	Units	Groundwater concentration ranges and averages					
		Botany Sands			Bedrock		
		Minimum	Maximum	Average	Minimum	Maximum	Average
Ammonia	mg/L	0.58	7.81	4.4	0.15	1.7	0.76
Nitrate	mg/L	<0.01	0.09	0.022	0.03	0.23	0.14
Nitrite	mg/L	<0.01	<0.01	0.005	<0.01	<0.01	0.005
Nitrogen (Total Oxidised)	mg/L	<0.01	0.09	0.022	0.03	0.23	0.14
Reactive Phosphorus (as P)	mg/L	<0.01	0.35	0.11	<0.01	<0.01	0.005
Arsenic	µg/L	<1	26	7.7	<1	<1	<0.1
Cadmium	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	µg/L	<1	2	0.81	<1	<1	<1
Copper	µg/L	<1	1	0.63	4	29	14
Lead	µg/L	<1	6	1.9	<1	<1	<1
Mercury	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	µg/L	<1	10	2.3	27	203	91
Zinc	mg/L	0.005	0.015	0.009	0.031	0.094	0.062
TRH C6 to C40	mg/L	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
BTEX	mg/L	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
VOCs and SVOCs	mg/L	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR

5.6 Landfill gas and air monitoring

5.6.1 Landfill gas management system

Landfill gas issues have been previously identified on the site along the eastern boundary where gas emissions and odours have been recorded along the interface between refuse and natural weathered shale. In addition, the Department of Environment and Climate Change (DECC, now EPA) has previously raised concerns regarding emissions and odour reportedly emanating from the site (in the area historically identified as Sector B). In 2007, it was requested by DECC that the owners of the site provide landfill gas mitigation designs for the perimeter of the facility. Douglas Partners (2008) subsequently proposed two design systems as well as numerous landfill gas mitigation methods, a plan for construction as well as potential ongoing monitoring program. It is unknown whether this plan was implemented.

The Alexandria Landfill Site-Recycling and Landfill Premises Revised Surface Water and Leachate Management Plan (SWLMP) (ICCG, 2011), identifies a subsurface gas mitigation trench installed in the north-western area of the site, as shown in **Figure 1** below.



Figure 1 Reported location of existing gas mitigation system

No ‘as built’ records are available for the trench; however the Report on Landfill Gas Mitigation Measures Alexandria Landfill, St Peters (Douglas Partners, 2008) provided design plans. The description of the gas mitigation trench included:

- Excavation of a benched trench to four to eight metres depth;
- Infilling the trench with coarse (greater than 40 millimetres) aggregate placed in layers;
- Installation of slotted HDPE piping on two horizontal horizons coupled along the length of the trench and brought to two vertical coupled risers or similar structures and manifolded to land lines leading to a movable exhaust system located in the landfill; and
- Capping of the trench using clay or geotextile.

The existing air monitoring and landfill gas monitoring program is summarised in **Table 10** below.

Table 10 Air Monitoring and Landfill Gas Infrastructure Summary

Item	Description
Dust Monitoring	Dust monitoring is conducted under EPL 12,594 at four gauges: <ul style="list-style-type: none"> - DG1: adjacent to weighbridge. - DG2: south-east close to “sealed Air” boundary. - DG3: south-west close to Canal Road. - DG4: adjacent to leachate treatment plant/workshop.
Landfill Gas Monitoring Wells	Surface gas monitoring. Existing landfill gas infrastructure included: <ul style="list-style-type: none"> - Subsurface gas monitoring at MW4c. - Subsurface gas mitigation trench Additional landfill gas monitoring wells installed as part of the Phase 2 ESA (AECOM, 2015): <ul style="list-style-type: none"> - On-site monitoring wells LG301 to LG313 - Off-site monitoring well LG300

5.6.2 Landfill gas characterisation

5.6.2.1 Bulk gases

The latest round of subsurface landfill gas monitoring was completed as part of the Phase 2 ESA (AECOM, 2015) in February 2015. Thirteen landfill gas wells (LG300 to LG312) and two groundwater monitoring wells (MW311 and MW313) were monitored with a landfill gas analyser and sampled with Summa canisters for bulk and trace landfill gases.

Concentrations of subsurface methane were highest across the central portion of the landfill where the depth of filling was greatest and lower around the edges of the site, with the exception of the northeast boundary of the site where subsurface methane concentrations were analysed at 74.2 per cent at the boundary (LG308). A summary of the analytical results are provided in **Table 11** below.

Table 11 Summary of most recent landfill gas monitoring results (AECOM, 2015)

Gas	Unit	Minimum	Maximum	Average
Methane	Mol %	0.14	74.2	37
Oxygen	Mol %	3.53	20	10
Carbon Dioxide	Mol %	0.507	40.7	17
Carbon Monoxide	Mol %	<0.001	<0.001	<0.001
Inert Gases (N ₂ . Ar) by difference	Mol %	2.2	89	47
Ethane	Mol %	0	0	0
Propane	Mol %	0	0	0
Butane	Mol %	0	0	0
Hydrogen	Mol %	0.01	0.014	0.010
Helium	Mol %	0	0	0
Flow rate (field)	L/hr	0	7.2	2

The composition of bulk landfill gases analysed from each monitoring well is shown in **Figure 2** below.

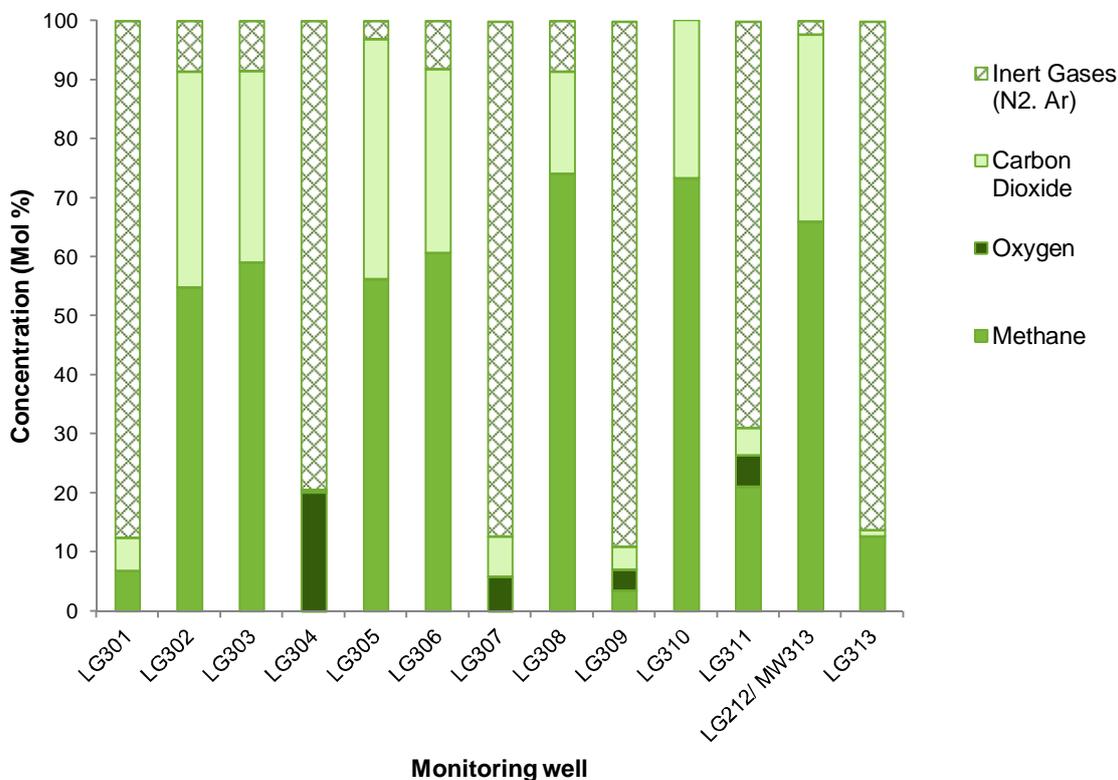


Figure 2 Composition of landfill gases (AECOM, 2015)

5.6.2.2 Trace gases

The range and averages of the concentrations of trace ground gases, hydrogen sulfide, TRH and VOCs detected in landfill gas from the round of landfill gas sampling completed as part of the Phase 2 ESA (AECOM, 2015) in February 2015, are listed in **Table 12** below.

Table 12 Trace gas detections - summary of most recent landfill gas monitoring results (AECOM, 2015)

Chemical	Units	Minimum concentration	Maximum concentration	Average concentration
TRH C10-C14	µg/m ³	<35000	517,000	133,294
TRH C6-C9	µg/m ³	<20000	433,000	91,675
TRH >C10-C16	µg/m ³	<40000	208,000	85,125
TRH >C10-C16 less Naphthalene (F2)	µg/m ³	<40000	208,000	85,113
TRH C6-C10	µg/m ³	<20000	556,000	109,538
TRH C6-C10 less BTEX (F1)	µg/m ³	<20000	522,000	105,075
Hydrogen sulphide (field)	ppm	0	1194 />1000	~116
Naphthalene	µg/m ³	<100	387	105
tert-Butyl alcohol	mg/m ³	<0.15	1.5	0.37
Trichloroethene (TCE)	µg/m ³	<5.4	108	18
cis-1,2-dichloroethene	µg/m ³	<20	86.4	21
Vinyl chloride	µg/m ³	<5.1	485	63
Total Xylene	µg/m ³	<650	7860	1213
Benzene	µg/m ³	<100	1470	478
Ethylbenzene	µg/m ³	<220	22,000	2540
Toluene	µg/m ³	<190	1870	469
Xylene (m & p)	µg/m ³	<430	5640	826
Xylene (o)	µg/m ³	<220	2220	407
Freon 113	µg/m ³	<380	ND	190
Freon 114	µg/m ³	<350	ND	175
2-Propanol	µg/m ³	<120	1620	158
Isooctane	µg/m ³	<230	2650	670
Propene	µg/m ³	<90	10,800	988
Heptane	µg/m ³	<200	10,600	1979
Hexane	µg/m ³	<180	4400	1252
Tetrahydrofuran	µg/m ³	<150	1200	190
Methyl Ethyl Ketone	µg/m ³	<150	377	94
1,2,4-trimethylbenzene	µg/m ³	<240	33,500	2636
1,3,5-trimethylbenzene	µg/m ³	<240	13,600	1025
1-methyl-4 ethyl benzene	µg/m ³	<240	9380	751
4-Methyl-2-pentanone	µg/m ³	<200	528	127
Carbon disulfide	µg/m ³	<160	178	86
Chlorobenzene	µg/m ³	<230	1160	180

Chemical	Units	Minimum concentration	Maximum concentration	Average concentration
Cyclohexane	µg/m ³	<170	7260	1988
Dichlorodifluoromethane	µg/m ³	<250	20,400	1392
Ethanol	µg/m ³	<90	162	58
Isopropylbenzene	µg/m ³	<250	3710	720
n-butylbenzene	µg/m ³	<270	922	193
n-propylbenzene	µg/m ³	<250	10,400	1040
sec-butylbenzene	µg/m ³	<270	872	256
Styrene	µg/m ³	<210	231	113

5.6.2.3 Landfill gas generation estimate

A landfill gas generation estimate has been undertaken for the site (by Leighton Dragados Samsung), using a "first-order decay" model, to provide an order of magnitude estimate of landfill gas production. The model adopted was the National Greenhouse and Energy Reporting (NGER) solid waste emission calculator (Version 1.91).

The key assumptions made for the landfill gas generation estimate were:

- Waste filling commenced in 1988, with an allowance for some minor filling prior.
- Waste input tonnages were based on INFO DOC 715 (Woodward Clyde 1999) for years prior to 2002 and assumptions based on a view of surveys thereafter.
- Waste stream composition assumes commercial/industrial (C&I) and construction/demolition (C&D) waste as per Stage 2 ESA and the EPL. Default NGER decomposition parameters were used, assuming that food waste was removed from the C&I waste stream in accordance with the NGER guidelines.
- The estimate considers the area of the EPL 4627 and the EPL 12594, which are the areas where waste filling has occurred.

The outcomes of the modelling are order of magnitude only, given the uncertainty in the waste tonnages and waste type. Some additional uncertainties regarding the landfill gas generation estimate are the level of leachate in the landfill in the future and the age of the waste placed.

Based on the data provided, it is estimated that the landfill may currently generate between 100 and 300 cubic metres per hour of landfill gas, and that the generation potential is expected to slowly reduce over time.

The estimated gas collection rate is insufficient for the operation of a landfill gas engine, but may be sufficient for operation of a small landfill gas flare. A landfill gas flare can usually be operated if a gas collection rate of at least 100 cubic metres per hour is achieved.

Should landfill gas collection rate fall below 100 cubic metres per hour, then an alternative treatment to flaring would likely be required such as treatment in an activated carbon system to remove trace contaminants in the gas (and associated odours) as identified in the Phase 2 ESA, or a biofilter to oxidise methane.

5.7 Existing monitoring and management requirements

The existing monitoring and management requirements for the site are detailed in the following documents:

- EPL 4,627: WestConnex Delivery Authority, Alexandria Landfill, 10 Albert Street, St Peters, dated 23 March 2015: Waste disposal by application to land. The licence allows for acceptance of: general solid waste (non-putrescible) (application to land); waste tyres (application to land); asbestos waste (application to land); and any waste below the licensing thresholds in Schedule 1 of the POEO Act 1997.
- EPL 12,594: WestConnex Delivery Authority, Alexandria Recycling Centre, 10-16 Albert Street St Peters, dated 24 March 2015: Recovery of general waste and waste storage (other types of waste).
- Sydney Water (TWA No. 29304) for the discharge of treated leachate to a sewer discharge point in Albert Street.

The EPLs are in the process of being formally transferred to Roads and Maritime.

The monitoring and management requirements for the site detailed in the EPLs and TWA are summarised in **Section 9.1**.

This page has been left blank intentionally.

6.0 Proposed final landform and land use

6.1 Final landform

The proposed final landform has been designed to enable the future development of the site as a motorway interchange (St Peters interchange). Drawings and cross sections have been prepared which detail the final landform (refer **Appendix A**). The final landform and topography would make allowance for the construction of the St Peters interchange, including future roadway alignments, which would be constructed on piles extending through the landfill mass to prevent damage associated with differential settlement.

The design of the final landform has included provision for the incorporation of a new landfill cap across the site and the construction of a new landfill leachate treatment plant/collection system (in addition to the existing system) located in the south-western portion of the site. The existing leachate treatment system is currently being upgraded in accordance with an effluent improvement program agreed with Sydney Water. The upgraded system is expected to be fully operational and compliant by the end of 2015. The upgraded system would be retained to offer a level of redundancy until the new system is fully functional after which collected leachate would be diverted to the new leachate treatment plant and the current leachate treatment plant would be decommissioned.

The final landform would consist of the following features:

- A new landfill cap.
- A raised and vegetated containment mound in the south-western portion of the site with a maximum proposed elevation of RL 19 metres AHD and with the steepest batter slope of 2H:1V.
- Allowance for proposed roadway alignments, including embankments and tunnel entrances.
- A new landfill Leachate Treatment Plant / collection system (in addition to the existing system) located in the southern portion of the site. Site areas not used for motorway construction and associated infrastructure will be landscaped (refer to the Urban Design Report, Appendix F of the EIS).

Cut and fill plans reviewed by AECOM (refer Drawing M5-LDS-SKT-700-320-DR-7812 in **Appendix A**) indicate an estimated total of 620,000 cubic metres of material would be cut and an estimated total of 556,000 cubic metres would be filled across the site.

Design measures would be incorporated to address the effect of piles supporting St Peters interchange bridge and roadway structures on the functionality and performance of the capping system and landfill management system infrastructure. Specifically:

- Capping: The majority of areas where piles need to penetrate the capping system are associated with foundation support for road pavements and/or road embankments. In these areas, the pavement / embankment systems would cap the pile area and provide sufficient resistance to water ingress and landfill gas egress around the pile. In areas where piles are needed to support bridge piers, a sealing system using bentonite and geosynthetic materials would be constructed around the piles and/or pile caps.
- Leachate and gas collection system beneath cap: This system comprises a network of closely spaced gravel trenches with collection pipes. The trench spacing would be adjusted in the vicinity of pile installations to provide gaps for pile installation. In the event that existing trenches are penetrated during pile installation, adjacent trenches would collect any disrupted flow such that overall network performance is not compromised.
- Existing (deep) leachate collection system: Piles would be laid out to avoid the locations of the existing collection lines at the landfill base. However, due to location uncertainty, risk would remain that a pile(s) would penetrate a drainage collection line. In general, the likelihood of piling strikes significantly impacting the leachate collection system is considered low. This is because piling strikes would be highly localised, and although local pipe collapse could occur, there would be alternate local flow paths available to adjacent non-collapsed pipe downstream through the remnant collapsed pipe itself or through pipe bedding materials. Notwithstanding, leachate pipe flow rates are very low and alternate flow paths to bypass a localised pipe collapse could occur in the small pore spaces that would remain present.

6.2 Final land use

The final land use of the site would comprise a motorway interchange with associated ancillary facilities and open space (refer Drawing M5-AJV-SKT-700-320-DR-7801 in **Appendix A**). The St Peters interchange has been designed to connect the New M5 to Campbell Road and Euston Road, St Peters and through to Gardeners Road, Mascot, to enable traffic to travel to and from the inner western suburbs of Sydney, the airport precinct and Port Botany via the existing surface road network. The remaining ramps within the St Peters interchange would be opened to provide connectivity between western Sydney and the international gateways of Sydney Airport and Port Botany via the future M4-M5 Link and future Sydney Gateway.

The design for the St Peters interchange has been prepared to provide fully grade separated connectivity for the New M5 and future M4-M5 Link tunnels to / from:

- Euston Road / Campbell Road;
- Gardeners Road; and
- The future Sydney Gateway.

The St Peters interchange would be primarily located on the site, however may incorporate land surrounding the site. Closure of the landfill and remediation/land forming works are required for future beneficial use of the land as part of the project. The St Peters interchange has been designed to incorporate landfill closure considerations including capping, leachate and landfill gas management.

7.0 Landfill closure and rehabilitation

7.1 Closure and stabilisation of the landfill

Key landfill closure milestones and indicative timeframes which inform this LCMP are presented in **Table 13**.

Table 13 Landfill closure works and indicative timing

Landfill closure component	Timeframe ¹
Cessation of the commercial use of Alexandria Landfill for landfilling/recycling (following landfill acquisition by the NSW Government).	20 December 2014
Ongoing monitoring in accordance with the relevant requirements outlined in EPL 4,627, EPL 12,594, TWA 29304 requirements.	January 2015 onwards
Monitoring, maintenance and upgrade of existing site leachate management system.	April 2015 – April 2017*
Completion of Alexandria Landfill phase 2 intrusive site investigations (draft Phase 2 ESA).	May 2015
Preparation of a draft LCMP.	May 2015
Site activities in accordance with EPLs and development consents, including: <ul style="list-style-type: none"> - Processing/removal of various stockpiles of waste and materials stored for resource recovery - Evaluating opportunities to recycle and/or recover materials for re-use - Processing of materials scheduled for reuse - Removing and/or disposing of waste materials assessed to be unsuitable for recycling/reuse or to another suitably licenced landfill facility in accordance with EPA requirements - Stabilisation of a cliff face landslip. 	January 2015 – March 2016
New M5 approval (State and Commonwealth).	April – June 2016
Commencement of bulk earthworks and land forming works including landfill capping and gas management system installation and construction works (incorporating leachate plant construction) ² .	June 2016 – April 2017
St Peters interchange construction and post closure monitoring.	2017 – December 2019
Indicative timeframe for post closure monitoring.	~30 years

1. Denotes indicative timeframe based on existing program of works
2. The landfill cap would be installed post bulk earthworks and formation of the final landform for the interchange. Management systems would occur before and after the installation of the landfill cap, depending on the requirements/function of the system.

This page has been left blank intentionally.

8.0 Site closure – Key components

In accordance with EPA (2015), the key components of the landfill closure works include the following:

- Waste cell preparation works with basal leachate collection system.
- Excavation and transfer of surplus material (based on final landform design).
- Placement of excavated surplus material (in layers).
- Final landfill cap design.
- Landfill gas management.
- Leachate management.

The above components are discussed further in the following sections.

8.1 Final landfill cap design

A final landfill cap design has been developed based on review and evaluation of existing guidance documents, site conditions, existing environment, the proposed future land use setting, and through consultation with the NSW EPA.

The agreed final capping layer comprises the following components:

- A nominal 500 millimetre thick top soil re-vegetation layer with localised thickening to accommodate taller vegetation (if required).
- A minimum 500 millimetre thick low permeability material layer with permeability of 10^{-8} metres per second (minimum of 500 millimetres thickness and 10^{-8} metres per second as agreed with NSW EPA).
- A minimum 300 millimetres thick earth cover, comprising crushed sandstone or selected material.
- Gas collection system located within the waste material substrate.

Where the thickness of the landfill cap is required to be minimised a geo-composite layer (GCL) may be used. The GCL would allow for a reduction in the thickness of the low permeability layer from 500 millimetres to 300 millimetres and hence the thickness of the overall cap without compromising the seepage preventing capability of the layer.

It is noted that laying of the GCL on a 1V:2H or 1V:4H batter may present long term stability issues. As such, where capping on 1V:2H or 1V:4H batter is required, incorporation of a GCL layer is not recommended (subject to further input and advice from the GCL manufacturer).

Details of the proposed landfill cap design and layout are provided on the drawings provided in **Appendix A** (refer Drawings refer Drawings M5-LDS-SKT-700-320-DR-7804- M5-LDS-SKT-700-320-DR-7804 to M5-LDS-SKT-700-320-DR-7804- M5-LDS-SKT-700-320-DR-7806 in **Appendix A**). It is anticipated that rehabilitation/revegetation activities would be undertaken progressively as the final capping layer is completed across the site.

The final capping layer must be constructed in consideration of the cap design outlined in this LCMP. In accordance with NSW EPA (2015) and following construction of the final landfill cap, Roads and Maritime or its nominated representative must submit a Construction Quality Assurance Report (CQAR) to the EPA containing the as-constructed final landfill cap details and addressing the Construction Quality Assurance (CQA) requirements. It is noted that staged approval from NSW EPA is likely to be required throughout the landfill closure process.

The requirements of the CQAR specified in NSW EPA (2015) include the following:

- The proposed testing, inspection and verification procedures to demonstrate that materials and constructed features at the landfill comply with the approved designs and specifications.
- Approval must be obtained from EPA prior to placement of excavated waste within the proposed waste containment cell.
- Specification of sampling locations, frequency of testing, test methods, laboratories, accreditations, applicable specifications, quality standards, data evaluation, acceptance and rejection criteria and contingency measures in the event of failure.

- Description of roles, responsibilities and qualifications/experience of the parties involved in delivering construction quality assurance.
- Engagement of a suitably qualified CQA engineer to verify and report on all CQA matters.
- Appropriately qualified sub-contractors to install geosynthetic materials.
- Drilling sub-contractors installing sub-surface monitoring devices would hold appropriate licences to do this work.
- The Plan would specify the hold points and inspection points for the project.
- Upon reaching each hold point, the Construction Quality Assurance engineer would review all test results for the materials proposed to be used; proposed work methods and quality control procedures; proposed panel layouts for any geosynthetic elements; and each sub-contractor's credentials.
- When each stage has been completed, the engineer would review a work-as-executed survey of the completed work. At all of these points, work would stop and would not restart until the engineer has reviewed the documentation and given approval for the project to continue.
- The CQA engineer is required to undertake site inspections of the work at all of these points and should be present when all samples are taken for the testing of construction materials. At a minimum, hold and inspection points would be established at the start and finish of the following stages during construction of the leachate barriers and final capping: trial pad activities, sub-base, bearing layers, each lift of clay liner or sealing layer, the finished top surface of the clay liner or sealing layer, drainage layers, all geosynthetic layers, protection layers, pipework, landfill gas controls, penetrations of liners by leachate and gas collection infrastructure, and monitoring installations.
- Response actions are required if there are variations to the approved designs and specifications and the Construction Quality Assurance Plan. If a major variation arises, work would stop on the affected element and the licensee should notify the EPA in writing, seeking a licence variation. For minor variations, notification is not required; it is sufficient for the Construction Quality Assurance engineer to note the variation in the final Construction Quality Assurance Report and to confirm that the variation did not compromise achievement of the minimum standards in these guidelines.
- If staged construction is proposed, this would be noted in the Construction Quality Assurance Plan. The most common example of this is where the walls of a new cell will be constructed progressively as the waste height rises. The licensee would submit an addendum to the Construction Quality Assurance Report upon completion of each new portion of the cell wall.

8.1.1 Growing media establishment following installation of cap

Establishing an appropriate substrate growing medium capable of supporting vegetation is vital to the success of future landscaping and revegetation activities. In all areas where landscaping is required, a suitable revegetation layer will be applied prior to revegetation activities being undertaken. Revegetation layer requirements would be detailed in a vegetation management plan or similar prepared for the site as part of the overarching landscaping strategy for the site.

The final landscape plans, including selected species, would be confirmed during detailed design. However, the design of the cap, the thickness of the growing medium, species used and planting plans as presented in the landscape strategy have been determined to ensure that root systems do not penetrate through the base of the cap. During detailed design, soil mixes and subgrade treatments across the project would be developed (which would account for specific requirements across the project), and would be supported by soil management protocols and treatments to provide optimum growing environments for all new landscape works.

Landscape maintenance / monitoring post planting would be undertaken in accordance with the Roads and Maritime Specification R179 "Landscape Planting.

8.1.2 Revegetation

It is anticipated that revegetation would be undertaken using a variety of techniques including direct seeding, tubestock plantings and natural regeneration (from topsoil seedbank). Measures such as fencing and tree guards would be implemented to protect the revegetated areas from predation and browsing. All revegetation works would be undertaken in accordance with a site specific vegetation management plan developed for the site.

Vegetation would be selected based on consideration of the following attributes:

- Rapid and sustainable establishment.
- Ability to stabilise the ground surface and protect the cap from erosion.
- Sustain high evapotranspiration rates.
- Extend roots into all areas of the cap for moisture removal.
- Ensure growth and coverage through all seasons.
- Survive sub-optimal seasons (such as droughts), and be resilient (able to continue to meet the performance objectives despite extreme weather, fire, weeds, grazing and pests).

8.2 Landfill gas management

Based on the existing dataset and the landfill gas generation estimate, the landfill gas management system would comprise:

- A radial subsurface gas drainage system connecting to a main trunk system and gas collection system. The subsurface drains will be concentrated in areas of identified potential gas accumulation.
- Gas drains constructed from 100 millimetres outside diameter (OD) slotted PVC within an engineered fill substrate. The engineered substrate will be placed over the compacted landfill waste surface. Capping layers as described in the above sections will be placed over the gas drainage network.
- Vertical gas collection wells targeting areas where additional gas mitigation is required are proposed.
- A network of subsurface landfill gas wells to monitor the effectiveness of the mitigation systems and comply with EPL conditions.
- Subject to detected landfill gas concentrations, the gas extraction system may be an active (forced) or passive gas extraction system. Active extraction systems remove gas under vacuum, which is subsequently pumped to a central collection/emission point for energy recovery or flaring. Passive gas drainage systems transfer gas by atmospheric pressure differentials. Gas would subsequently be directed for treatment to a microbiological gas system (less than 100 cubic metres per hour) or to a passive flare (subject to gas flow greater than 100 cubic metres per hour).
- If gas flaring is undertaken the flare is proposed to be located in the south-west portion of the site as shown on Drawing M5-AJV-SKT-700-320-DR-7802 in **Appendix A**.

The details of the final gas management system would be refined following confirmation of gas concentrations across the site. Details of the proposed gas management system and layout are provided on the design drawings in **Appendix A**.

8.3 Landfill Fire Management

The risk and proposed management of surficial and deep-seated landfill fires are described below.

Surficial fires (occurring at or near the surface of the earth) are caused by the combustion of exposed solid waste materials and are generally triggered by an ignition source coming into contact with uncovered waste. Surficial fires can also be initiated by excavation and exposure to air of waste that has developed an elevated temperature due to internal decomposition. The risk of starting a surficial fire may be significant during waste excavation and capping works and would be mitigated by restricting potential ignition sources and by potholing of waste prior to excavation to identify landfill gas 'hotspots'. Surficial fires would be relatively easily identified and extinguished with common firefighting equipment that would be present at site during the closure works.

Deep-seated fires are caused by the combustion of below-ground solid waste materials. These fires are generally initiated by oxygen entering the waste mass and coming into contact with waste that has developed an elevated temperature due to internal decomposition. The risk of a deep-seated fire occurring is generally related to the ingress of atmospheric oxygen into the waste through surface pathways such as gaps/defects in the capping system and poorly sealed landfill gas extraction wells or other surface structures. The risk of oxygen ingress would be mitigated in design by developing appropriate design details for the capping system and landfill gas extraction wells. Long-term mitigation would be provided through inspection and maintenance of the capping system and landfill gas extraction wells and appropriate operation procedures for landfill gas extraction. In

particular, balancing landfill gas extraction rates with gas generation rates would reduce potential to draw air into the waste mass.

The overall likelihood of a landfill fire occurring is considered low due to the lack of readily decomposable (putrescible) waste in the landfill.

In the case that a deep-seated landfill fire did occur, impacts to open space and surrounding land would be mainly related to odour, smoke generation, and temporary reduction in landfill gas extraction. Potential impacts onto the road infrastructure would be mainly related to potential settlement of non-piled structures. The likelihood of early detection of a deep-seated fire would be increased through ongoing monitoring of landfill gas extraction wells for elevated gas temperatures and for the presence of oxygen or combustion products such as carbon monoxide. If signs of a fire are detected, the following management measures could be employed:

- Landfill gas extraction system temporary shutdown (to reduce potential oxygen ingress).
- Thermal imaging to identify location of fire.
- Location and sealing of the surface ingress of oxygen.
- Deep injection of nitrogen or water to control the fire.

8.4 Leachate drainage layer

In accordance with the requirements outlined in NSW EPA (1996), the leachate drainage layer should incorporate the following elements:

- a drainage layer with a thickness of greater than 30 centimetres. The drainage material should exhibit a coefficient of permeability $K > 1 \times 10^{-3} \text{ ms}^{-1}$.
- The drainage media should be selected to have sufficiently large pore space to prevent encrustation. Gravel or a combination of gravel and a geonet may be used. The gravel selected ideally should be:
 - Rounded.
 - Of grain size greater than 20 millimetres.
 - Smooth-surfaced.
 - Non-reactive in mildly acidic conditions.
 - Relatively uniform in grain size.
 - Free of carbonates that could form encrustations around the collector pipes.
 - Geotextiles should not be used where their low porosity and consequent encrustation could result in blockage of the drainage system.
- Perforated collector pipes should be placed within the drainage layer at intervals of not more than 50 metres to facilitate the collection and discharge of leachate. These pipes should generally:
 - Be a minimum 150 millimetres in diameter.
 - Be strong enough not to collapse under the weight of the waste.
 - Have a minimum longitudinal gradient of one percent.
 - Be capable of being rinsed and monitored.

The drainage media should comprise a full gravel layer across the entire newly installed leachate drainage network. A 'french drain' gravel drainage layer around the drainage collector pipes is not considered appropriate for the site.

Details of the proposed gas management system and layout are provided on the design drawings provided in **Appendix A**.

8.5 Leachate management

Prior to NSW Government ownership of the site, the Sydney Water TWA permitted a treated leachate disposal rate of 620 kilolitres per day. Following site acquisition by the NSW Government, Sydney Water prepared an updated TWA with the following permissible rates of discharge to sewer:

- Instantaneous maximum rate of gravitated discharge – 15 litres per second.
- Maximum daily discharge 1000 kilolitres.
- Average daily discharge – 500 kilolitres.

An effluent improvement program has been agreed with Sydney Water to upgrade the leachate treatment plant to a compliant standard S which outlines the steps to achieve reliable full compliance with the ammonia TWA discharge limit of less than 100 milligrams per litre within six months. Upgrade works to the leachate treatment plant have commenced and it is expected that the upgrade would be completed by the end of 2015.

The existing leachate treatment plant system is currently being upgraded to treat a minimum of 100 kilolitres per day of raw leachate from the site and be compliant for the next two years (until 2017). Roads and Maritime would design and construct a new leachate treatment plant (with an approximate maximum leachate treatment capacity of 200 kilolitres per day) in the western portion of the site (refer AECOM, 2015j in **Appendix D**). Construction of the new leachate treatment plant is proposed to commence in 2016 for completion in 2017. The construction of the leachate treatment plant is discussed further in the following sections.

8.5.1 Leachate treatment plant

A new leachate treatment plant would be constructed to mitigate the risk of system failure associated with the existing aging facility. It is assumed that the existing plant would be removed but selected components of the collection system would remain and be incorporated in the new leachate collection system. A summary of the proposed changes are provided below:

- The existing subsurface collection grid located at depth on the circa 2000 landfill pit floor and associated sump and well riser. The well riser is to be extended and a new pump and rising main installed to connect into the new network. Note that the existing collection grid layout is derived from historical records which are not based on “as constructed” records. As such, the location, form and condition are unknown. Pumping from this system is however considered to be of benefit and is anticipated to continue as long as the existing collection system remains functional.
- The leachate treatment plant will biologically treat the raw leachate to remove the high levels of ammonia which are typically found in landfill leachate wastewaters. The ammonia is converted to nitrate by providing aeration to bioreactors. Treated water is then pumped to sewer.
- The proposed leachate treatment system has been designed to treat double the current daily flow inputs to the site (200 kilolitres per day). The proposed design limits were adopted for planning purposes and can be up-scaled to allow for increased capacity if required.
- The layout for the treatment plant requires sealed access roadways and paved surface to ensure containment of spills from either waste water or chemicals. The design vehicle would be a flatbed truck as typical for the delivery of chemicals, or the maintenance of equipment. A bunded chemical unloading area has been included in the pavement design.
- Botany Sands groundwater interception drain, sump and pump system is to be retained/upgraded/replaced as required.

8.5.2 Stormwater and leachate pump station

The design of the stormwater and leachate system is shown on Drawing M5-AJV-SKT-700-320-DR-7801 in **Appendix D**. The key landfill closure components are summarised below:

- The existing leachate collection system would be maintained in the short term, although it is anticipated that the system may cease to function in the near future based on the historical performance and the anticipated life of similar systems;
- Construction of a new leachate collection system at the base of the proposed waste containment cell, prior to placement of waste. The new leachate collection system would be installed to collect leachate under the capping layer for new works in fill material, the new landfill cell and the subsoil drain at the toe of batters;

- Collected leachate will be pumped to a new leachate treatment plant through a rising main. Treated leachate would continue be discharged into the local sewer system under a Sydney Water TWA;
- Stormwater runoff outside the tunnel portal, including pavement and batter run-off will be collected through a pipe and pit stormwater system into the stormwater pump station which would be equipped with water quality control installations including, gross pollutant collection, sedimentation collection and hydrocarbon spill collection;
- Collected stormwater would be pumped to the surface through a rising main and conveyed to a water quality control basin before discharging to Alexandra Canal (to be approved); and
- The proposed system is shown in Figure 1 in **Section 8.4** below.

Further information regarding location of the combined pump station and concept development for the combined pump station is provided in AECOM 2015j in **Appendix D**.

8.6 Surface water drainage management

The proposed surface water drainage design is shown in the following figures in **Appendix A**:

- M5-AJV-DWG-700-320-DR-7251 – Drainage and Water Quality Plan Sheet 1
- M5-AJV-DWG-700-320-DR-7252 – Drainage and Water Quality Plan Sheet 2
- M5-AJV-DWG-700-320-DR-7253 – Drainage and Water Quality Plan Sheet 3
- M5-AJV-SKT-700-320-DR-7251 - Drainage and Water Quality Catchment Plan 1
- M5-AJV-SKT-700-320-DR-7252 - Drainage and Water Quality Catchment Plan 2
- M5-AJV-SKT-700-320-DR-7253 - Drainage and Water Quality Catchment Plan 3
- M5-SKT-DWG-700-320-DR-7271 - Drainage and Water Quality Catchment Plan

There are six proposed sub catchments within the site:

- A – Canal Road portal catchment
- B – Campbell Street portal catchment
- C – Western catchment
- D – Campbell Road to Euston Road intersection catchment
- E – Minor catchment (eastern portion of the site)
- F – Minor catchment (south west portion of the site)

Surface water runoff from, batters and pavements will be diverted to either the Canal Road or Campbell Street Stormwater Pump Station where there would be a gross pollution trap and hydrocarbon collection. The surface water would then be discharged into a water quality basin and then final discharge into the Alexandra Canal.

8.7 Asbestos management

As an outcome of the Phase 2 ESA, asbestos containing materials (including friable asbestos), have been identified at the site. As such, an interim Asbestos Management Plan (AMP) has been prepared for the management of asbestos containing materials (ACM) that may be encountered during current operations at the site. This document has been provided in **Appendix E** for information purposes only. It is noted that a new AMP would need to be prepared by the landfill closure/remediation contractor that specifies site management requirements which are specific to the adopted landfill closure methodology, outline the management requirements to control the asbestos hazard and mitigate risk both during and post landfill closure. The AMP would also nominate specific roles and responsibilities of the personnel responsible for implementing the plan.

9.0 Proposed management and monitoring

It is noted that the requirements outlined in the EPLs and TWA which applied during the active landfilling, recycling and waste transfer phase of landfill operations have been transferred to WestConnex Delivery Authority (and eventually to Roads and Maritime) as the new custodians of the site and would remain in force during the landfill closure phase of operations. Monitoring is currently being undertaken in accordance with current EPL and TWA requirements. It is anticipated that the EPL requirements would be superseded and a new monitoring program developed following installation of the final capping layer and associated leachate and gas management and monitoring infrastructure. These monitoring requirements are contemplated in the management plans detailed in **Appendices F, G, H and I**.

The landfill closure phase monitoring and post closure requirements are detailed in **Sections 9.1 and 9.2**.

9.1 Landfill closure phase monitoring and management requirements

During the landfill closure phase the monitoring and management requirements would largely be guided by the existing EPLs and TWA requirements which have been transferred over to WestConnex Delivery Authority (and eventually Roads and Maritime) following site acquisition. It is noted that the ultimate responsibility for the EPL monitoring would be transferred to the landfill remediation contractor (subject to EPA approval).

A summary of the applicable monitoring and management requirements are provided in **Table 14 to Table 16**.

This page has been left blank intentionally.

Table 14 Monitoring and management requirements stipulated in EPL 4,627 (prior to landfill closure works)

Task	Details		Reference (where applicable)	Applicable prior to commencement of landfill closure (Yes/No)
Groundwater quality monitoring	Locations: MW01, MW02s, MW02d, MW03, MW04	<ul style="list-style-type: none"> - Standing water level monitored quarterly - Quarterly Analytes: Alkalinity (CaCO₃), bicarbonate, calcium, chloride, magnesium, nitrogen (ammonia), pH, potassium, sodium, sulfate, total dissolved solids (TDS) - Annual Analytes: Aluminium, arsenic, barium, benzene, cadmium, chromium (hexavalent), chromium (total), cobalt, copper, ethylbenzene, fluoride, lead, mercury, nitrate, nitrite, organochlorine pesticides (OCPs), organophosphate pesticides (OPPs), polycyclic aromatic hydrocarbons (PAHs), toluene, total organic carbon (TOC), total petroleum hydrocarbons (TPH), total phenolics, xylenes and zinc 	Figure 5 Leachate & Groundwater Management Features in Alexandria Landfill Site Revised Surface Water & Leachate Management Plan September 2004	Yes
Leachate quality monitoring	Location: Leachate Sump	<ul style="list-style-type: none"> - The licensee must measure the level of leachate daily, prior to pumping from the leachate sump - Standing water level quarterly (same date as analysis below) - Quarterly Analytes: Alkalinity (CaCO₃), bicarbonate, calcium, chloride, magnesium, nitrogen (ammonia), pH, potassium, sodium, Sulfate, TDS, aluminium, arsenic, barium, benzene, cadmium, chromium (hexavalent), chromium (total), cobalt, copper, ethylbenzene, fluoride, lead, mercury, nitrate, nitrite, OCPs, OPPs, PAHs, toluene, TOC, TPH, total phenolics, xylenes and zinc 	Figure 5 Leachate & Groundwater Management Features in Alexandria Landfill Site Revised Surface Water & Leachate Management Plan September 2004	Yes
Leachate	Defined as water which has come into contact with waste/the tipping face/the green waste processing/storage areas, liquid removed from the leachate collection system, treated or untreated	<ul style="list-style-type: none"> - By 16 August 2012 the licensee must install the leachate drainage system (leachate sump, interception drain and injection trench) in accordance with the document titled 'Filling Plan' dated May 2012 prepared by Genesis - Within two weeks of installing the leachate drainage system the licensee must submit to the EPA as built design drawings 		No
		<ul style="list-style-type: none"> - Leachate must only be disposed of by pumping to sewer, or removed from the premises by tanker and disposed of lawfully off-site - Leachate must not be used in the truck was facility at the premises. - Leachate must not be irrigated and/or used for dust control at the premises. - The licensee must maintain the level of leachate below -16.0 metres AHD and at least 0.5 metres below the standing groundwater level. 		Yes

Task	Details	Reference (where applicable)	Applicable prior to commencement of landfill closure (Yes/No)
Landfill Gas	<p>“Wood waste” is any unprocessed timber or green waste and any processed timber and green waste</p>		Yes

Task	Details	Reference (where applicable)	Applicable prior to commencement of landfill closure (Yes/No)	
Waste	Site is licensed to receive general solid waste (non-putrescible, no garden or wood waste), waste tyres, asbestos waste and any waste below the licensing thresholds	<ul style="list-style-type: none"> - All asbestos waste must be disposed at the Premises in accordance with the document titled 'Filling Plan' dated May 2012 prepared by Genesis and correspondence from the Licensee dated 21 June 2012 titled 'Alexandria Landfill Pty Ltd, Disposal of Asbestos Waste EPL 4,627' - All asbestos waste must be covered immediately to a depth of at least 0.15 metres and at the end of each day's operation, to a depth of 0.5 metres as per the requirements of Clause 42 of the POEO (Waste) Regulation 2005 	Schedule 1 of the POEO Act	No
Noise	Noise from the premises must not exceed an LA10 (15 minute) noise emission criterion of 50dB (A) except as expressly provided by this licence		Yes	
Potentially offensive odour	No condition of this licence identifies a potentially offensive odour for the purposes of Section 129 of the POEO Act 1997	Section 129 of the POEO Act 1997 indicates that the licensee must not cause or permit the emission of an offensive odour from the premises but provides a defence if the emission is identified in the relevant environment protection licence as a potentially offensive odour and the odour was emitted in accordance with the conditions of a licence directed at minimising odour	Section 129 of the POEO Act 1997	Yes
Dust	All operations and activities occurring at the premises must be carried out in a manner that will minimise the emission of dust from the premises		Yes	

Task	Details	Reference (where applicable)	Applicable prior to commencement of landfill closure (Yes/No)
Stormwater	<ul style="list-style-type: none"> - The tipping face must be surrounded by a 300 millimetre high impermeable bund which will prevent stormwater from flowing across the tipping face - Any stormwater which comes into contact with waste (other than inert waste), the tip face and/or the green waste areas must be managed in the same manner as leachate - Stormwater run-off from quadrant A and C must not enter quadrant B, unless otherwise approved by the EPA - The licensee must treat the liquid in the stormwater pond in quadrant C as leachate. The EPA would vary this condition to permit the water to be managed as stormwater provided the licensee can provide evidence to demonstrate that the water does not contain leachate 		Yes

Table 15 Monitoring and management requirements stipulated in EPL 12,594

Task	Details	Reference	Applicable prior to commencement of landfill closure (Yes/No)	
Dust monitoring	Dust Monitoring Points: DG1, DG2, DG3, DG4	PM10 (grams per square metre per month) quarterly in accordance with Australian Standard 3580.10.1-2003 The POEO (Clean Air) Regulation 2010 requires testing for certain Analytes as per the Methods for the Sampling and Analysis of Air Pollutants in NSW	Diagram attached to the letter to the Environment Protection Authority dated 30 January 2012 The POEO (Clean Air) Regulation 2010	Yes
Weather monitoring	<ul style="list-style-type: none"> - The licensee must monitor by sampling and obtaining results by analysis the parameters specified - The licensee must use the sampling method, units of measure, averaging period and sample at the frequency specified below: <ul style="list-style-type: none"> • Rainfall (millimetres) daily in accordance with sampling method AM-4 • Wind Speed at two metres (metres per second) continuous with a three hourly averaging period in accordance with sampling method AM-2 and AM-4 • Wind Direction at two metres continuous with a three hourly averaging period in accordance with sampling method AM-2 and AM-4 • Temperature at two metres (°C) continuous with a three hourly averaging period in accordance with sampling method AM-4 		Yes	
Groundwater monitoring	Refer requirements of EPL 4,627		Yes	
Leachate monitoring	Refer requirements of EPL 4,627		Yes	

Task	Details	Reference	Applicable prior to commencement of landfill closure (Yes/No)
Waste	<p>Waste Storage and Resource Recovery</p> <p>The following wastes received at the premises must meet the following conditions:</p> <ul style="list-style-type: none"> - Foundry Sands: As defined in the foundry sand in recovered aggregate exemption 2008 - Soils: That meet the CT1 thresholds for General Solid Waste in Table 1 of the Waste Classification Guidelines in accordance with the following limits: Arsenic (40 milligrams per kilogram), cadmium (two milligrams per kilogram), copper (200 milligrams per kilogram), mercury (1.5 milligrams per kilogram), zinc (600 milligrams per kilogram), TPH C6-C9 (150 milligrams per kilogram) TPH C10-C36 (16 milligrams per kilogram), PAHs (80 milligrams per kilogram), PCBs (individual) (1 milligrams per kilogram) - No potential or actual acid sulfate soils is to be received at the premises - Garden Waste, Wood Waste, Metal Waste, Glass, Plastic, Building and Demolition Waste: As defined in Schedule 1 of the POEO Act 1997 Maximum of 240,000 tonnes of waste processed per annum - General or Specific exempted Waste: Waste that meets all the conditions of a resource recovery exemption under Clause 51A of the POEO (Waste) Regulation 2005 - Waste: Any waste received on site that is below the licensing thresholds in Schedule 1 of the POEO Act 1997 - No disposal of landfilling of waste must occur at the premises 		No

Task	Details	Reference	Applicable prior to commencement of landfill closure (Yes/No)
	<p>Stockpiles</p> <ul style="list-style-type: none"> - By 10 April 2012, the licensee must install a permanent stockpile height marker for all stockpiles located within 50 metres of properties at 2 Bishop St, St Peters that shows the height of 3 m so that a visual check can be made against the marker to determine the height of the stockpiles - Stockpiles of waste or recovered material (including stockpiled materials already processed on site) must not exceed the following limits: Wood waste for reuse – 2000 tonnes Shredded wood waste and garden waste – 2000 tonnes Metal, Glass, Plastic – 500 tonnes each Building and Demolition Waste – 180,000 tonnes - Stockpiles of processed or unprocessed waste (except bitumen) with particle size less than 20 mm should only be located within the Pit Are of the premises as shown on Plan 1 – General Layout – Proposed Waste Transfer Station dated 27/10/005 within development consent No. 11646 of 2004 issued by the Land and Environment Court of New South Wales on 28 September 2006 - Height of stockpiles as per EPL 4,627 - All stockpiles of waste within 75 metres of the north and north-western boundary of the premises must be located behind the physical barriers being shipping containers and walls in accordance with specifications outlined in Dial-A-Dump Industries letter dated 26 February 2010 (EPA Reference DOC10/9109) - Waste processing, crushing and grinding activities must only occur below eight metres RL and at the locations shown on Plan 1 – General Layout – Proposed Waste Transfer Station dated 27/10/005 within development consent No. 11646 of 2004 issued by the Land and Environment Court of New South Wales on 28 September 2006 		No
Potentially offensive odour	Refer requirements of EPL 4,627		Yes

Task	Details	Reference	Applicable prior to commencement of landfill closure (Yes/No)
Surface Water and Leachate Management	<ul style="list-style-type: none"> - The licensee must operate the facility in accordance with the document titled "Alexandria Landfill Site Revised Surface Water and Leachate Management Plan" dated September 2004, prepared by Ian Grey Consulting Pty Limited (Report ID AJ001/Rp003 Rev D) - All stormwater and stormwater treatment devices (including drainage systems, sumps and traps) must be regularly maintained 		No
Landfill Gas	<p>Refer requirements of EPL 4,627, with the exception of the addition:</p> <ul style="list-style-type: none"> - The licensee must notify the EPA as soon as practicable and in any case within 48 hours after it becomes aware of methane concentrations in any wood waste stockpile exceeding 12,500 parts per million 		Yes
Stormwater	<ul style="list-style-type: none"> - By 17 September 2012 the licensee must install the new stormwater drain and dam system in accordance with the document titled 'Filling Plan' dated May 2012 prepared by Genesis - Within two weeks of installing the stormwater drain and dam the licensee must submit to the EPA as built design drawings 		No
Dust	<ul style="list-style-type: none"> - Dust spray systems must be installed and operated to minimise dust from all stockpiles and processing areas at the facility - Dust sprays and/or dust collection systems must be installed and operating on all crushing, grinding and screening equipment at the facility - The licensee must ensure that all stockpiles are wetted prior to waste being removed from them for processing, and that during processing, they are kept wet and high-pressure water sprays are utilised to prevent the mitigation of dust - The vehicle routes in use around the premises, except for concrete hardstands, are to be kept damp from 0700 to 1700 Monday to Friday and 0700 to 1600 Saturday 		Yes

Table 16 Existing monitoring and management requirements as stipulated in TWA 29304

Task	Details	Applicable to Closure Phase (Yes/No)
Trade Waste Water	<ul style="list-style-type: none"> - The Customer may discharge trade wastewater into the Sewer in a manner whereby the substance characteristics of the trade wastewater are of a type and discharged at a rate, level or concentration equal to or less than that described in this schedule - Analyte Limits: <ul style="list-style-type: none"> Ammonia as N: Long Term Average Daily Mass (LTADM) 1.5 kilograms per day Maximum Daily Mass (MDM) 25 kilograms per day Standard 100 milligrams per litre Suspended Solids: LTADM 5 kilograms per day <ul style="list-style-type: none"> MDM 20 kilograms per day Standard 600 milligrams per litre Total Dissolved Solids: LTADM 450 kilograms per day <ul style="list-style-type: none"> MDM 674 kilograms per day Standard 1000 milligrams per litre Barium: LTADM 0.21 kilograms per day <ul style="list-style-type: none"> MDM 1 kilograms per day Standard 5 milligrams per litre Iron: LTADM 0.7 kilograms per day <ul style="list-style-type: none"> MDM 4 kilograms per day Standard 50 milligrams per litre - Property Limits: <ul style="list-style-type: none"> Temperature: Not to exceed 38 degrees Celsius Colour: Determined on a system specific basis pH: Within the range 7.0 to 10.0 Fibrous material: None which could cause obstruction to Sydney Water's sewerage system Gross solids (other than faecal): A maximum linear dimension of less than 20 millimetres, a maximum cross section dimension of six millimetres and a quiescent setting velocity of 3m/h Flammability: Where flammable and/or explosive substances may be present, the customer must demonstrate to the satisfaction of Sydney Water that there is no possibility of explosions or fires occurring from the sewerage system. The flammability of the discharge must never exceed five per cent of the Lower Explosive Limit (LEL) at 25 degrees Celsius. - Rate of discharge: <ul style="list-style-type: none"> Instantaneous maximum rate of gravitated discharge six litres per second Maximum daily discharge 620 kilolitres Average daily discharge 121 kilolitres - Sampling Analysis, flow rates and volume determination as per Appendix C 	Yes

This page has been left blank intentionally.

9.2 Post closure phase monitoring and management requirements

The following table summarises proposed monitoring activities to be undertaken at the site post construction of final landform (e.g. capping). It is anticipated that one EPL would be adapted for the site post closure with details regarding the specific monitoring locations and targets to be confirmed following completion of the construction phase. The monitoring requirements stipulated below are largely based on the existing monitoring requirements for EPL 4,627, EPL 12,594 and TWA 29,304.

Table 17 Proposed post closure monitoring and management summary

Task	Details
Groundwater quality monitoring	<p>Locations to be confirmed post construction phase</p> <ul style="list-style-type: none"> - Standing water level monitored quarterly - Quarterly Analytes: Alkalinity (CaCO₃), bicarbonate, calcium, chloride, magnesium, nitrogen (ammonia), pH, potassium, sodium, sulfate, total dissolved solids (TDS) - Annual Analytes: Aluminium, arsenic, barium, benzene, cadmium, chromium (hexavalent), chromium (total), cobalt, copper, ethylbenzene, fluoride, lead, mercury, nitrate, nitrite, OCPs, OPPs, PAHs, toluene, TOC, TPH, total phenolics, xylenes and zinc <p>Additional monitoring requirements to be undertaken in accordance with the approved Groundwater and Leachate Monitoring Plan (Appendix F)</p>
Leachate quality monitoring	<p>Locations to be confirmed post construction phase</p> <ul style="list-style-type: none"> - The licensee must measure the level of leachate daily, prior to pumping from the leachate sump - Standing water level quarterly (same date as analysis below) - Quarterly Analytes: Alkalinity (CaCO₃), bicarbonate, calcium, chloride, magnesium, nitrogen (ammonia), pH, potassium, sodium, sulfate, TDS, Aluminium, arsenic, barium, benzene, cadmium, chromium (hexavalent), chromium (total), cobalt, copper, ethylbenzene, fluoride, lead, mercury, nitrate, nitrite, OCPs, OPPs, PAHs, toluene, TOC, TPH, total phenolics, xylenes and zinc <p>Additional monitoring requirements to be undertaken in accordance with the approved Groundwater and Leachate Monitoring Plan (Appendix E)</p>
Leachate	<p>Defined as water which has come into contact with waste/the tipping face/the green waste processing/storage areas, liquid removed from the leachate collection system, treated or untreated</p> <ul style="list-style-type: none"> - Leachate must only be disposed of by pumping to sewer, or removed from the premises by tanker and disposed of lawfully off-site - Leachate must not be used in the truck wash facility at the premises - Leachate must not be irrigated and/or used for dust control at the premises - The licensee must ensure containment by maintaining an inward hydraulic gradient - The licensee must notify DEC of the actions it will take to dispose of leachate in compliance with the conditions of this licence, in the event that it no longer has an agreement with Sydney Water to dispose of up to 792 kilolitres per day of treated leachate to sewer. This advice must be provided to DEC within seven days of the licensee no longer having access - The licensee must notify EPA as soon as practicable and in any case within 48 hours after it becomes aware that the leachate level in the riser is has exceeded the proposed target depth - The licensee must provide to the EPA each quarter copies of a written log used to record the leachate levels in the sump <p>Additional monitoring and management requirements to be undertaken in accordance with the approved Leachate Extraction Management Plan (Appendix G) and the approved Groundwater and Leachate Monitoring Plan (Appendix F)</p>

Task	Details	
Landfill Gas	Landfill gas system requirements and monitoring to be undertaken in accordance with the approved Landfill Gas Extraction Management Plan in Appendix H	
Capping	Regular surface integrity inspections would be conducted to confirm requirements for capping improvement works. Monitoring would be conducted in accordance with Section 9.2 (p. 55) of the NSW EPA (2015) Draft Environmental Guidelines: Solid Waste Landfills 2 nd Edition	
Noise	Noise from the premises must not exceed an LA10 (15 minute) noise emission criterion of 50dB (A) except as expressly provided by the new EPL	
Potentially offensive odour	No condition of the existing EPL identifies a potentially offensive odour for the purposes of Section 129 of the <i>POEO Act 1997</i>	Section 129 of the POEO Act 1997 indicates that the licensee must not cause or permit the emission of an offensive odour from the premises but provides a defence if the emission is identified in the relevant environment protection licence as a potentially offensive odour and the odour was emitted in accordance with the conditions of a licence directed at minimising odour
Dust	All operations and activities occurring at the premises must be carried out in a manner that will minimise the emission of dust from the premises	

10.0 Operational responsibilities and reporting requirements

10.1 Operational responsibilities

The current operational responsibilities for the site are summarised in **Table 18**. It is noted that the required operational items and associated responsibilities are likely to change as work on site progresses, particularly during the post closure phase of monitoring. As such, a Site Management Plan (SMP) detailing site operations, roles and responsibilities would require preparation by the landfill/remediation contractor. The operational responsibilities outline therein should be updated regularly to reflect changing compliance requirements. It is noted that the ongoing management of the site is the responsibility of the landfill/remediation contractor.

Table 18 Current operational responsibilities

Item	Description	Compliance requirement of:
Site Management	<ul style="list-style-type: none"> - A nominated Site Manager must be present during the hours of operation - Access to the site will be controlled - Site will be securely fenced 	EPL 12,594
Hours of Operation	<ul style="list-style-type: none"> - Processing of materials and arrival and departure of trucks: 0700 to 1800 Mon to Fri and 0730 to 1600 Sat - For inward movement of goods only (no processing or outward movement): 0900 to 1500 Sun and on public holidays for trucks less than two tonne - For maintenance and office activities: 0700 to 1900 Mon to Fri and 0730 to 1700 Sat 	EPL 12,594
Stockpile Management	<ul style="list-style-type: none"> - The height of any stockpile of waste within 50 metres of properties located at 2 Bishop Street must not exceed three metres. - All stockpiles of waste 	EPL 12,594
Dust Management	<ul style="list-style-type: none"> - Dust spray systems must be installed and operating to minimise dust from all stockpiles and processing areas at the facility - Dust sprays and/or dust collection systems must be installed and operating on all crushed, grinding and screening equipment at the facility - All stockpiles are wetted prior to waste being removed from them for processing, and that during processing, they are kept wet and high-pressure water sprays are utilised to prevent the migration of dust - Vehicle routes in use around the premises, except for concrete hardstands, are to be kept damp from 0700 to 1700 Mon to Fri and 0700 to 1600 Sat 	EPL 12,594
Preventing Fires	<ul style="list-style-type: none"> - All operations and activities occurring at the premises must be carried out in a manner that will prevent and minimise the risk of fire at the premises - Any fires at the premises must be extinguished as soon as possible 	EPL 12,594
Wheel Wash	<ul style="list-style-type: none"> - All vehicles leaving the site must be first put through an operating wheel wash except those that have been in the landfilling or the material processing areas 	EPL 12,594

10.2 Reporting frequency

The current reporting responsibilities for the site are summarised in **Table 19**.

Table 19 Current reporting responsibilities

Item	Frequency	Description	Compliance requirement of:
Annual Report	Annual	An annual return is to be prepared that includes: <ul style="list-style-type: none"> - A statement of EPL compliance; and - A summary of monitoring results and complaints register 	EPL 4,627 and EPL 12,594
Notification of Material Harm	Each occurrence		EPL 4,627 and EPL 12,594
Waste Levy Reporting	Monthly	Record all materials entering and leaving the site using the site weighbridge and software to enable monthly Section 88 reporting to the EPA utilising the WMCR online system and e-certify the monthly report	Section 88 of the POEO Regulation
Volumetric Survey	Biannual	Volumetric survey of the premises carried out by a registered surveyor: <ul style="list-style-type: none"> - During June in each year and provided to the EPA in the approved form and manner by no later than 31 July in that year; and - During December in each year and provided to the EPA in the approved form and manner by no later than 31 January in that year 	EPL 12,594
TWA Reporting	22 day intervals in accordance with TWA	Submit results of composite sampling analysis to Sydney Water within 21 days from the date the sample was collected.	TWA consent No:29304

Note: During landfill closure works (from the access date to the site of the preferred landfill/remediation contractor) and during the defect liability period completed "Construction works, including landfill closure works", these responsibilities are expected to be undertaken by the environmental management representative for the project (subject to EPA approval).

Following completion of landforming works, including final capping, installation of the new leachate treatment plant and landfill gas management system, the monitoring plan and reporting requirements would be amended to reflect the revised site conditions in accordance with the management plans in provided in **Appendices F, G and H**.

11.0 Closure phase communications and reporting

11.1 Communications protocols

Relevant site contact details for the landfill/remediation contractor shall be documented in the SMP to be prepared by the landfill/remediation contractor.

11.2 Environmental audit schedule

The landfill/remediation contractor would prepare an audit schedule and develop audit tools to examine the effective implementation of the WHS Management System, assess compliance and drive continuous improvement. Audit tools would include the following:

- Workplace audit;
- Mobilisation/Systems audit; and
- Weekly inspection.

Site Audits would be carried out monthly by the landfill/remediation contractor or their representatives on a monthly basis.

Formal weekly inspections would be carried out by the site management team and contractor supervision. The inspection is a forum to identify any hazards that may exist in the workplace or the work being carried out. Any hazards identified during inspections would be reported to company management using the checklist, which would be retained on file for the duration of the project to which it relates.

Identified hazards would be controlled using the recommended control measures taking into account the hierarchy of risk control measures. Immediate controls would be implemented wherever possible to eliminate or minimise the risk associated with an identified hazard.

11.3 Annual document review

The appendices of this plan are living operational documents that will be reviewed and revised annually (or by an date or frequency agreed with the EPA). Additional updates of the plan may be required to address:

- Changes to legislative requirements;
- Outcomes of environmental audit activities (if undertaken);
- Any potential environmental, health or safety risk;
- The adequacy of monitoring activities; and
- Advancements in applicable technologies.

Any updates of the plan appendices are to be controlled and maintained in a document register administered by the landfill/remediation contractor.

This page has been left blank intentionally.

12.0 Certified Statement of Completion

In accordance with requirements outlined in NSW EPA (2015), when sufficient evidence can be provided that the landfill is stable and non-polluting, the occupier may seek to complete all obligations and retrieve any financial assurance by submitting a certified statement of completion to the EPA. This statement must certify that the LCMP has been implemented, remediation work has been completed, and further environmental management of the premises is not required. This stage may not be reached until 30 years after the site stops receiving waste.

The certified statement of completion should demonstrate the following criteria have been met:

- Gas concentration levels in all perimeter gas wells have fallen to less than one per cent methane (volume/volume) and less than 1.5 per cent carbon dioxide for a period of 24 months.
- Analysis of the leachate composition indicates low levels of contamination posing no hazard to the environment, and surface water and groundwater monitoring indicates no water pollution. These matters should be addressed in accordance with the relevant published water quality guidelines.
- The landfill final capping has been assessed over some years and found to be in good condition and stable, with acceptable stormwater drainage and with no evidence of erosion, cracking, dead vegetation, ponding, differential settlement or slope instability.
- The level of suspended solids in rainwater running off the final capping should be less than 50 milligrams per litre.
- The methane concentration at the surface of the final capping should not exceed 500 parts per million at any point.
- The closed landfill no longer poses an adverse amenity risk. It does not generate offensive or excessive odour, dust, noise, litter and debris, present a fire risk, or attract scavengers and vermin.
- All other requirements of the Closure Plan and Surrender Notice have been completed and/or satisfied. Once the EPA has approved the certified statement of completion, the last licensee can stop maintaining and monitoring the site and any financial assurance requirements will lapse.

This page has been left blank intentionally.

13.0 References

- Alexandria Landfill, 2014. *Pollution Incident Response Management Plan, Alexandria Landfill*, January 2014
- AECOM (2014a). *Phase 1 Environmental Site Assessment, Alexandria Landfill Acquisition Area, St Peters, NSW*. Draft, 3 November.
- AECOM, 2015a. *Leachate Management System – Alexandria Landfill, 10-16 Albert Street, St Peters* Memorandum 30 January 2015
- AECOM, 2015b. *Northern Ramps – Landfill Closure Alexandria Landfill Leachate Management System Technical Memo 1*, 18 February 2015 (AECOM Doc Ref: 60327128_60327128_TM1 18022015)
- AECOM, 2015k *Asbestos Management Plan Alexandria Landfill, Alexandria, NSW*, Draft 26 March 2015 (AECOM Doc Ref: 60327128_SMC_AMP_DRAFT_20150326_Rev4)
- IGGC, 2011. *Alexandria Landfill Site Environmental Monitoring Results, Year Ending 30th November 2010*. 9 February
- ICCG, 2012. *Alexandria Landfill Site-Recycling and Landfill Premises Revised Surface Water and Leachate Management Plan (SWLMP), November 2011*
- IGGC, 2013. *Alexandria Landfill Site Environmental Monitoring Results, Year Ending 30th November 2012*. 22 January.
- Land and Environment Court, 2006. Conditions of consent, 28 September 2006
- NSW EPA, 1996. *Environment Guidelines: Solid Waste Landfills*
- NSW EPA, 1998. *Industrial Waste Landfills*
- NSW EPA, 2000. *Approved Methods of Sampling and Analysis of Air Pollutants in New South Wales*
- NSW EPA 2015. *Draft Environmental Guidelines Solid Waste Landfills*. Second Edition, 2015. March
- NSW Department of Planning and Environment, 2015. *Secretary's Environmental Assessment Requirements – Section 115Y of the Environmental Planning and Assessment Act 1979*, 5 March 2015 and updated on 26 August 2015
- NSW, 2011a. *Work Health & Safety Act 2011 (WHS Act)*
- NSW, 2011b. *Work Health & Safety Regulation 2011 (WHS Regulation)*
- NSW, 2011c. *Code of Practice How to Remove Asbestos Safely, 2011*
- VIC EPA, 2012. *Closed Landfill Guidelines* Publication number 1490, December 2012
- VIC EPA, 2014 *Siting, Design, Operation And Rehabilitation Of Landfills*

This page has been left blank intentionally.

Appendix A

Figures and Design Drawings

Appendix A Figures and Design Drawings



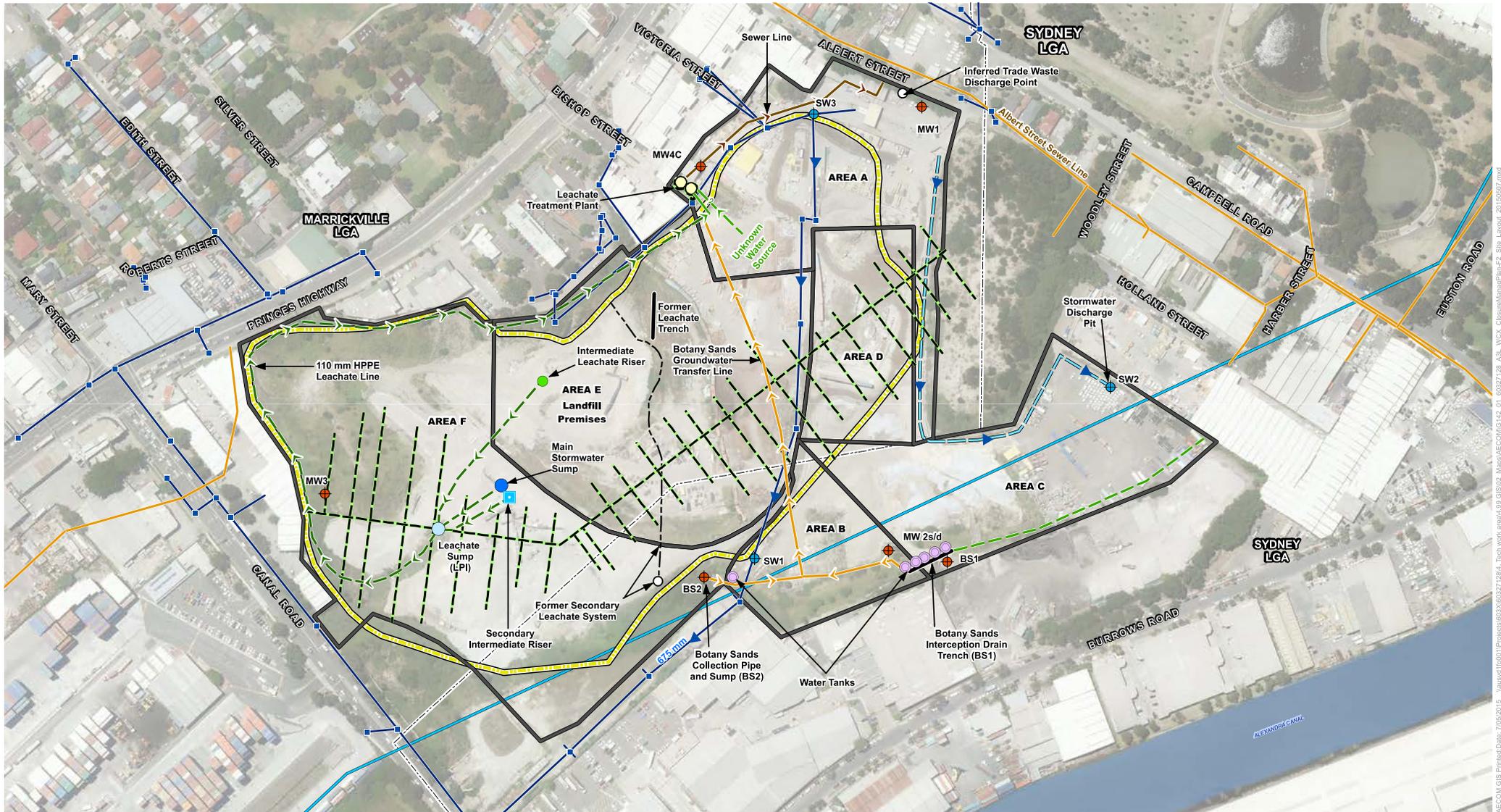
WESTCONNEX STAGE 2
Alexandria Landfill
Closure Management Plan
Figure 1: Site Location



0 0.75 1.5 3 km

MAY 2015
60327128

AECOM \\nasv91p001\Projects\60327128\4_Tech_work_area\4_99_gis\02_Maps\AECOM\G141_01_60327128_A3LL_WCX_ClosureManagementPlan-FL_Site_Location_20150507.mxd Updated 7/05/2015

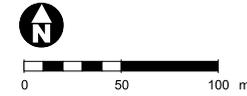


- KEY**
- Area Boundaries
 - Quarry Pit Extent
 - Local Government Area
 - Desalination Pipeline
 - Stormwater Drainage Line
 - Botany Sands Transfer Line
 - Leachate Transfer Line
 - Sewer Discharge Line
 - ◆ Groundwater Sampling Location
 - Indicative Location of Herringbone Drainage
 - Former Surface Drain
 - ◆ Stormwater Drainage Line
 - ◆ Botany Sands Transfer Line
 - ◆ Leachate Transfer Line
 - ◆ Sewer Discharge Line

CONFIDENTIAL GIS MAP

WestConnex
Building for the future

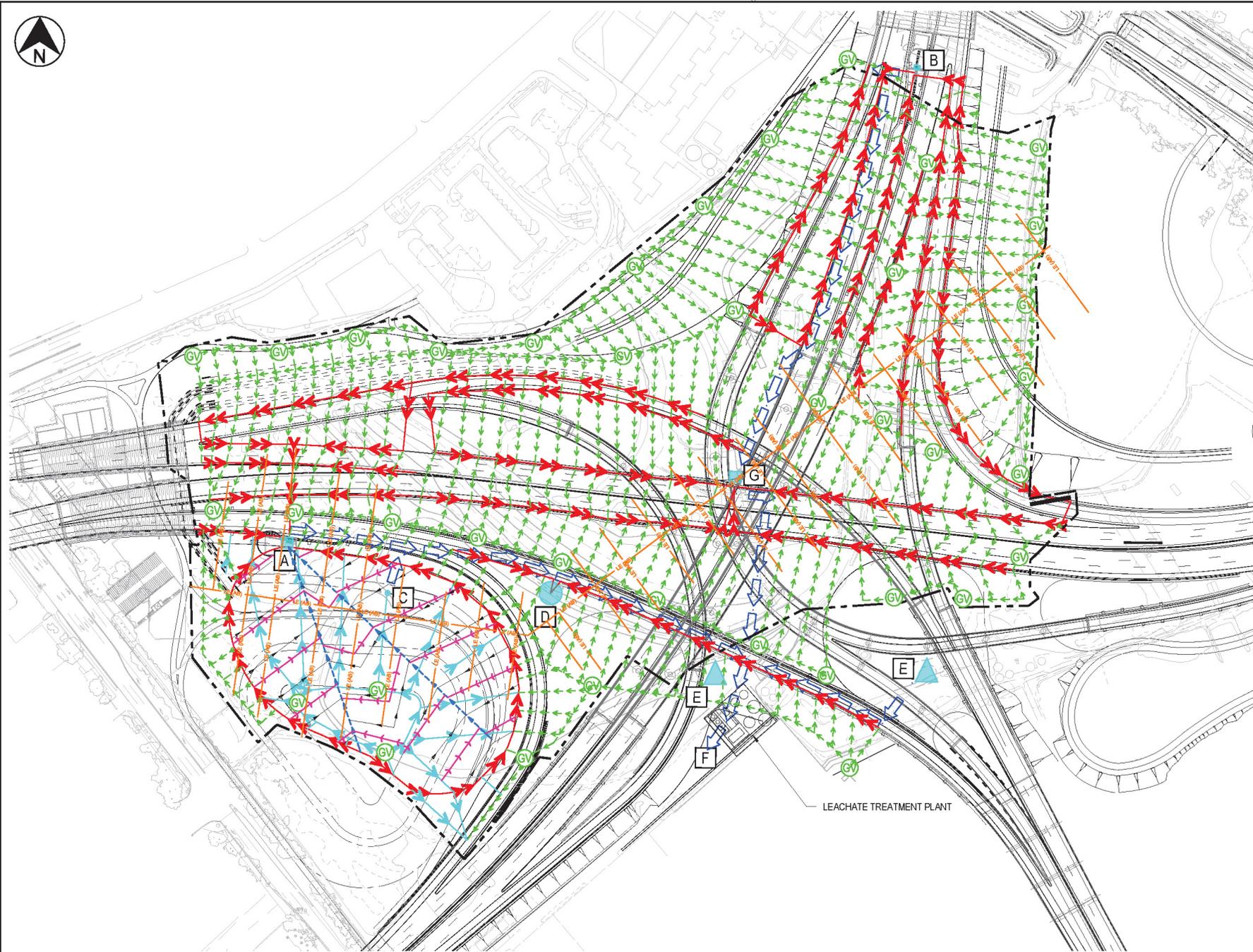
AECOM



Map produced by AECOM on behalf of WestConnex Development Authority.
Map data copyright 2014 WestConnex Delivery Authority, NSW. Spatial data used under license from Land and Property Management Authority, NSW © 2014.
AECOMWDA makes no representations or warranties of any kind, about the accuracy, reliability, completeness, suitability or fitness for purpose in relation to the map content.



SCALE	1:2,750	A3
SHEET	1 of 1	COORDINATE SYSTEM GDA 1994 MGA Zone 56
TITLE	WestConnex Motorway FIGURE 2: Site Layout Alexandria Landfill Closure Management Plan	
PROJECT	WESTCONNEX STAGE 2 TA	
CLIENT	WESTCONNEX DELIVERY AUTHORITY	
DRAWN	DN	PROJECT # 60327128
CHECK	DATE 7/05/2015	MAP # REV Project G142 01 60327128



LEGEND

- EXTENT OF SITE CAPPING AND WASTE PLACEMENT
- RISER PIPELINE
- MAIN FEEDER DRAINS AND GAS COLLECTION (REFER NOTES 1 & 5)
- WASTE MOUND FEEDER DRAINS AND GAS COLLECTION (REFER NOTE 2)
- COLLECTOR DRAIN (SEE NOTE 3)
- LEACHATE COLLECTORS (REFER LINER DETAIL ON M5-LDS-DWG-700-390-TW-9140)
- LEACHATE FEEDER DRAINS ABOVE BASE LINER (REFER NOTE 6)
- LEACHATE FEEDER DRAINS BELOW BASE LINER (REFER NOTE 7)
- EXISTING LEACHATE COLLECTION SYSTEM MAINTAINED BY WDA
- PROPOSED GAS VENT (REFER NOTE 4)
- LEACHATE SUMP / STORAGE TANKS
- EXISTING Ø2.1m LEACHATE RISER / SUMP WELL
- FUTURE LEACHATE EXTRACTION WELL FIELD (6 No. WELLS)
- EXISTING BOTANY SANDS GROUNDWATER EXTRACTION SYSTEM TO BE RETAINED
- PROPOSED TREATED LEACHATE DISCHARGE POINT

NOTES

1. Ø150mm PERFORATED HDPE PIPE LOCATED IN 350mm SQUARE GRAVEL TRENCH AT 10m CENTRES.
2. Ø100mm PERFORATED HDPE PIPE LOCATED IN A 300mm SQUARE GRAVEL TRENCH AT 20m CENTRES.
3. Ø375mm HDPE PIPE WITH 600mm SQUARE CONCRETE PITS AT MAX 200m CENTRES. ALLOW FOR VENTING OF PITS.
4. GAS VENTS AT 50m SPACING IN GAS COLLECTOR PIPES. Ø200mm GALVANISED VENT PIPE TO BE 3m HIGH AND PROTECTED BY A 1.8m HIGH PERIMETER FENCE.
5. FEEDER DRAINS BELOW PAVEMENT COULD BE REPLACED BY A PERMEABLE LAYER BELOW PAVEMENT.
6. Ø150mm PERFORATED HDPE PIPE AT 25m CENTRES.
7. Ø100mm PERFORATED HDPE PIPE AT 20m CENTRES IN A 300mm SQUARE GRAVEL TRENCH.

INFORMATION SHOWN ON THIS DRAWING IS PRELIMINARY ONLY AND SUBJECT TO ADJUSTMENT DURING DETAILED DESIGN STAGE.

STATUS: **SKETCH FOR INFORMATION**

RFT APP 2 - TENDER INFORMATION REQUIREMENTS VOLUME

DRAWING NUMBER: **M5-AJV-SKT-700-320-DR-7801** REV: **A**

DATE: 08/06/2015 07:45 PM, LOGIN NAME: GALLAGHER, QSOFT LOCATION: C:\projects\m5\design\m5\m5-ajv-skt-700-320-dr-7801.dwg

REV	DATE	DESCRIPTION	SG	RH	BO	PROJECT DIRECTOR
A	03.07.15	ISSUED FOR INFORMATION	SG	RH	BO	

TITLE	INITIAL	DATE
DRAWN PERSON	SG	03.07.15
DRAFTING CHECK		
DESIGNER		
DESIGN CHECK		
DESIGN MANAGER		
PROJECT DIRECTOR		

ORIGINAL DRAWING AT A3 SIZE

SCALE 1:2000

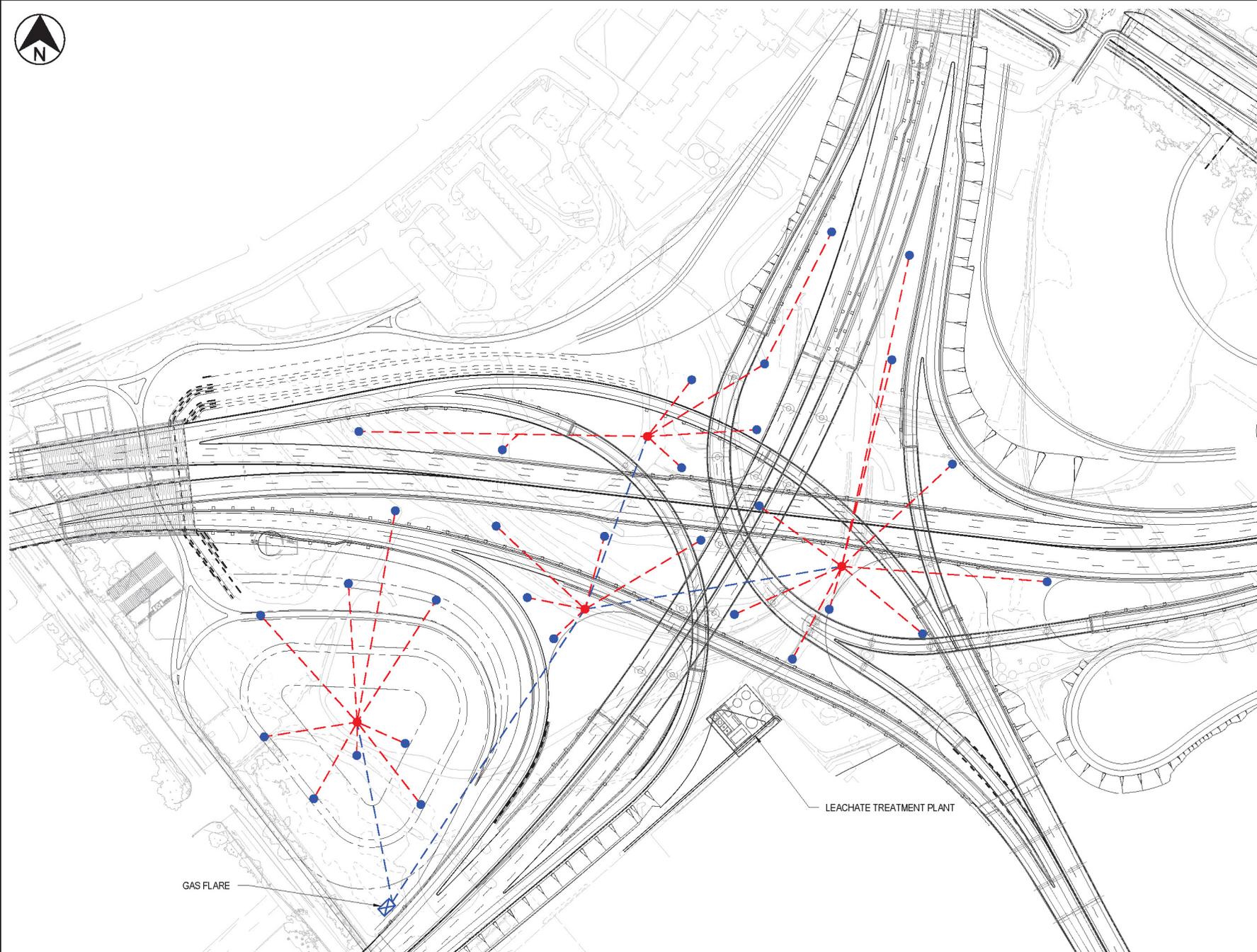
COORDINATE BY STEM: MEA Zone 56 HEIGHT DATUM: A.H.D.

CLIENT: **NSW GOVERNMENT** **Transport WestConnex Delivery Authority**

RIGHT TO PHOTOGRAPHY: SAMSUNG CAT JOINT VENTURE

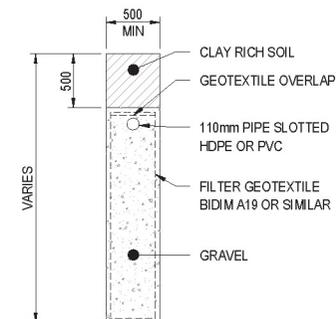
PROJECT: **WESTCONNEX STAGE 2 NEW M5 MAIN WORKS DESIGN & CONSTRUCT**

TITLE: **ST. PETERS INTERCHANGE LEACHATE TREATMENT AND GAS COLLECTION PASSIVE SYSTEM GENERAL ARRANGEMENT PLAN**



LEGEND

- GAS WELL
- MANIFOLD
- - - PIPES (FLOW LINES)
- - - HEADER LINES



TYPICAL LFG COLLECTION TRENCH
SCALE 1:50

NOTES:

1. LOCATION OF LFG COLLECTION TO BE DETERMINED IF LFG TRENCH NEEDED.

DATE: 08/06/2015 09:47 PM I:\CON\M5E_GALLONKEY.dwg
LOCATION: C:\Users\jacob.hassel@arecon.com.au\AppData\Local\Temp\14720018E-A1V-SKT-700-320-DR-7802.dwg

REV	DATE	DESCRIPTION	SG	RH	BO	DESIGN MANAGER	PROJECT DIRECTOR
A	03.07.15	ISSUED FOR INFORMATION	SG	RH	BO		

TITLE	INITIAL	DATE
DRAFTSPERSON	SG	03.07.15
DRAFTING CHECK		
DESIGNER		
DESIGN CHECK		
DESIGN MANAGER		
PROJECT DIRECTOR		

ORIGINAL DIMING AT A3 SIZE
SCALE 150 0 0.5 1 AT A3

SCALE 1200 0 20 40 AT A3

COORDINATE BY ITEM: MEA Zone SG HEIGHT DATUM: A.H.D.

CLIENT

Transport WestConnex Delivery Authority

RIGHTS TO PHOTOGRAPHY RESERVED

CLIENT: aurecon JACOBS HASSELL

PROJECT: WESTCONNEX STAGE 2
NEW M5 MAIN WORKS DESIGN & CONSTRUCT

TITLE: ST. PETERS INTERCHANGE
LEACHATE TREATMENT AND GAS COLLECTION
ACTIVE SYSTEM
GENERAL ARRANGEMENT PLAN

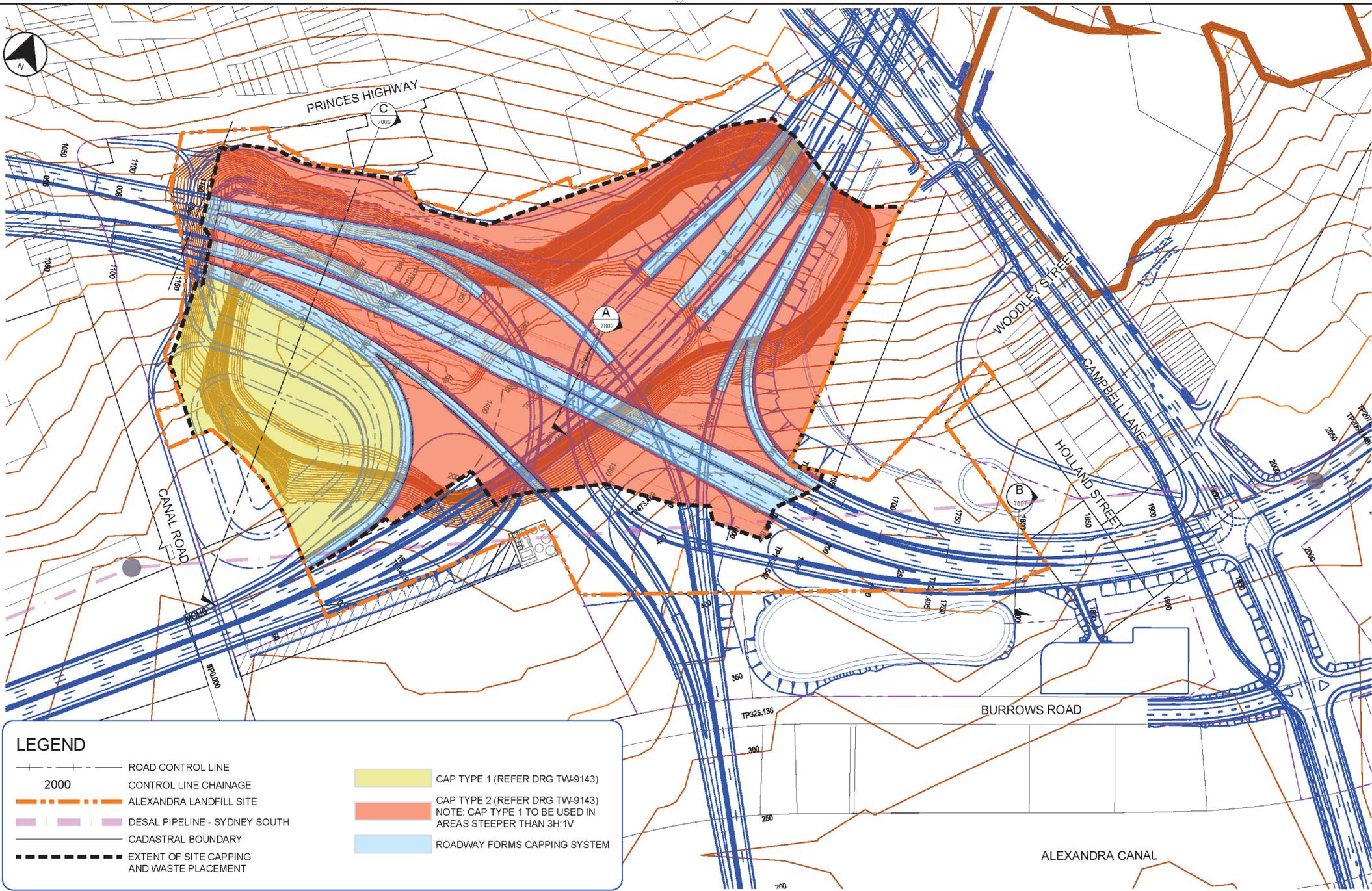
INFORMATION SHOWN ON THIS DRAWING IS PRELIMINARY ONLY AND SUBJECT TO ADJUSTMENT DURING DETAILED DESIGN STAGE.

STATUS: **SKETCH FOR INFORMATION**

DWT APP 2 - TENDER INFORMATION REQUIREMENTS VOLUME

DRAWING NUMBER: M5-AJV-SKT-700-320-DR-7802

REV: A



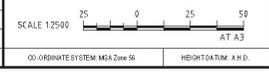
LEGEND

- ROAD CONTROL LINE
- CONTROL LINE CHAINAGE
- ALEXANDRA LANDFILL SITE
- DESAL PIPELINE - SYDNEY SOUTH
- CADASTRAL BOUNDARY
- EXTENT OF SITE CAPPING AND WASTE PLACEMENT
- CAP TYPE 1 (REFER DRG TW-9143)
- CAP TYPE 2 (REFER DRG TW-9143)
NOTE: CAP TYPE 1 TO BE USED IN AREAS STEEPER THAN 3H:1V
- ROADWAY FORMS CAPPING SYSTEM

DATE: 03/07/15 4:40:37 PM, LOGIN NAME: TIBORWEB_RIVAN, LOCATION: U:\Work\Stage 2\IE - Design\BOM - CAD\BOM\Drawings\BOM AND LOCAL ROADS\FINAL\320\400\650\001\LDS-SKT-700-320-DR-7803.dwg

REV	DATE	DESCRIPTION	BC	RH	BO
A	03.07.15	ISSUED FOR INFORMATION			

TITLE	INITIAL	DATE
DRAFTSPERSON	BC	03.07.15
DRAWING CHECK		
DESIGNER		
DESIGN CHECK		
DESIGN/MANAGER		
PROJECT DIRECTOR		



CLIENT

Transport
WestConnex
Delivery Authority

RIGHTS TO PROJECTS SHARING CAT JOINT VENTURE

PROJECT: WESTCONNEX STAGE 2
NEW M5 MAIN WORKS DESIGN & CONSTRUCT

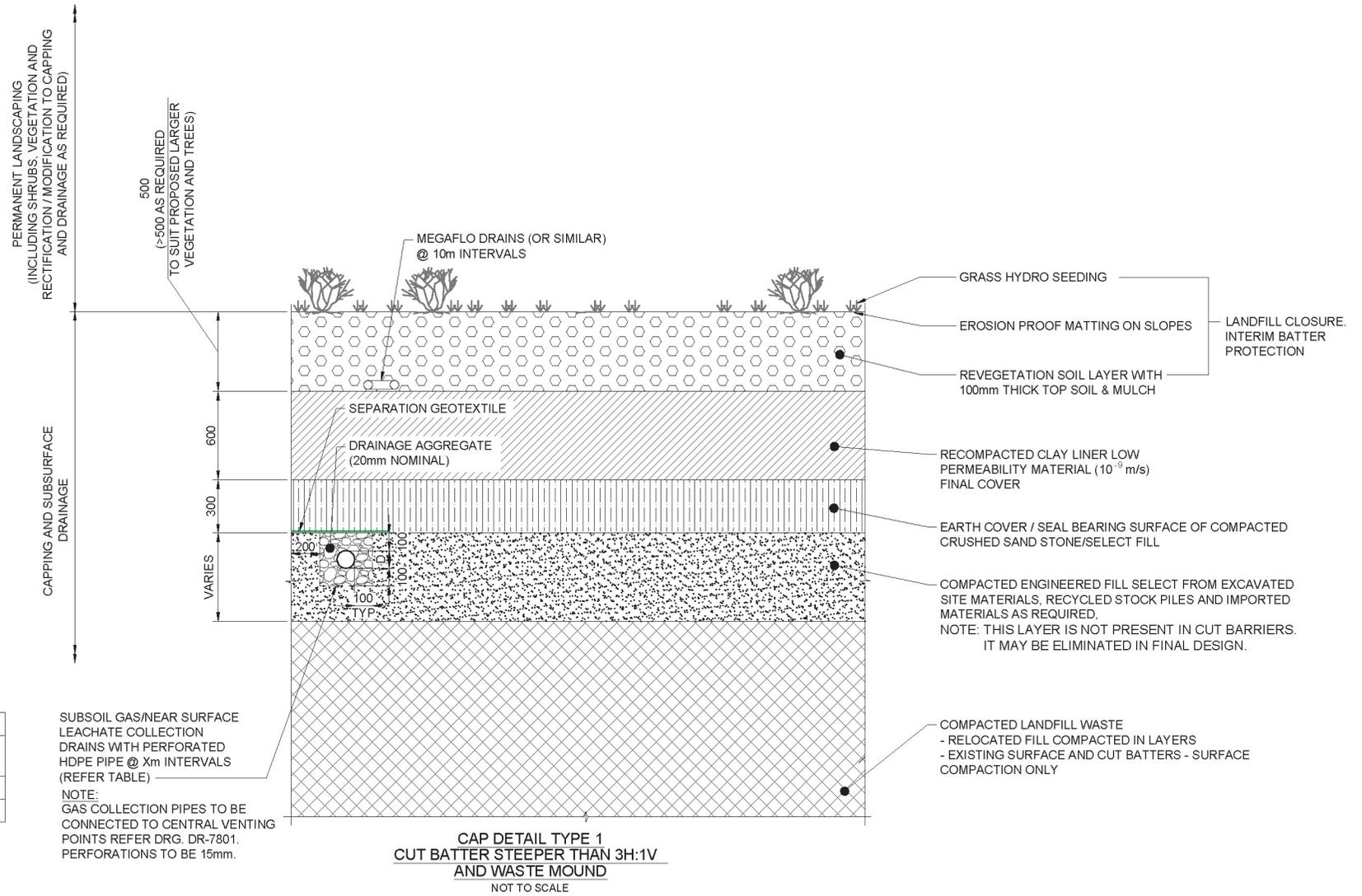
TITLE: ALEXANDRA LANDFILL CLOSURE PLANS
EXTENT OF CAPPING

STATUS: **SKETCH INFORMATION ONLY**

DRAWING NUMBER: M5-LDS-SKT-700-320-DR-7803

REV: A

DATE: 03/07/15 4:45:03 PM, LOCAL NAME: T:\BOWEN_R\IAN, LOCATION: U:\Work\Stage 2\IE - Design\IEB - CAD\IEB Drawings\SI1 AND LOCAL ROAD\FINAL\320\400\65000\IEB-LDS-SKT-700-320-DR-7804.dwg



SUBSOIL GAS PIPE		
	DIAMETER D (mm)	SPACING X (mm)
CUT BATTERS	Ø150	10
WASTE MOUND	Ø100	20

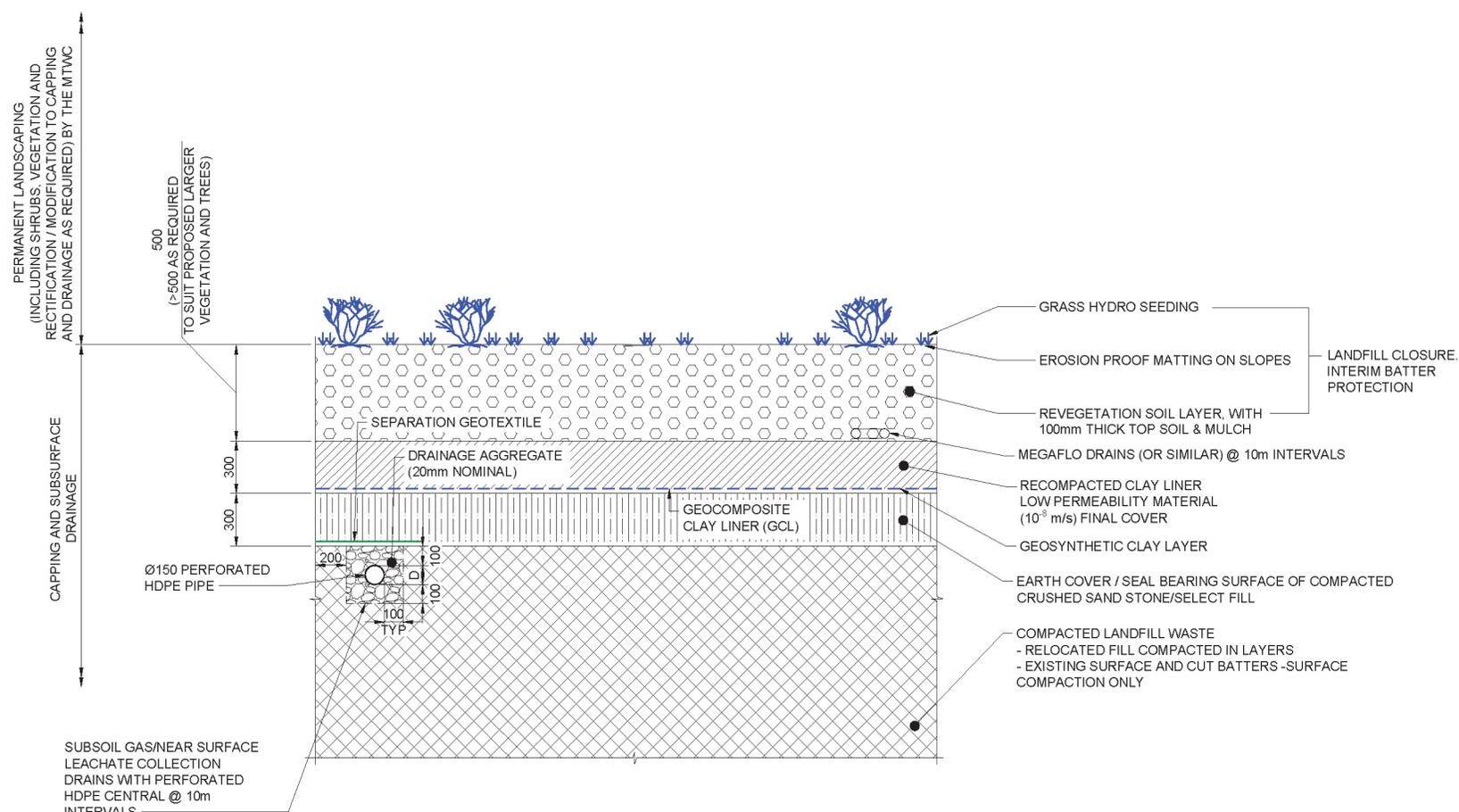
SUBSOIL GAS/NEAR SURFACE LEACHATE COLLECTION DRAINS WITH PERFORATED HDPE PIPE @ Xm INTERVALS (REFER TABLE)

NOTE:
GAS COLLECTION PIPES TO BE CONNECTED TO CENTRAL VENTING POINTS REFER DRG. DR-7801. PERFORATIONS TO BE 15mm.

CAP DETAIL TYPE 1
CUT BATTER STEEPER THAN 3H:1V
AND WASTE MOUND
NOT TO SCALE

<table border="1"> <thead> <tr> <th>REV</th> <th>DATE</th> <th>DESCRIPTION</th> <th>BY</th> <th>CHKD</th> <th>APP'D</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>03.07.15</td> <td>ISSUED FOR INFORMATION</td> <td>BC</td> <td>RH</td> <td>BO</td> </tr> </tbody> </table>		REV	DATE	DESCRIPTION	BY	CHKD	APP'D	A	03.07.15	ISSUED FOR INFORMATION	BC	RH	BO	<table border="1"> <thead> <tr> <th>TITLE</th> <th>INITIAL</th> <th>DATE</th> </tr> </thead> <tbody> <tr> <td>DRAFTSPERSON</td> <td>BC</td> <td>03.07.15</td> </tr> <tr> <td>DRAFTING CHECK</td> <td></td> <td></td> </tr> <tr> <td>DESIGNER</td> <td></td> <td></td> </tr> <tr> <td>DESIGN CHECK</td> <td></td> <td></td> </tr> <tr> <td>DESIGNMANAGER</td> <td></td> <td></td> </tr> <tr> <td>PROJECT DIRECTOR</td> <td></td> <td></td> </tr> </tbody> </table>	TITLE	INITIAL	DATE	DRAFTSPERSON	BC	03.07.15	DRAFTING CHECK			DESIGNER			DESIGN CHECK			DESIGNMANAGER			PROJECT DIRECTOR			ORIGINAL DRAWING AT A3 SIZE CLIENT: NSW GOVERNMENT Transport WestConnex Delivery Authority PROJECT: WESTCONNEX STAGE 2 NEW M5 MAIN WORKS DESIGN & CONSTRUCT TITLE: ALEXANDRA LANDFILL CLOSURE PLANS TYPICAL CAPPING LAYER DETAILS SHEET 1 STATUS: SKETCH INFORMATION ONLY DRAWING NUMBER: M5-LDS-SKT-700-320-DR-7804 REV: A
REV	DATE	DESCRIPTION	BY	CHKD	APP'D																															
A	03.07.15	ISSUED FOR INFORMATION	BC	RH	BO																															
TITLE	INITIAL	DATE																																		
DRAFTSPERSON	BC	03.07.15																																		
DRAFTING CHECK																																				
DESIGNER																																				
DESIGN CHECK																																				
DESIGNMANAGER																																				
PROJECT DIRECTOR																																				

DATE: 03/07/15 4:50 PM, LOCAL NAME: TUBOINER, PLAN LOCATION: U:\AEC\Drawings\2015\LOCAL\ROADS\FINAL\320\400\650001E\LDS-SKT-700-320-DR-7805.dwg

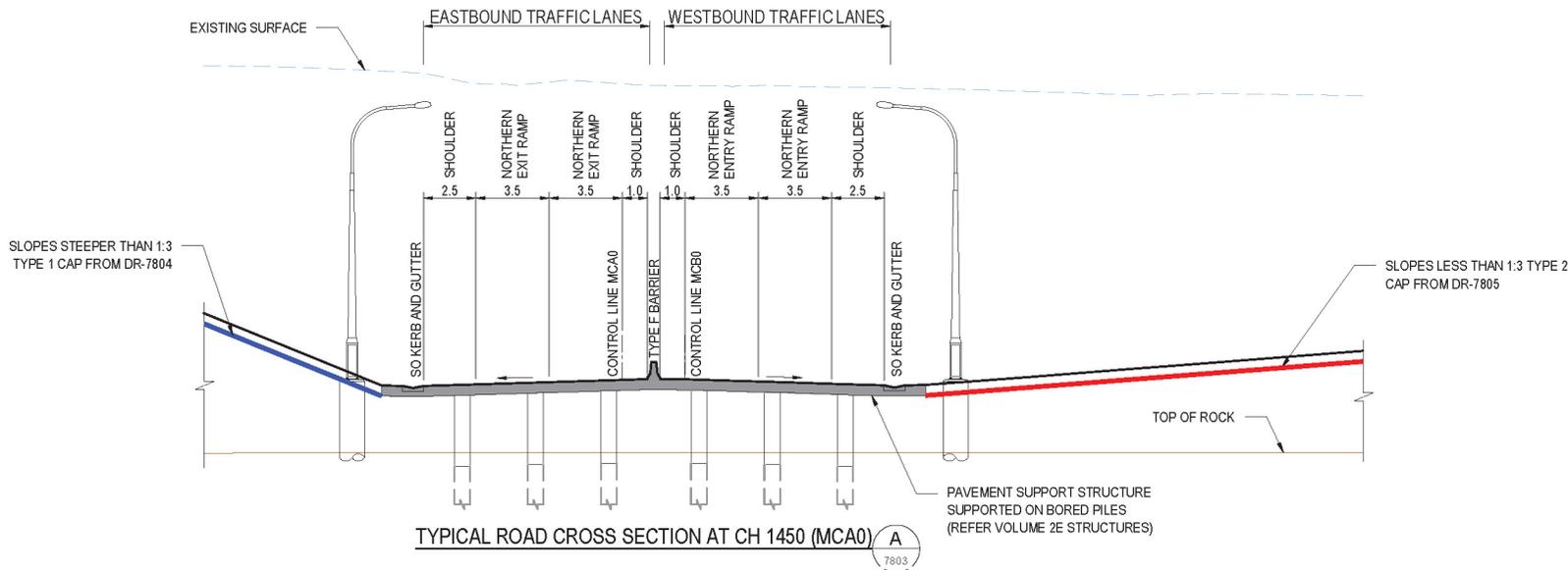


NOTE:
GAS COLLECTION PIPES TO BE CONNECTED TO CENTRAL VENTING POINTS REFER DRG. DR-7801.
PERFORATIONS TO BE 15mm.

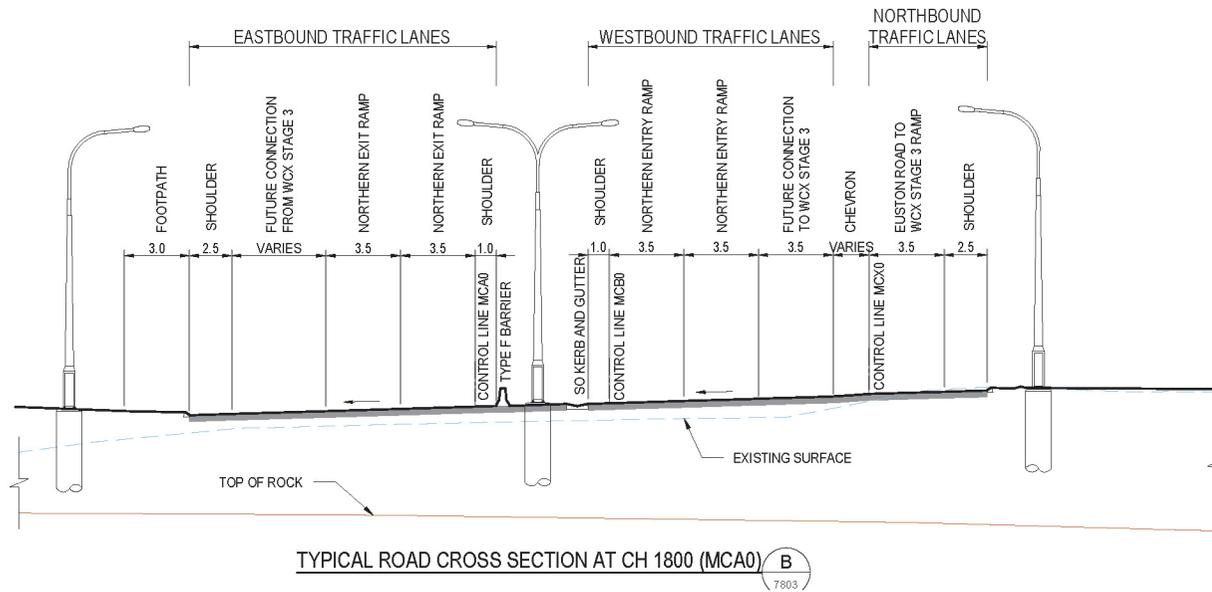
**CAP DETAIL 2
CUT BATTER IN WASTE
MAXIMUM SLOPE OF 3H:1V
NOT TO SCALE**

DATE: 03/07/15 4:50 PM, LOCAL NAME: TUBOINER, PLAN LOCATION: U:\AEC\Drawings\2015\LOCAL\ROADS\FINAL\320\400\650001E\LDS-SKT-700-320-DR-7805.dwg		TITLE: ORIGINAL DRAWING AT A3 SIZE		CLIENT: Transport WestConnex Delivery Authority		PROJECT: WESTCONNEX STAGE 2 NEW M5 MAIN WORKS DESIGN & CONSTRUCT		STATUS: SKETCH INFORMATION ONLY	
DRAWN BY: []		DRAFTSPERSON: BC 03.07.15		DRAWING CHECK: []		DESIGNER: []		DESIGN CHECK: []	
DESIGN MANAGER: []		PROJECT DIRECTOR: []		DRAWN BY: []		DESIGNER: []		DESIGN CHECK: []	
ISSUED FOR INFORMATION		BC RH BO		DRAWN BY: []		DESIGNER: []		DESIGN CHECK: []	
REV	DATE	DESCRIPTION	DRAWN	APPROVAL	PROJECT DIRECTOR	COORDINATE BY SYSTEM: M5L200 00	HEIGHT DATUM: A.H.D.	DRAWING NUMBER: M5-LDS-SKT-700-320-DR-7805	
A	03.07.15	ISSUED FOR INFORMATION	BC	RH	BO			REV: A	

This Drawing may have been prepared using colour and may be incomplete if copied



TYPICAL ROAD CROSS SECTION AT CH 1450 (MCA0) A



TYPICAL ROAD CROSS SECTION AT CH 1800 (MCA0) B

DATE: 03/07/15 15:45:05 PM LOCATION: M5 - TILBURNIER - PLAN LOCATION: U:\M5 Stage 2\E - Design\B-Drawings\BSP1 AND LOCAL ROADS FINAL\3300400\660004\LDS-SKT-700-320-DR-7807.dwg

REV	DATE	DESCRIPTION	BY	CHKD	APP'D	PROJECT DIRECTOR
A	03.07.15	ISSUED FOR INFORMATION	BC	RH	BO	

TITLE	INITIAL	DATE
DRAWING PERSON	BC	03.07.15
DRAFTING CHECK		
DESIGNER		
DESIGN CHECK		
DESIGN MANAGER		
PROJECT DIRECTOR		

ORIGINAL DRAWING AT A3 SIZE

SCALE 1:25

COORDINATE SYSTEM: MGA Zone 56 HEIGHT DATUM: AHD

CLIENT: **NSW GOVERNMENT** Transport WestConnex Delivery Authority

RIGHTS TO FORM OURS SAMSUNG CAT JUNE VENTURE

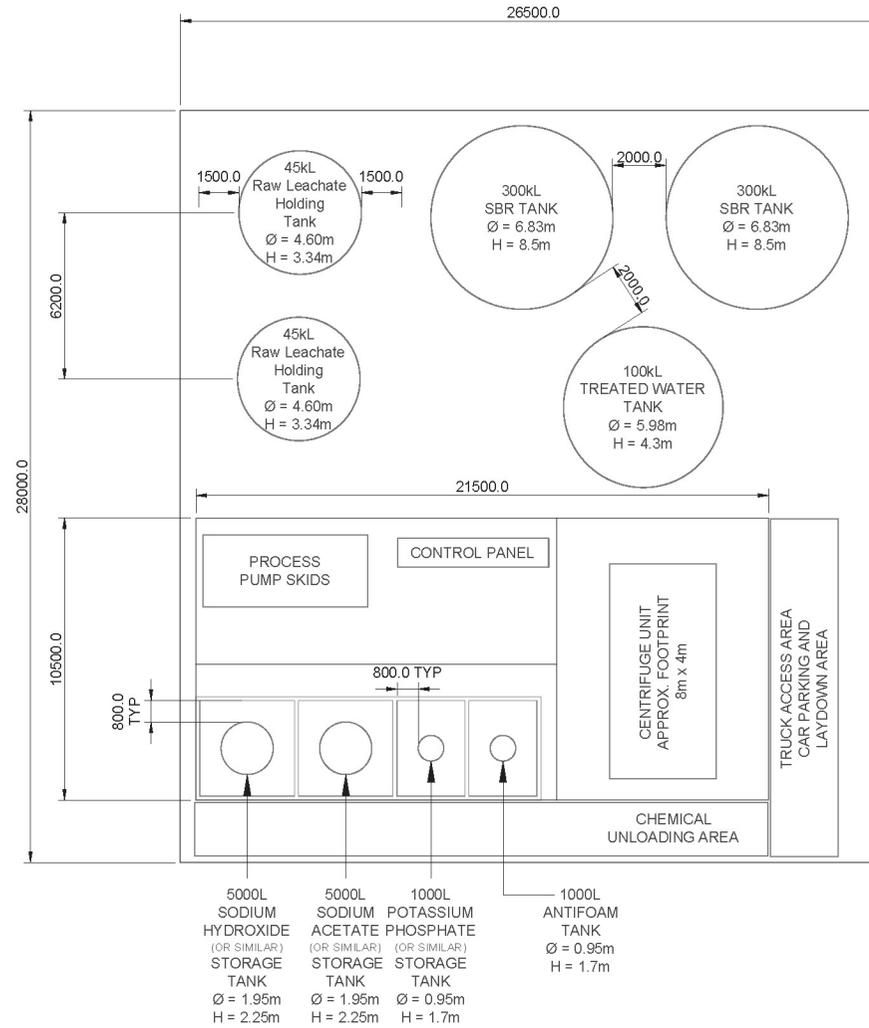
PROJECT: WESTCONNEX STAGE 2 NEW M5 MAIN WORKS DESIGN & CONSTRUCT

TITLE: ALEXANDRA LANDFILL CLOSURE PLANS TYPICAL ROAD DETAILS SHEET 1

STATUS: **SKETCH INFORMATION ONLY**

PROJECT NUMBER: M5-LDS-SKT-700-320-DR-7807

REV: A



DATE: 03/07/15 15:20:20 PM, LOCAL NAME: T:\BOWEN_R\PLAN LOCATION: U:\Work\Stage 2\IE - Design\Bids\Drawings\BSP1 AND LOCAL ROAD\FINAL\3300400\660001E\LDS-SKT-700-320-DR-7809.dwg

REV	DATE	DESCRIPTION	BC	RH	BO	PROJECT DIRECTOR
A	03.07.15	ISSUED FOR INFORMATION				

CLIENT

Transport
WestConnex
Delivery Authority

RIGHT TO PHOTOGRAPH AND RECORD

PROJECT

**WESTCONNEX STAGE 2
NEW M5 MAIN WORKS DESIGN & CONSTRUCT**

TITLE

**ALEXANDRA LANDFILL CLOSURE PLANS
LEACHATE TREATMENT PLANT
PLAN**

STATUS

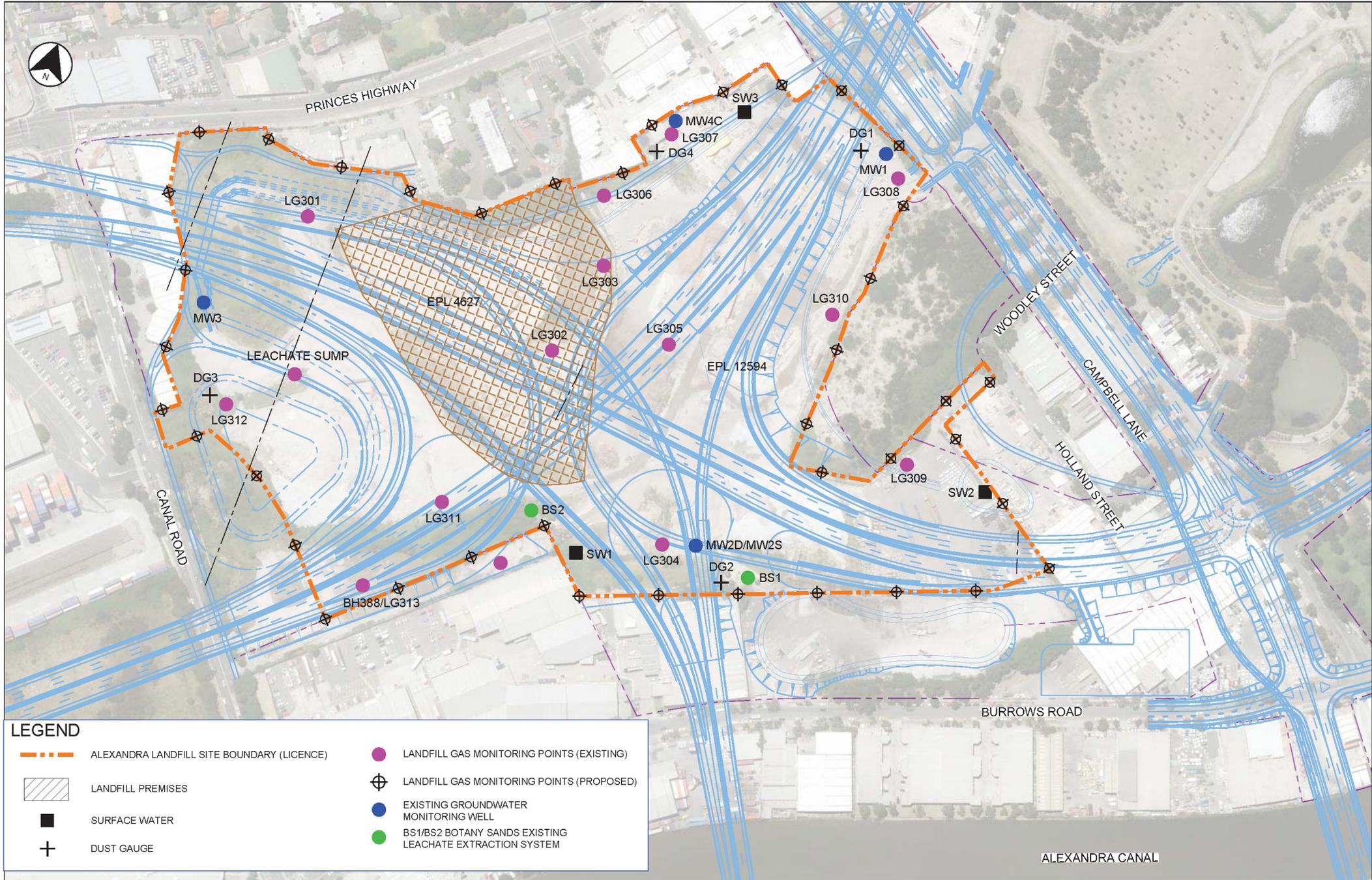
**SKETCH
INFORMATION ONLY**

DRIVING NUMBER

M5-LDS-SKT-700-320-DR-7809

REV

A



LEGEND

- ALEXANDRA LANDFILL SITE BOUNDARY (LICENCE)
- LANDFILL PREMISES
- SURFACE WATER
- + DUST GAUGE
- LANDFILL GAS MONITORING POINTS (EXISTING)
- ⊕ LANDFILL GAS MONITORING POINTS (PROPOSED)
- EXISTING GROUNDWATER MONITORING WELL
- BS1/BS2 BOTANY SANDS EXISTING LEACHATE EXTRACTION SYSTEM

DATE: 03/07/15 15:40:00 PM, LOCAL NAME: TIBORNER, PLAN LOCATION: U:\Work\Stage 2\15 - Design\15-03-01\15-03-01\15-03-01-01.dwg

REV	DATE	DESCRIPTION	BY	CHKD	APP'D	DATE
A	03.07.15	ISSUED FOR INFORMATION	BC	RH	BO	
			BC	RH	BO	
			DR	AP	PD	

ORIGINAL DIMING AT A3 SIZE

SCALE 1:2500

25 0 25 50
M AT A3

COORDINATE SYSTEM: MGA Zone 56 HEIGHT DATUM: A.H.D.

CLIENT

Transport WestConnex Delivery Authority

RIGHTS TO PROJECTS SHARED CAT JOINT VENTURE

PROJECT: WESTCONNEX STAGE 2
NEW M5 MAIN WORKS DESIGN & CONSTRUCT

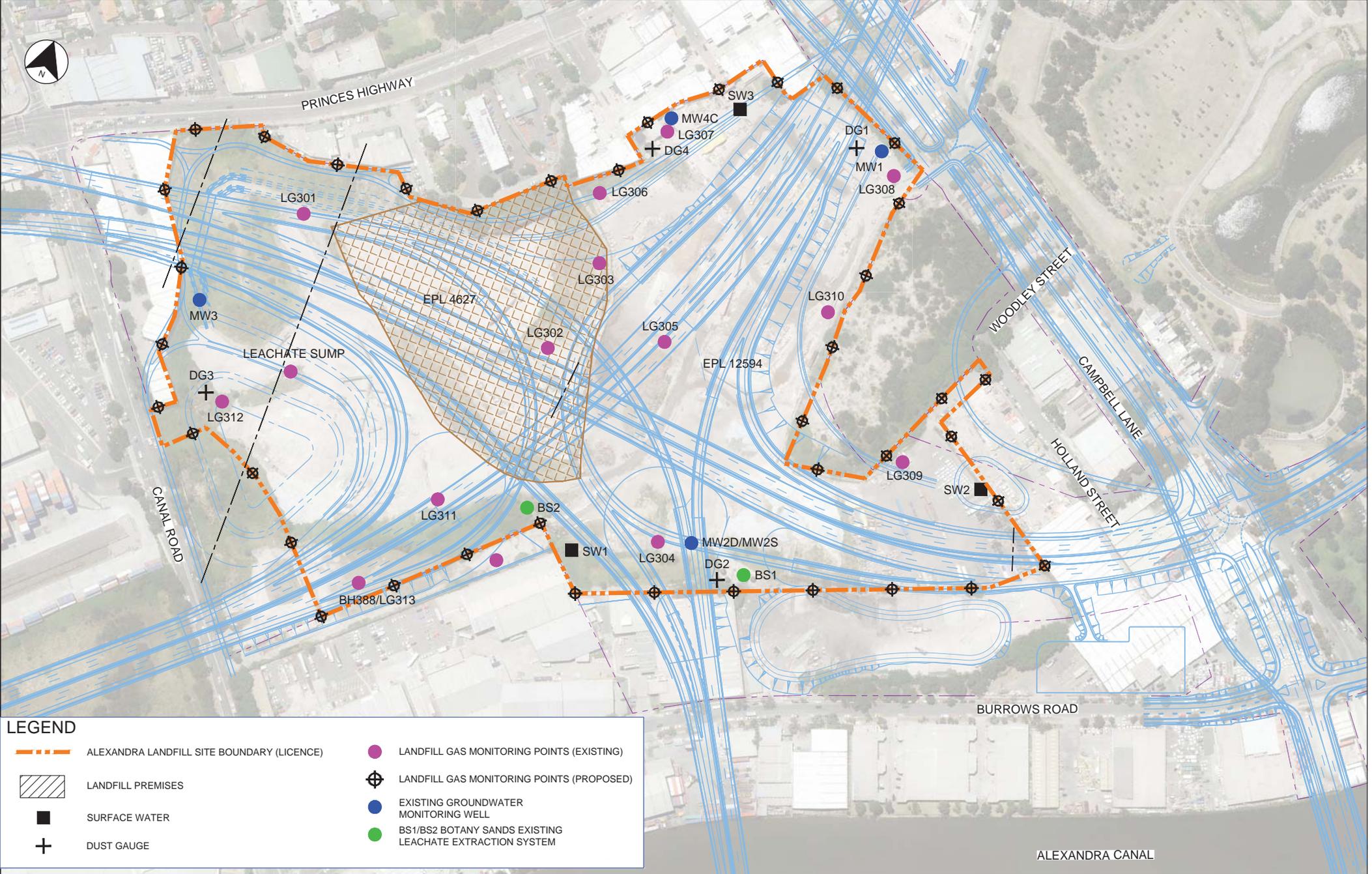
TITLE: ALEXANDRA LANDFILL CLOSURE PLANS
ENVIRONMENTAL
MONITORING LOCATIONS

STATUS: **SKETCH INFORMATION ONLY**

DRWING NUMBER: M5-LDS-SKT-700-320-DR-7811

REV: A

This Drawing may have been prepared using colour and may be incomplete if copied



LEGEND

- ALEXANDRA LANDFILL SITE BOUNDARY (LICENCE)
- LANDFILL PREMISES
- SURFACE WATER
- + DUST GAUGE
- LANDFILL GAS MONITORING POINTS (EXISTING)
- ⊕ LANDFILL GAS MONITORING POINTS (PROPOSED)
- EXISTING GROUNDWATER MONITORING WELL
- BS1/BS2 BOTANY SANDS EXISTING LEACHATE EXTRACTION SYSTEM

DATE: 20/07/2015 14:40:27 PM, LOGIN NAME: THIRUMBER, RYAN, LOCAL PATH: LOCAL ROADS\FINAL\39704000\05000ME LDS-SKT-700-320-DR-7811.dwg

REV	DATE	DESCRIPTION	DRAWN	REVIEWED	APPROVAL	PROJECT DIRECTOR
A	03.07.15	ISSUED FOR INFORMATION	BC	RH	BO	

ORIGINAL DRAWING AT A3 SIZE

SCALE 1:2500

25 0 25 50

AT A3

COORDINATE SYSTEM: MGA Zone 56

HEIGHT DATUM: AHD

CLIENT

Transport
WestConnex
Delivery Authority

LEIGHTON DRAGADOS SAMSUNG CAT JOINT VENTURE

WestConnex STAGE 2 M5

PROJECT

WESTCONNEX STAGE 2
NEW M5 MAIN WORKS DESIGN & CONSTRUCT

TITLE

ALEXANDRA LANDFILL CLOSURE PLANS
ENVIRONMENTAL
MONITORING LOCATIONS

STATUS

SKETCH
INFORMATION ONLY

RFT APP2 - TENDER INFORMATION REQUIREMENTS VOLUME

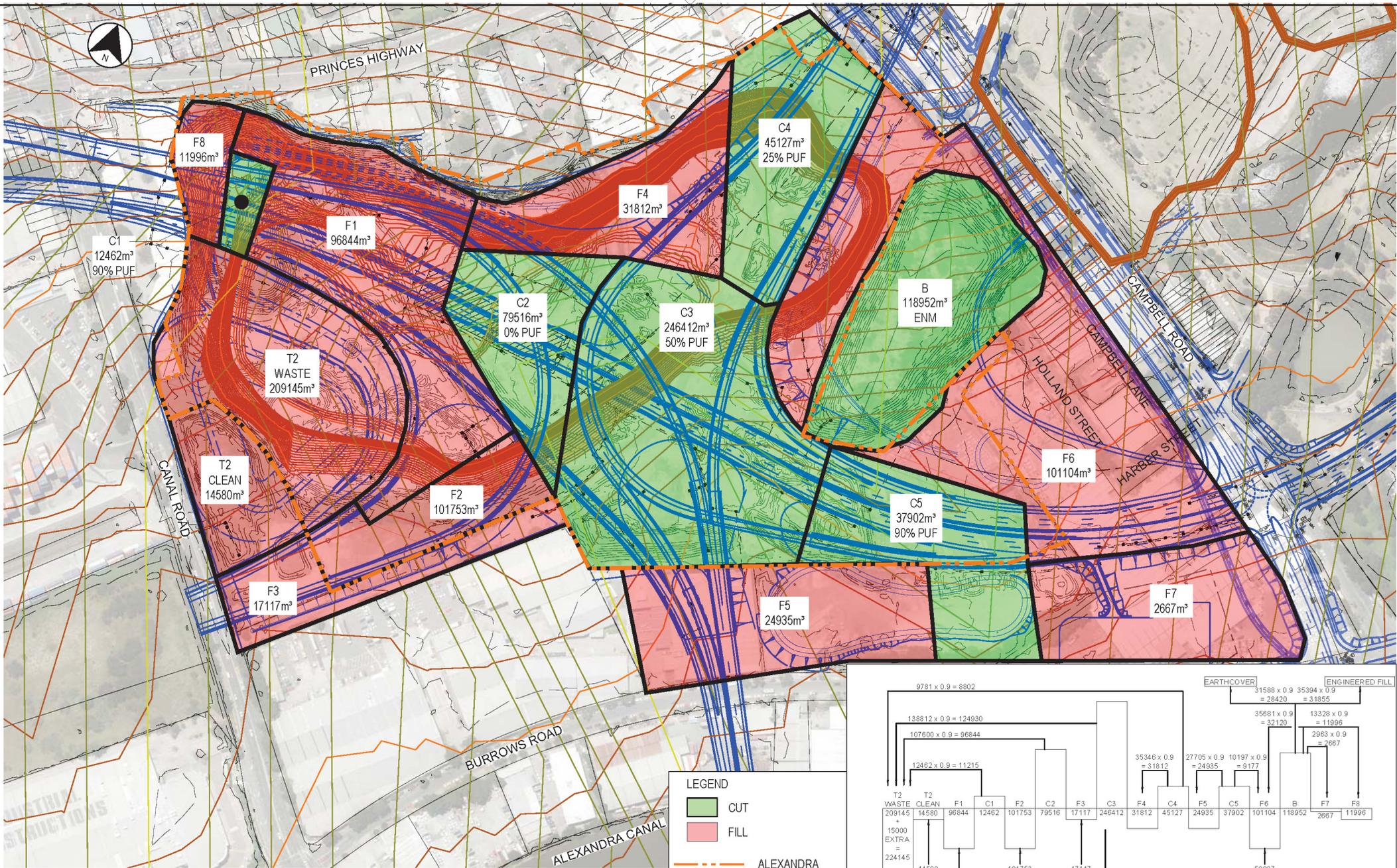
DRAWING NUMBER

M5-LDS-SKT-700-320-DR-7811

REV

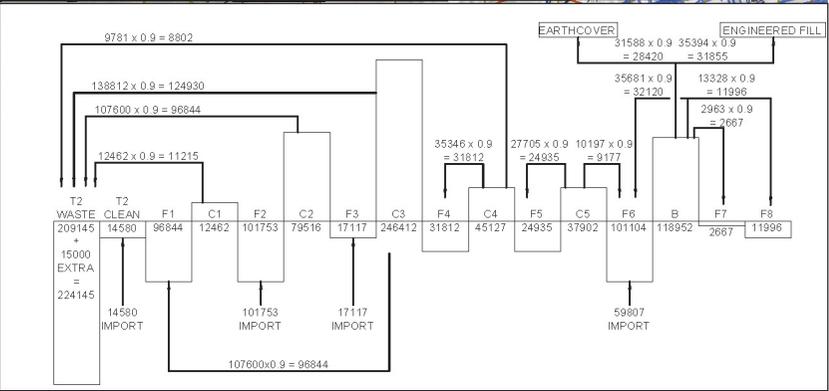
A

10 15 20 25 mm ON A3 ORIGINAL This drawing may have been prepared using colour and may be incomplete if copied



LEGEND

- CUT
- FILL
- ALEXANDRA LANDFILL SITE
- EXISTING CONTOUR



DATE: 03/07/15 14:44 PM, LOGIN NAME: THOMAS RYAN, LOCATION: U:\M3 Stage 2\E - Design\EBD - CAD\EBD Drawings\SP1 AND LOCAL ROADS FINAL\380400\660001\LDS-SKT-700-320-DR-7812.dwg

REV	DATE	DESCRIPTION	BY	CHKD	APP'D
A	03.07.15	ISSUED FOR INFORMATION	BC	RH	BO

ORIGINAL DRAWING AT A3 SIZE

SCALE 1:2500

SCALE 1:2500 AT A3

CLIENT

WestConnex
Delivery Authority

PROJECT

WESTCONNEX STAGE 2
NEW M5 MAIN WORKS DESIGN & CONSTRUCT

TITLE

ALEXANDRA LANDFILL CLOSURE PLANS
EARTHWORKS PLAN

STATUS

SKETCH INFORMATION ONLY

RFT APP 2 - TENDER INFORMATION REQUIREMENTS VOLUME

DRAWING NUMBER

M5-LDS-SKT-700-320-DR-7812

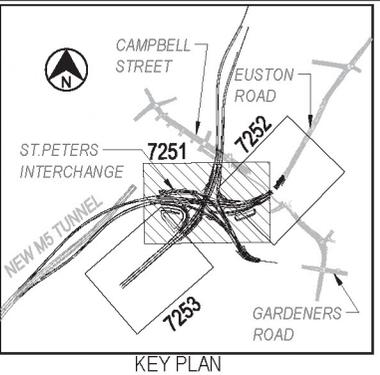
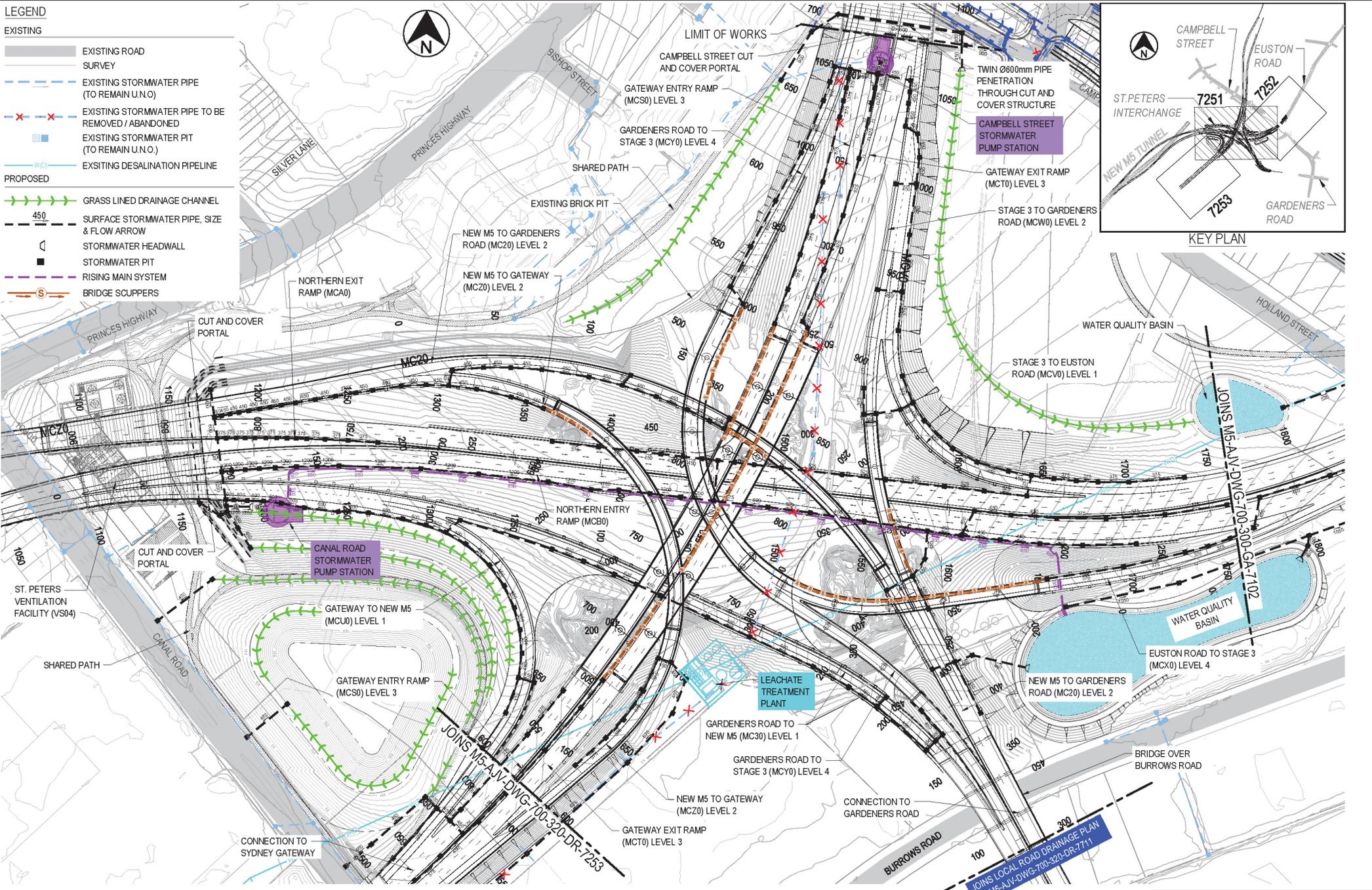
REV

A

This Drawing may have been prepared using COLOUR and may be incomplete if copied

LEGEND

- EXISTING**
- EXISTING ROAD
 - SURVEY
 - EXISTING STORMWATER PIPE (TO REMAIN U.N.O)
 - EXISTING STORMWATER PIPE TO BE REMOVED / ABANDONED
 - EXISTING STORMWATER PIT (TO REMAIN U.N.O)
 - EXISTING DESALINATION PIPELINE
- PROPOSED**
- GRASS LINED DRAINAGE CHANNEL
 - SURFACE STORMWATER PIPE, SIZE & FLOW ARROW
 - STORMWATER HEADWALL
 - STORMWATER PIT
 - RISING MAIN SYSTEM
 - BRIDGE SCUppers



DATE: 03/07/15 2:40:01 PM LOGIN NAME: GALLAGHER, GOSSETT
 LOCATION: C:\projects\stage2\app\dwg\700-320-DR-7251-7253.dwg

REV	DATE	DESCRIPTION	DRAWN	CHECKED	APPROVED
0	03.07.15	CONCEPT DESIGN ISSUE TO REFLECT POST-TENDER ADDENDUM 1	SG	RND	MP

TITLE	INITIAL	DATE
DRAWING PERSON	SG	03.07.15
DRAFTING CHECK	SG	03.07.15
DESIGNER	KH	03.07.15
DESIGN CHECK	RND	03.07.15
DESIGN MANAGER	MP	03.07.15
PROJECT DIRECTOR	TE	03.07.15

ORIGINAL DRAWING AT A3 SIZE

SCALE 1:2000

AT A3

COORDINATE SYSTEM: MEA Zone 56
HEIGHT DATUM: A.H.D.

CLIENT

RIGHTS TO PHOTOGRAPHS: SAMSUNG, CAT, JUNGLE VENTURE

WestConnex STAGE 2 M5

PROJECT

WESTCONNEX STAGE 2
NEW M5 MAIN WORKS DESIGN & CONSTRUCT

TITLE

ST. PETERS INTERCHANGE
DRAINAGE AND WATER QUALITY
PLAN
SHEET 1

INFORMATION SHOWN ON THIS DRAWING IS PRELIMINARY ONLY AND SUBJECT TO ADJUSTMENT DURING DETAILED DESIGN STAGE.

STATUS

**CONCEPT DESIGN
NOT FOR CONSTRUCTION**

RFT APP 2 - TENDER INFORMATION REQUIREMENTS VOLUME

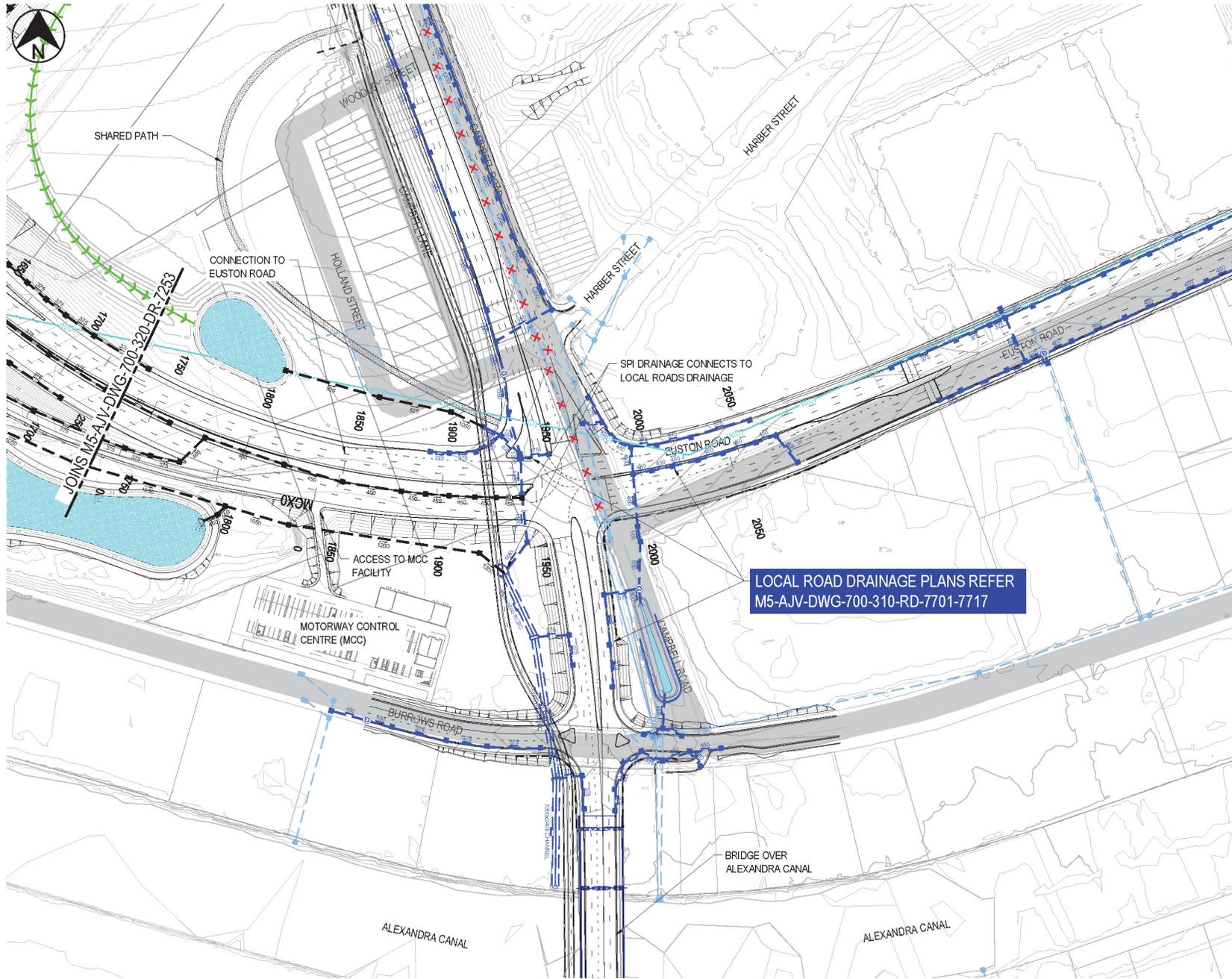
2F - DRAINAGE DESIGN

DRAWING NUMBER

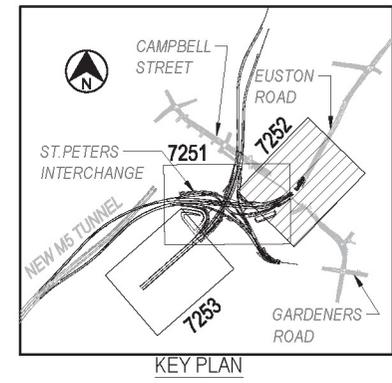
M5-AJV-DWG-700-320-DR-7251

REV

0



- LEGEND**
- EXISTING**
- EXISTING ROAD
 - SURVEY
 - - - EXISTING STORMWATER PIPE (TO REMAIN U.N.O)
 - x - x - EXISTING STORMWATER PIPE TO BE REMOVED / ABANDONED
 - EXISTING STORMWATER PIT (TO REMAIN U.N.O)
 - (W/P)— EXISTING DESALINATION PIPELINE
- PROPOSED**
- (G/L)— GRASS LINED DRAINAGE CHANNEL
 - 450 — SURFACE STORMWATER PIPE, SIZE & FLOW ARROW
 - STORMWATER HEADWALL
 - STORMWATER PIT
 - - - RISING MAIN SYSTEM
 - (S)— BRIDGE SCUPPERS



DATE: 03/07/15 2:45:10 PM LOGIN NAME: GILL COLONY SCOTT
 LOCATION: C:\projects\m5\m5-ajv-dwg-700-320-dr-7251-7253.dwg

REV	DATE	DESCRIPTION	DRAWN	APPROVAL	PROJECT DIRECTOR
0	03.07.15	CONCEPT DESIGN ISSUE TO REFLECT POST-TENDER ADDENDUM 1	SG	RND	MP

TITLE	INITIAL	DATE
DRAFTSPERSON	SG	03.07.15
DRAFTING CHECK	SG	03.07.15
DESIGNER	KH	03.07.15
DESIGN CHECKER	RND	03.07.15
DESIGN MANAGER	MP	03.07.15
PROJECT DIRECTOR	TE	03.07.15

ORIGINAL DRAWING AT A3 SIZE

SCALE 1:2000

AT A3

CLIENT: **NSW GOVERNMENT** **WestConnex Delivery Authority**

RIGHT TO PHOTOGRAPHY: DRAGADOS, SAMSUNG, SAMSUNG C&T, WestConnex STAGE 2 M5

CONTRIBUTORS: **DRAGADOS**, **SAMSUNG**, **SAMSUNG C&T**, **WestConnex STAGE 2 M5**

DESIGNERS: **aurecon**, **JACOBS**, **HASSELL**

PROJECT: **WESTCONNEX STAGE 2 NEW M5 MAIN WORKS DESIGN & CONSTRUCT**

TITLE: **ST. PETERS INTERCHANGE DRAINAGE AND WATER QUALITY PLAN SHEET 2**

INFORMATION SHOWN ON THIS DRAWING IS PRELIMINARY ONLY AND SUBJECT TO ADJUSTMENT DURING DETAILED DESIGN STAGE.

STATUS: **CONCEPT DESIGN NOT FOR CONSTRUCTION**

RFT APP 2 - TENDER INFORMATION REQUIREMENTS VOLUME

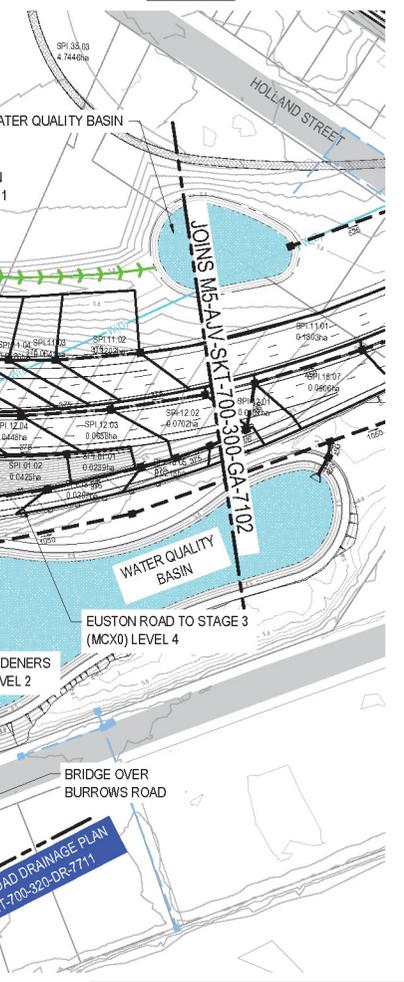
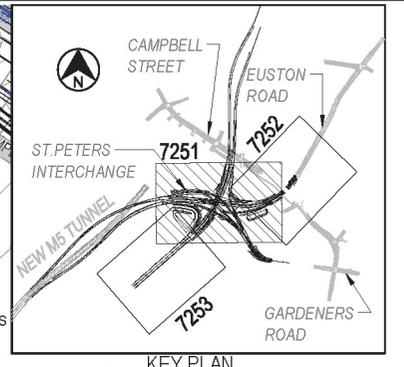
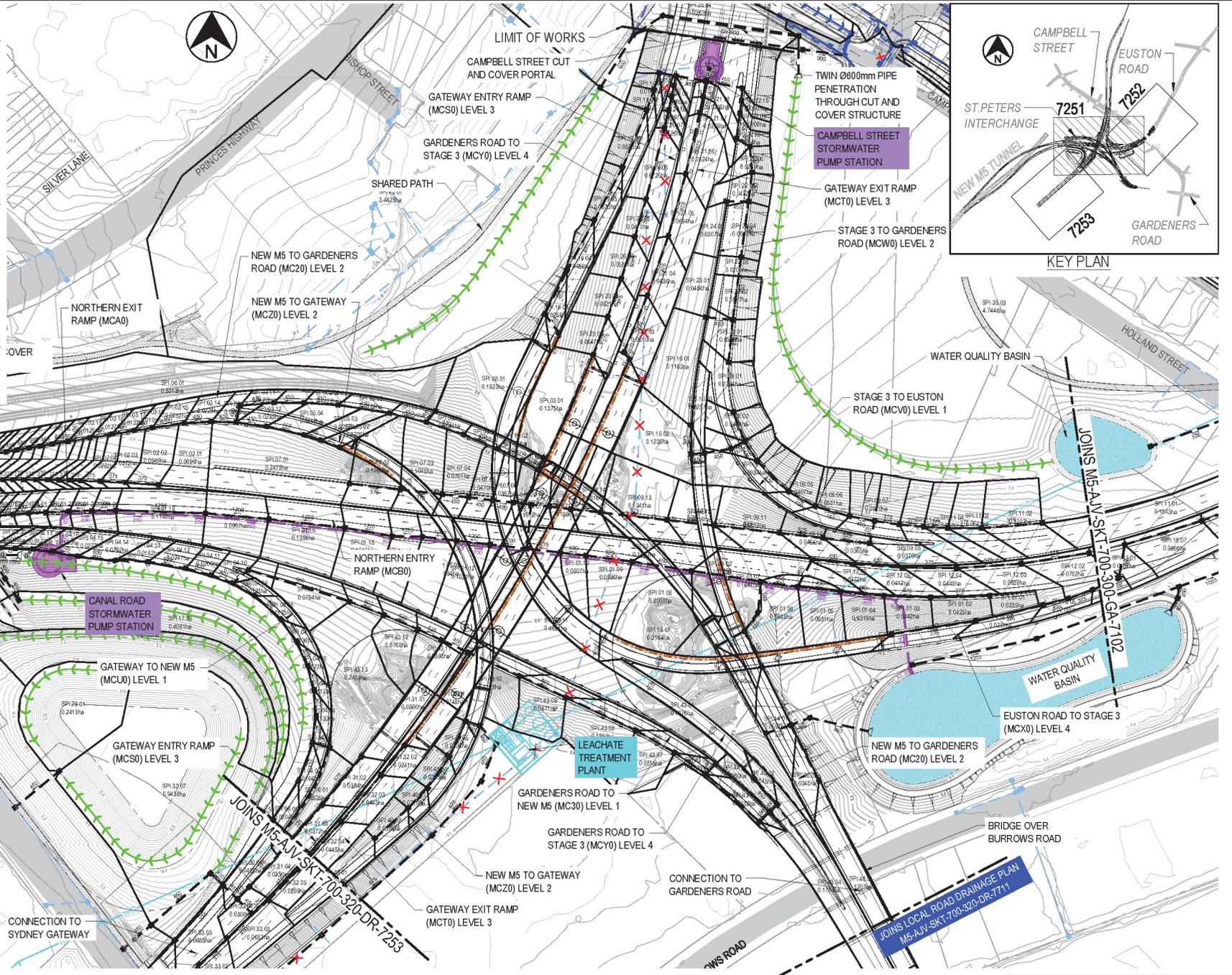
2F - DRAINAGE DESIGN

DRAWING NUMBER: **M5-AJV-DWG-700-320-DR-7252**

REV: **0**

LEGEND

- EXISTING**
- EXISTING ROAD
 - SURVEY
 - EXISTING STORMWATER PIPE (TO REMAIN U.N.O)
 - EXISTING STORMWATER PIPE TO BE REMOVED / ABANDONED
 - EXISTING STORMWATER PIT (TO REMAIN U.N.O)
 - EXISTING DESALINATION PIPELINE
- PROPOSED**
- GRASS LINED DRAINAGE CHANNEL
 - SURFACE STORMWATER PIPE, SIZE & FLOW ARROW
 - STORMWATER HEADWALL
 - STORMWATER PIT
 - RISING MAIN SYSTEM
 - BRIDGE SCUppers
- CATCHMENT AREAS**
- CATCHMENT BOUNDARY
 - CATCHMENT ID
 - CATCHMENT AREA



DATE: 03/07/15 2:30:07 PM, LOGON NAME: GALLAGHER, QSOFT LOCATION: C:\pwworking\jacobshasselldrawings\14920016-AJV-SKT-700-320-DR-7251-7253.dwg

REV	DATE	DESCRIPTION	SG	RND	MP
0	03.07.15	ISSUED FOR INFORMATION			
1	03.07.15	ISSUED FOR INFORMATION			
2	03.07.15	ISSUED FOR INFORMATION			
3	03.07.15	ISSUED FOR INFORMATION			
4	03.07.15	ISSUED FOR INFORMATION			
5	03.07.15	ISSUED FOR INFORMATION			
6	03.07.15	ISSUED FOR INFORMATION			
7	03.07.15	ISSUED FOR INFORMATION			
8	03.07.15	ISSUED FOR INFORMATION			
9	03.07.15	ISSUED FOR INFORMATION			
10	03.07.15	ISSUED FOR INFORMATION			

TITLE	INITIAL	DATE
DRAWING PERSON	SG	03.07.15
DRAWING CHECK	SG	03.07.15
DESIGNER	KH	03.07.15
DESIGN CHECK	RND	03.07.15
DESIGN MANAGER	MP	03.07.15
PROJECT DIRECTOR	TB	03.07.15

Scale 1:2000

AT AS

Client: **NSW Government** **Transport WestConnex Delivery Authority**

DRIGHT TO PHOTO: DRAGONIS SAMBUNG JANT JOINT VENTURE

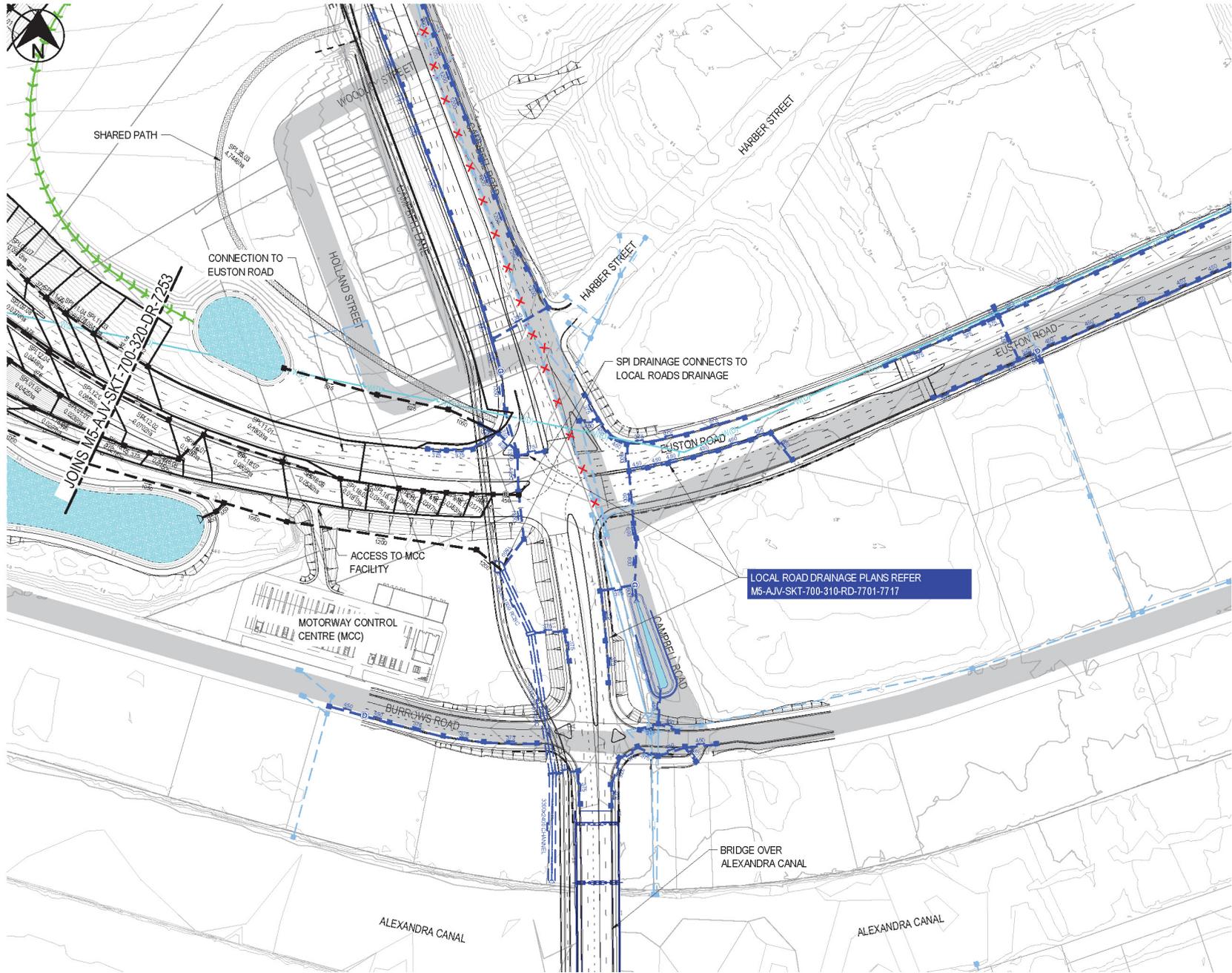
Client: **aurecon JACOBS HASSELL**

PROJECT: **WESTCONNEX STAGE 2 NEW M5 MAIN WORKS DESIGN & CONSTRUCT**

TITLE: **ST. PETERS INTERCHANGE DRAINAGE AND WATER QUALITY CATCHMENT PLAN SHEET 1**

INFORMATION SHOWN ON THIS DRAWING IS PRELIMINARY ONLY AND SUBJECT TO ADJUSTMENT DURING DETAILED DESIGN STAGE.

STATUS:	SKETCH FOR INFORMATION
RFT APP. 2 - TENDER INFORMATION REQUIREMENTS VOLUME:	2F - DRAINAGE DESIGN
DRAWING NUMBER:	M5-AJV-SKT-700-320-DR-7251
REV:	0



LEGEND

EXISTING

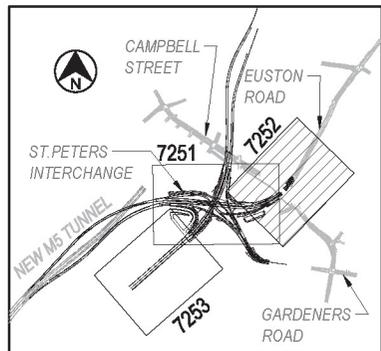
- EXISTING ROAD
- SURVEY
- EXISTING STORMWATER PIPE (TO REMAIN U.N.O)
- EXISTING STORMWATER PIPE TO BE REMOVED / ABANDONED
- EXISTING STORMWATER PIT (TO REMAIN U.N.O)
- EXISTING DESALINATION PIPELINE

PROPOSED

- GRASS LINED DRAINAGE CHANNEL
- SURFACE STORMWATER PIPE, SIZE & FLOW ARROW
- STORMWATER HEADWALL
- STORMWATER PIT
- RISING MAIN SYSTEM
- BRIDGE SCUPPERS

CATCHMENT AREAS

- CATCHMENT BOUNDARY
- CATCHMENT ID
- CATCHMENT AREA

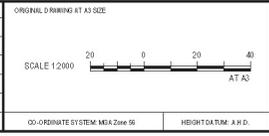


KEY PLAN

DATE: 03/07/15 2:30:16 PM, LOGIN NAME: GALLAGHER, SCOTT, LOCATION: C:\pwworking\jacobshasselldrawings\14920010\M5-AJV-SKT-700-320-DR-7251-7253.dwg

REV	DATE	DESCRIPTION	SG	RND	MP
0	03.07.15	ISSUED FOR INFORMATION			

TITLE	INITIAL	DATE
DRAFTSPERSON	SG	03.07.15
DRAFTING CHECK	SG	03.07.15
DESIGNER	KH	03.07.15
DESIGN CHECK	RND	03.07.15
DESIGN MANAGER	MP	03.07.15
PROJECT DIRECTOR	TB	03.07.15



PROJECT: WESTCONNEX STAGE 2
NEW M5 MAIN WORKS DESIGN & CONSTRUCT

TITLE: ST. PETERS INTERCHANGE
DRAINAGE AND WATER QUALITY
CATCHMENT PLAN
SHEET 2

INFORMATION SHOWN ON THIS DRAWING IS PRELIMINARY ONLY AND SUBJECT TO ADJUSTMENT DURING DETAILED DESIGN STAGE.

STATUS: **SKETCH FOR INFORMATION**

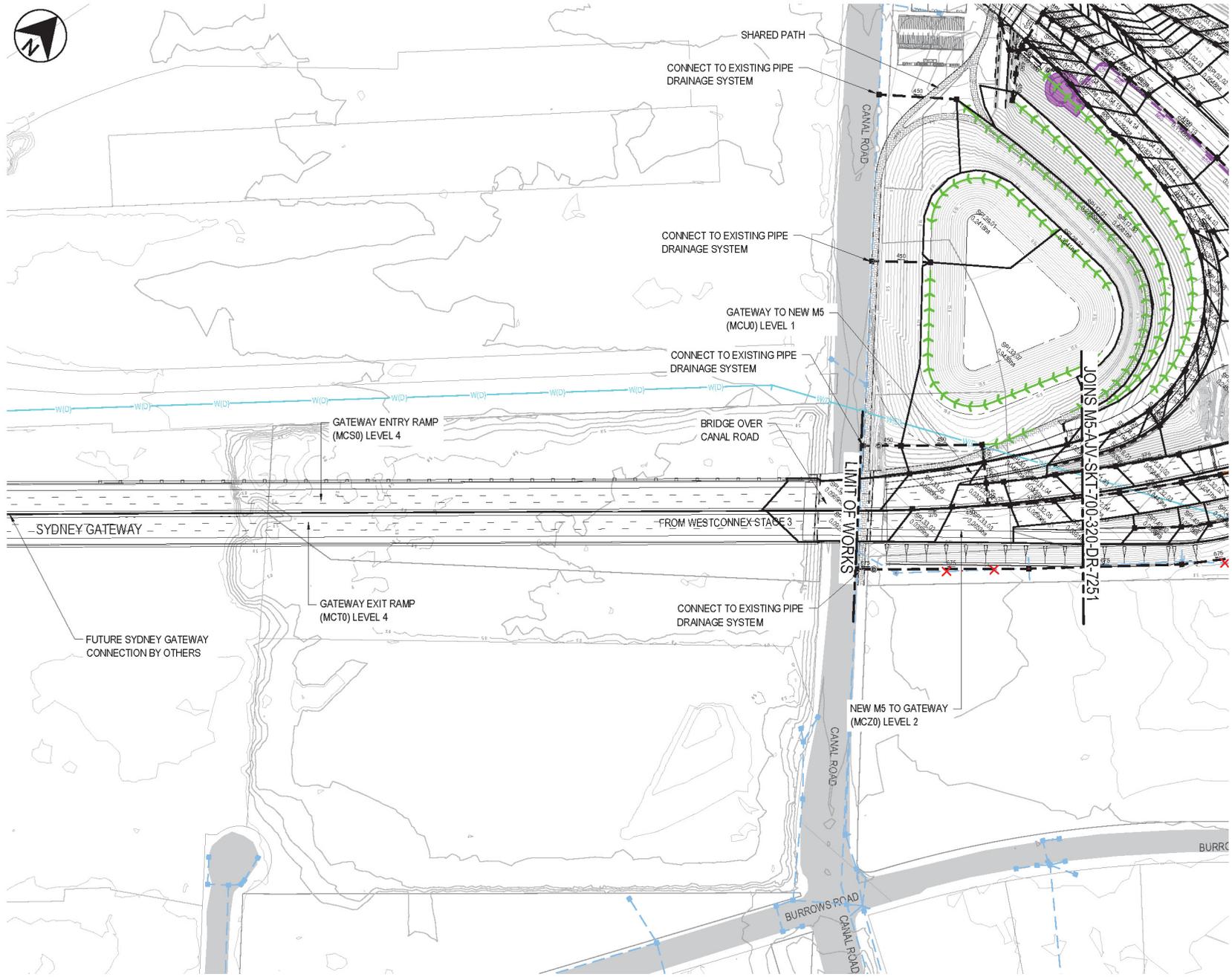
RFT APP 2 - TENDER INFORMATION REQUIREMENTS VOLUME

TITLE: 2F - DRAINAGE DESIGN

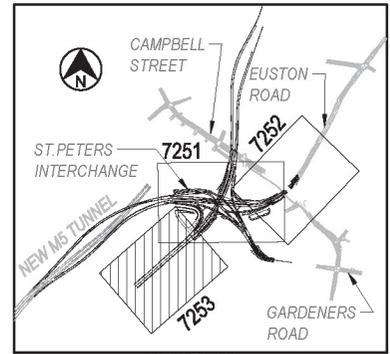
DRAWING NUMBER: M5-AJV-SKT-700-320-DR-7252

REV: 0

This Drawing may have been prepared using colour and may be incomplete if copied



LEGEND	
EXISTING	
	EXISTING ROAD
	SURVEY
	EXISTING STORMWATER PIPE (TO REMAIN U.N.O)
	EXISTING STORMWATER PIPE TO BE REMOVED / ABANDONED
	EXISTING STORMWATER PIT (TO REMAIN U.N.O)
	EXISTING DESALINATION PIPELINE
PROPOSED	
	GRASS LINED DRAINAGE CHANNEL
	SURFACE STORMWATER PIPE, SIZE & FLOW ARROW
	STORMWATER HEADWALL
	STORMWATER PIT
	RIISING MAIN SYSTEM
	BRIDGE SCUCCPERS
CATCHMENT AREAS	
	CATCHMENT BOUNDARY
	CATCHMENT ID
	CATCHMENT AREA



KEY PLAN

DATE: 03/07/15 2:02:05 PM, LOGIN NAME: GALLAGHER, PROJECT LOCATION: C:\projects\stage2\stage2\m5\skt-700-320-dr-7251-7253.dwg

REV	DATE	DESCRIPTION	SG	RND	MP
0	03.07.15	ISSUED FOR INFORMATION			

TITLE	INITIAL	DATE
DRAFTSPERSON	SG	03.07.15
DRAFTING CHECK	SG	03.07.15
DESIGNER	KH	03.07.15
DESIGN CHECK	RND	03.07.15
DESIGN MANAGER	MP	03.07.15
PROJECT DIRECTOR	TB	03.07.15

ORIGINAL DRAWING AT A3 SIZE

SCALE 1:2000

AT A3

COORDINATE SYSTEM: MEA Zone 56

HEIGHT DATUM: A.H.D.

CLIENT

Transport WestConnex Delivery Authority

RIGHTS TO PHOTOGRAPHS AND VIDEO

WestConnex STAGE 2 M5

PROJECT

WESTCONNEX STAGE 2
NEW M5 MAIN WORKS DESIGN & CONSTRUCT

TITLE

ST. PETERS INTERCHANGE
DRAINAGE AND WATER QUALITY
CATCHMENT PLAN
SHEET 3

INFORMATION SHOWN ON THIS DRAWING IS PRELIMINARY ONLY AND SUBJECT TO ADJUSTMENT DURING DETAILED DESIGN STAGE.

STATUS

SKETCH FOR INFORMATION

RFT APP 2 - TENDER INFORMATION REQUIREMENTS VOLUME

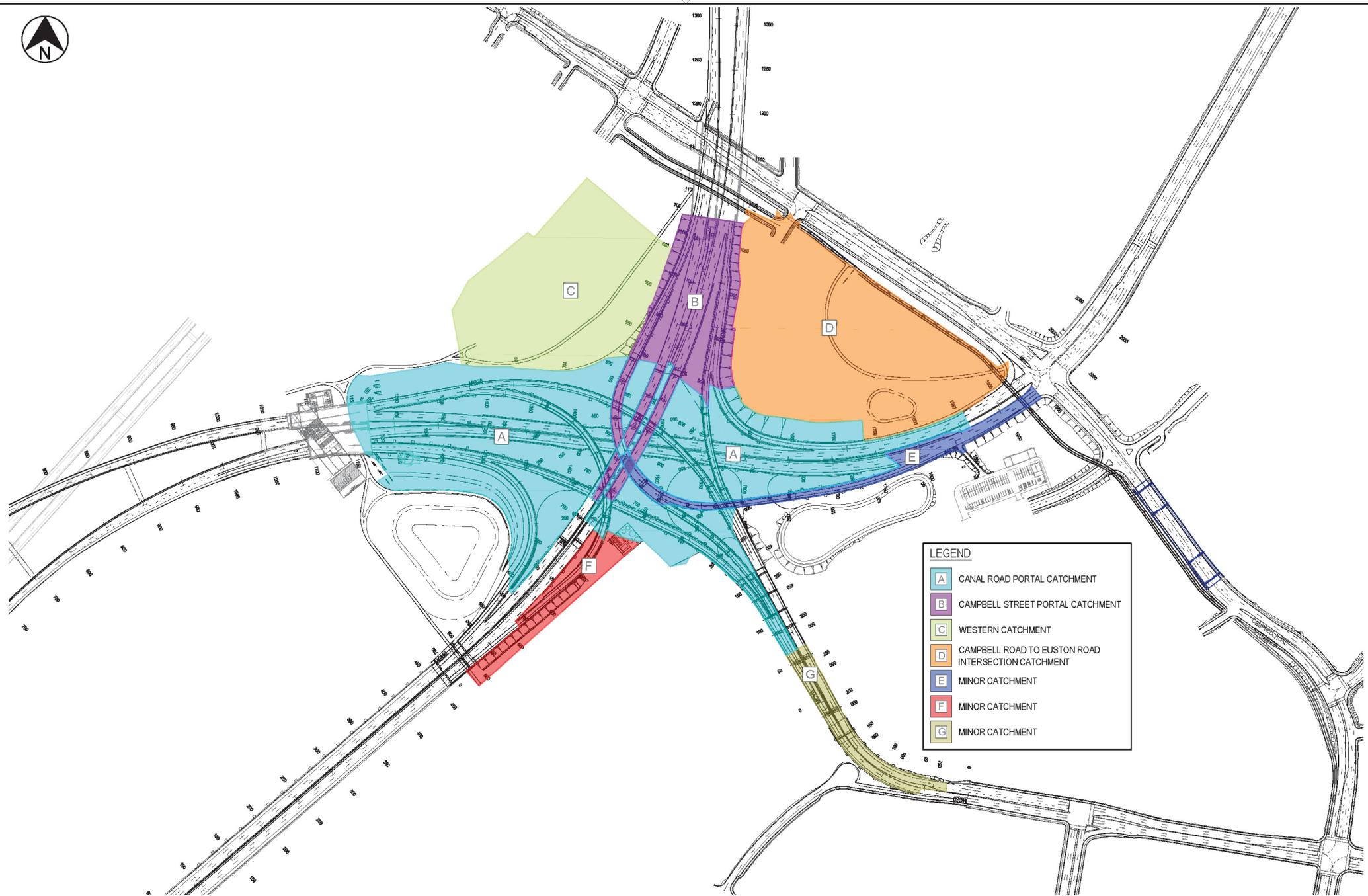
2F - DRAINAGE DESIGN

DRAWING NUMBER

M5-AJV-SKT-700-320-DR-7253

REV

0



LEGEND	
A	CANAL ROAD PORTAL CATCHMENT
B	CAMPBELL STREET PORTAL CATCHMENT
C	WESTERN CATCHMENT
D	CAMPBELL ROAD TO EUSTON ROAD INTERSECTION CATCHMENT
E	MINOR CATCHMENT
F	MINOR CATCHMENT
G	MINOR CATCHMENT

DATE: 03/07/15 14:21 PM, LOGON NAME: RAHMAN, SYED
 LOCATION: C:\pwworkspace\proj\2015\20150320\20150320-DR-7271.dwg

REV	DATE	DESCRIPTION	DRAWN	REVIEWED	APPROVAL	PROJECT DIRECTOR
0	03.07.15	ISSUED FOR INFORMATION - POST TENDER ADDENDUM 1	SG	RND	MP	TB

ORIGINAL DRAWING AT A3 SIZE
 SCALE 1:4000
 0 40 80
 AT A3
 CO-ORDINATE BY ETEM, MEK, ZONE 55
 HEIGHT DATUM: A.H.D.



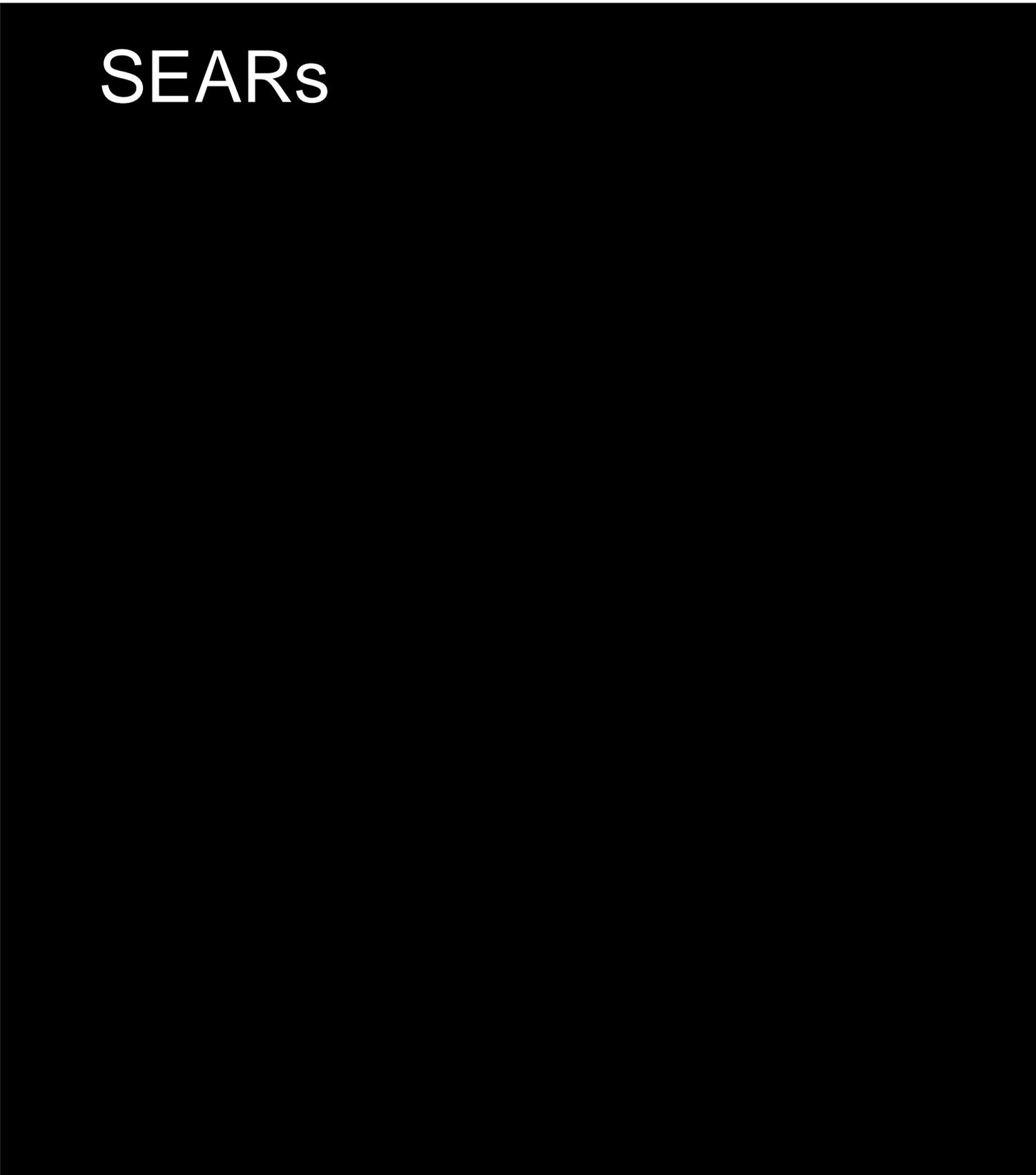
PROJECT: WESTCONNEX STAGE 2
 NEW M5 MAIN WORKS DESIGN & CONSTRUCT
 TITLE: ST. PETERS INTERCHANGE
 DRAINAGE AND WATER QUALITY
 COARSE CATCHMENT PLAN

PROJECT: WESTCONNEX STAGE 2
 NEW M5 MAIN WORKS DESIGN & CONSTRUCT
 TITLE: ST. PETERS INTERCHANGE
 DRAINAGE AND WATER QUALITY
 COARSE CATCHMENT PLAN

INFORMATION SHOWN ON THIS DRAWING IS PRELIMINARY ONLY AND SUBJECT TO ADJUSTMENT DURING DETAILED DESIGN STAGE.	
STATUS:	SKETCH FOR INFORMATION ONLY
DWT APP 2 - TENDER INFORMATION REQUIREMENTS VOLUME	2F - DRAINAGE DESIGN
DRAWING NUMBER:	M5-AJV-SKT-700-320-DR-7271
REV:	0

Appendix B

SEARs



Appendix B SEARs



Mr Peter Duncan
Chief Executive
Roads and Maritime Services
Locked Bag 928
North Sydney NSW 2059

Our ref: 14/18688

Dear Mr Duncan

SEARs WestConnex New M5 (SSI 6788)

Please find attached a copy of the Secretary's Environmental Assessment Requirements (SEARs) for the preparation of an Environmental Impact Statement (EIS) for the WestConnex New M5. These SEARs replace those issued for this project on 5 March 2015.

The Department has prepared these SEARs to reflect the decision that the project is a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). As identified in the SEARs, the Environmental Impact Statement must be prepared in accordance with the *Guidelines for preparing Assessment Documentation relevant to the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) — WestConnex New M5 Project (EPBC 2015/7520)*. These guidelines provide detailed information about the requirements for assessment of matters of national environmental significance.

In accordance with the Agreement between the Commonwealth of Australia and the State of New South Wales relating to Environmental Assessment, the Department will undertake an assessment of matters of national environmental significance. Enquiries about the requirements for assessment of matters of national environmental significance should be directed to the Department.

If you do not lodge an EIS for the proposal within two (2) years, you must consult further with the Secretary in relation to the preparation of the EIS.

On lodgement of the EIS, the Department will review the document in consultation with the relevant authorities to determine if it addresses the requirements in Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*.

I would appreciate it if you would contact the Department at least two weeks before you propose to submit your EIS. This will enable the Department to determine the number of copies (hard-copy and CD-ROM) of the EIS that will be required for reviewing purposes.

Should you have any enquiries regarding these SEARs, please contact Dominic Crinnion on (02) 9228 2084 or at Dominic.Crinnion@planning.nsw.gov.au.

Yours sincerely

Daniel Keary
A/Executive Director
Infrastructure and Industry Assessments
Delegate for the Secretary

Secretary's Environmental Assessment Requirements

Section 115Y of the *Environmental Planning and Assessment Act 1979*

Application Number	SSI 6788
Proposal	Multi-lane road link, including twin motorway tunnels, between the M5 East Motorway east of King Georges Road, Beverly Hills and St Peters.
Location	Land generally located between the M5 East Motorway east of King Georges Road, Beverly Hills and St Peters in the Canterbury, Hurstville, Rockdale, Marrickville, Botany Bay and City of Sydney local government areas.
Proponent	Roads and Maritime Services
Date of Issue	26 August 2015
General Requirements	<p>The Environmental Impact Statement (EIS) must be prepared in accordance with, and meet the minimum requirements of Part 3 of Schedule 2 of the <i>Environmental Planning and Assessment Regulation 2000</i> (the Regulation), including:</p> <ol style="list-style-type: none"> 1. the information required under clause 6 of Schedule 2 of the Regulation. 2. the content listed in clause 7 of Schedule 2 of the Regulation, including but not limited to: <ul style="list-style-type: none"> • a statement of the objectives of the proposal, including a description of the strategic need, justification, objectives and outcomes for the proposal, taking into account existing and proposed transport infrastructure and services within the adjoining subregions, and as relevant, the outcomes and objectives of relevant strategic planning and transport policies, including, but not limited to: <i>NSW 2021</i>; <i>NSW State Infrastructure Strategy 2012</i> (and update); <i>NSW Long Term Transport Master Plan</i> (December 2012); <i>A Plan for Growing Sydney</i> (December 2014); <i>NSW Freight and Ports Strategy 2013</i>; and any other relevant plans or draft plans published after the date of these requirements; • an analysis of feasible alternatives to the carrying out of the proposal and proposal justification, including: <ul style="list-style-type: none"> ○ an analysis of alternatives/options considered, having regard to the proposal objectives (including an assessment of the environmental costs and benefits of the proposal relative to alternatives and the consequences of not carrying out the proposal), and whether or not the proposal is in the public interest, ○ justification for the preferred proposal taking into consideration the objects of the <i>Environmental Planning and Assessment Act 1979</i>, ○ details of the alternative ventilation options considered during the tunnel design to meet the air quality criteria for the proposal, ○ details of the short-listed route and tunnel options from the tender process and the criteria that was considered in the selection of the preferred route and tunnel design, and ○ staging of the proposal and the broader WestConnex scheme, and in particular access to Sydney Airport and Port Botany and improved freight efficiencies; • a detailed description of the proposal, including: <ul style="list-style-type: none"> ○ proposed route, ○ design of the tunnels, interchanges (including tunnel portals and entry and exit ramps), and potential future connections to Stage 3 of WestConnex and other proposals such as southern Sydney

	<p>connection, and road user, pedestrian and cyclist facilities, and lighting,</p> <ul style="list-style-type: none"> ○ surface road upgrade works, including road widening, intersection treatment and grade separation works, property access, parking, pedestrian and cyclist facilities (including appropriate locations for overbridges) and public transport facilities, and integration with the M5 East Motorway, ○ ancillary infrastructure and operational facilities, such as operational and maintenance facilities, ventilation structures and systems, and fire and emergency services and infrastructure for the proposal, including (if required) additional infrastructure (such as tolling infrastructure) for the M5 East Motorway, ○ location and operational requirements of construction ancillary facilities and access, ○ land use changes as a result of the proposal and the acquisition of privately owned, Council and Crown lands, and impacts to Council and Crown lands, and ○ relationship and/or integration with existing public and freight transport services; <ul style="list-style-type: none"> ● an analysis of the proposal including an assessment, with a particular focus on the requirements of the listed key issues, in accordance with clause 7(1)(d) of Schedule 2 of the Regulation (where relevant), including an identification of how relevant planning, land use and development matters (including relevant strategic and statutory matters) have been considered in the impact assessment (direct, indirect and cumulative impacts) and/or in developing mitigation measures (to avoid, manage, offset and monitor impacts and where relevant, improve the existing environment); ● detail how the principles of ecologically sustainable development will be incorporated in the design, construction and ongoing operation phases of the proposal; and ● details of the proposal's relationship to and consistency with the broader WestConnex, and an assessment of the cumulative impacts taking into consideration the WestConnex program of works. <p>Where relevant, the assessment of key issues below, and any other significant issues identified in the risk assessment, must include:</p> <ul style="list-style-type: none"> ● adequate baseline data, in terms of temporal, spatial and parameters monitored; ● consideration of the potential cumulative impacts due to other development in the vicinity (completed, underway or proposed); and ● measures to avoid, minimise and if necessary offset predicted impacts, including detailed contingency plans for managing any significant risks to the environment.
<p>Key issues</p>	<p>The EIS must also address the following specific matters:</p> <p>Traffic and Transport — including but not limited to:</p> <ul style="list-style-type: none"> ● details of how the proposal meets the objectives of the overall WestConnex program; ● details of how the traffic and transport objectives of the proposal, and service and infrastructure responses, take into account: adjacent sensitive land uses; future housing and employment growth areas; existing town, employment and industrial centres; approved and proposed infrastructure proposals; and broader transport needs (including public transport, cyclist and pedestrian requirements and facilities); including with specific reference to: <ul style="list-style-type: none"> ● the preferred alignment and design, ● the proposed interchanges and connections to the surrounding road network, and ● associated road and related transport infrastructure facilities;

- an assessment and modelling of operational traffic and transport impacts on the local and regional road network (in consultation with affected councils), and the Sydney motorway network, including the consideration of planning proposals, major urban renewal and development, the potential cumulative impacts of Stage 3 – M4 South (Haberfield to St Peters), and the impacts of potential shifts of traffic movements to alternative routes outside the proposal area (including as a result of tolls);
- induced traffic and operational implications for public transport (particularly with respect to strategic bus corridors and bus routes) and future public transport opportunities;
- impacts on property and business access and on street parking provision, including permanent and temporary (construction) changes to access and parking, and traffic management measures such as clearways;
- impacts on cyclists and pedestrian access and safety and consideration of opportunities to integrate cycleway and pedestrian elements with surrounding networks;
- construction traffic and transport impacts of the proposal (including ancillary facilities) and associated management measures, in particular:
 - impacts on the road network (including safety and level of service, parking, pedestrian and cyclist access, and disruption to public transport services and access to properties),
 - route identification and suitability for heavy vehicles, and scheduling of transport movements, particularly movements outside standard construction hours,
 - the number, frequency and size of construction related vehicles (both light and heavy vehicles),
 - the nature of existing traffic on construction access routes (including consideration of peak traffic times), and
 - the need to close, divert or otherwise reconfigure elements of the road network associated with construction of the proposal, and
 - having reference to the cumulative construction impacts of other infrastructure preparing for or commencing construction.

Air Quality – including but not limited to:

- an assessment of construction and operational activities that have the potential to impact on in-tunnel, local and regional air quality. The air quality impact assessment must provide an assessment of the risk associated with potential discharges of fugitive and point source emissions on sensitive receivers, and include:
 - the identification of all sources of air pollution and assess potential emissions of PM₁₀, PM_{2.5}, CO, NO₂ and other nitrogen oxides and volatile organic compounds (eg BTEX) and consider the impacts from the dispersal of these air pollutants on the ambient air quality along the proposal route, proposed ventilation outlets and portals, surface roads in the vicinity of the St Peters interchange, the alternative surface road network, and in-tunnel air quality,
 - assessment of worst case scenarios for in-tunnel and ambient air quality, including assessment of a range of traffic scenarios, including worst case design maximum traffic flow scenario (variable speed) and worst case breakdown scenario, and discussion of the likely occurrence of each,
 - details of the proposed tunnel design and mitigation measures to address in-tunnel air quality and the air quality in the vicinity of portals and any mechanical ventilation systems (ie ventilation stacks and air inlets) including details of proposed air quality monitoring (including criteria),
 - demonstrate how the project and ventilation design ensures that concentrations of air emissions meet NSW, national and international best practice for in-tunnel and ambient air quality,

	<p>and taking into consideration the approved criteria for the NorthConnex project,</p> <ul style="list-style-type: none"> • consideration of any advice from the Advisory Committee on Tunnel Air Quality on the project particularly in relation to assessment methodology, • details of any emergency ventilation systems, such as air intake/exhaust stacks, including protocols for the operation of these systems in emergency situations, potential emission of air pollutants and their dispersal, and safety procedures, and • details of in-tunnel air quality control measures considered, including air filtration. Justification must be provided to support the proposed measures; <ul style="list-style-type: none"> • details of the proposed mitigation measures to prevent the generation and emission of dust (particulate matter and TSP) and air pollutants (including odours) during the construction of the proposal, particularly in relation to ancillary facilities (such as concrete batching plants), the use of mobile plant, stockpiles and the processing and movement of spoil; • cumulative assessment of the local and regional air quality due to the operation of the M5 East Motorway ventilation stack, operation of Stage 3 – M4 South (Haberfield to St Peters), and surface road operations; • The air quality assessment including the setting of air quality criteria must be done in consultation with NSW Health, and the Environment Protection Authority and the consideration of any applicable advice provided by the Advisory Committee on Tunnel Air Quality; and • modelling (including dispersion modelling) must be conducted in accordance with the <i>Approved Methods for the Modelling and Assessment of Air Pollutants in NSW</i> (EPA, 2005) or a suitably justified and verified alternative method based on current scientific understanding of atmospheric dispersion. Particular attention must be given to the verification of the method of predicting local air quality or meteorological conditions based on non-local or modelled data. <p>Human Health – including but not limited to:</p> <ul style="list-style-type: none"> • an assessment of human health impacts with particular consideration of: <ul style="list-style-type: none"> • how the design of the proposal minimises adverse health impacts, • human health impacts from the operation of the tunnel under a range of conditions, including worst case operating condition, • human health risks and costs associated with the proposal, including those associated with air quality, noise and vibration, and social impacts, during the construction and operation of the proposal, and • the Environmental Health Risk Assessment: Guidelines for assessing human health risks from environmental hazards (enHealth, 2012) and Air Quality in and Around Traffic Tunnels (NHMRC, 2008). <p>Noise and Vibration — including but not limited to:</p> <ul style="list-style-type: none"> • an assessment of the noise impacts of the proposal during operation, consistent with the <i>Road Noise Policy</i> (EPA, 2011) and <i>NSW Industrial Noise Policy</i> (EPA, 2000). The assessment must address: <ul style="list-style-type: none"> • the redistribution of traffic, • impacts to receivers (dwellings, child care centres, educational establishments, hospitals, motels, nursing homes, or places of worship), • sleep disturbance, and • the characteristics of noise (eg. low frequency noise); • an assessment of construction noise and vibration impacts, consistent with the <i>Interim Construction Noise Guideline</i> (ICNG) (DECCW, 2009) and <i>Assessing Vibration: a technical guideline</i> (DEC, 2006). The assessment must address:
--	---

- the nature of construction activities (including transport, tonal or impulsive noise-generating works and the removal of operational noise barriers, as relevant),
- the intensity and duration of noise and vibration impacts (both air and ground borne),
- the nature, sensitivity and impact to receivers,
- the need to balance timely conclusion of noise and vibration-generating works with periods of receiver respite, and other factors that may influence the timing and duration of construction activities (such as traffic management),
- an indication of potential for works outside standard construction hours, including predicted levels, exceedances and number of potentially affected receivers, justification for the activity in terms of the ICNG; and
- cumulative assessment of potential construction noise and vibration impacts due to other developments in the vicinity, including future stages of WestConnex.

Biodiversity — including but not limited to:

- an assessment of the potential ecological impacts of the proposal, with specific reference to vegetation and habitat clearing, connectivity, edge effects, weed dispersal, riparian and aquatic habitat impacts, soil and water quality impacts and operational impacts. The assessment must:
 - make specific reference to impacts on landscape values, biodiversity values of native vegetation and threatened species or populations, including worst case estimates of vegetation clearing and operational impacts;
 - demonstrate a design philosophy of impact avoidance on ecological values, and in particular, ecological values of high significance, and be consistent with the 'avoid, minimise or offset' principle;
 - be undertaken in accordance with the *Framework for Biodiversity Assessment* (OEH, 2014) and the *NSW Biodiversity Offsets Policy for Major Projects* (OEH, 2014), and by a person accredited in accordance with section 142B(1)(c) of the *Threatened Species Conservation Act, 1995*. Impacts on species, populations and ecological communities that will require further consideration and provision of information specified in section 9.2 of the *Framework for Biodiversity Assessment* include those identified by the OEH. Species specific surveys shall be undertaken for those species and in accordance with the survey requirements specified by the OEH; and
 - in relation to aquatic biodiversity be consistent with the draft *Policy and Guidelines for Fish Habitat Conservation and Management – Update 2013* (DPI, 2013).
- The assessment of potential ecological impacts is to comply with the requirements of the *Guidelines for preparing Assessment Documentation relevant to the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) — WestConnex New M5 Project (EPBC 2015/7520)*. The assessment is to contain detailed identification and assessment of direct and indirect impacts on threatened species and ecological communities that will, are likely to, or may be significantly impacted by the proposal, including but not limited to:
 - Cooks River/Castlereagh Ironbark Forest of the Sydney Basin Bioregion,
 - Green and Golden Bell Frog (*Littoria aurea*),
 - Turpentine-Ironbark Forest in the Sydney Basin Bioregion,
 - Bynoe's Wattle (*Acacia bynoeana*),
 - Downy Wattle (*Acacia pubescens*),
 - Deane's Paperbark (*Melaleuca deanei*),

- Hairy Geebung (*Persoonia hirsuta*),
- Spiked Rice-flower (*Pimelea spicata*),
- Magenta Lilly Pilly (*Syzygium paniculatum*), and
- Black-eyed Susan (*Tetradlea juncea*).

Urban Design and Visual Amenity – including, but not limited to:

- a consideration of the urban design and visual amenity implications of the proposal, including supporting infrastructure, during construction and operation. The assessment must identify urban design and landscaping objectives to enhance the ventilation stacks, interchanges, tunnels, ‘cut and cover’ arrangements, consider resulting residual land and treatments, and demonstrate how the proposed hard and soft urban design elements of the proposal would be consistent with the existing and desired future character of the area traversed affected by the proposal;
- identification of opportunities to utilise surplus or residual land, and utilise key structures (such as stacks) for multiple uses ie integration with other structures;
- evaluation of the visual impacts and urban design aspects of the proposal (and its components) on surrounding areas, and consistency with the urban and landscape design of the M5 East Motorway and WestConnex Urban Design Corridor Framework;
- a consideration of impacts on views and vistas, streetscapes, key sites and buildings, and direct amenity impacts (such as proximity and overshadowing);
- details of urban design and landscape mitigation measures, having regard to the urban design and landscape objectives for the proposal;
- measures to manage lighting impacts both during construction and operation, in particular lighting of the St Peters interchange and impacts on the operation of Sydney Airport; and
- artists’ impressions and perspective visualisations of the proposal from a variety of locations along and adjacent to the route.

Land Use, Social and Economic — including, but not limited to:

- a description of the existing socio-economic environment;
- impacts on directly affected properties and land uses, including impacts related to access, land use, settlement and subsidence associated with tunnel excavation, property acquisition (including relocations and expenses for those properties acquired) and amenity related changes;
- social and economic impacts to businesses and the community within the vicinity of the proposal, with associated property acquisition, traffic, access, property, public domain and open space, and amenity and health related changes (including the broader regional impacts associated with the closure of the Alexandria landfill site should this be part of the proposal);
- opportunities for local centre and street revitalisation near the St Peters interchange;
- an assessment of the impact of the proposal on community facilities, including open space and recreational facilities. The assessment must include the use of existing facilities impacted by the proposal, and options and opportunities for the relocation and/or reconfiguration of the community facilities, both temporary and permanent;
- where there are potential impacts to the OEH estate reserved under the *National Parks and Wildlife Act 1974* or where the proposal is located upstream of OEH estate, an assessment of the matters to be considered outlined in the *Guidelines for developments adjoining land and water managed by DECCW* (DECCW 2010);
- potential impacts on utilities (including communications, electricity, gas, and water and sewerage) and the relocation of these utilities; and
- a draft Community Consultation Framework identifying relevant stakeholders, procedures for distributing information and

receiving/responding to feedback and procedures for resolving stakeholder and community complaints during construction and operation. Key issues that must be addressed in the draft Strategy include:

- traffic management (including property access, pedestrian access),
- landscaping/urban design matters,
- construction activities including out of hours work, and
- noise and vibration mitigation and management.

Soil, Water and Hydrology— including but not limited to:

- an assessment of construction and operational erosion and sediment and water quality discharge impacts, taking into account impacts from treated discharge, accidents and runoff (i.e. acute and chronic impacts), having consideration to impacts to surface water runoff, soil erosion and sediment transport, mass movement, salinity and iron levels. The assessment must include identification and estimation of the quality and quantity of pollutants that may be introduced into any waterways by source and discharge point;
- an assessment of water quality impacts on receiving waterways likely to be affected by the proposal (including Wolli, Cup and Saucer Creeks, Cooks River and Alexandria Canal). The assessment must include existing water quality, geomorphology, riparian vegetation and rehabilitation of riparian land, and have reference to the *NSW Water Quality Objectives and* relevant public health and environmental water quality trigger values and criteria, including those specified in the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC/ARMCANZ 2000), any applicable regional, local or site-specific guidelines and any licensing requirements;
- an assessment of groundwater impacts (including ancillary facilities such as the tunnel control centre and any deluge systems), considering local impacts along the length of the tunnels and impacts on local and regional hydrology including consideration of any Water Sharing Plan and impacts on groundwater flow. The assessment must consider: extent of drawdown; impacts to groundwater quality; volume of groundwater that will be taken (including inflows); discharge requirements; location and details of groundwater management and implications for groundwater-dependent surface flows, groundwater-dependent ecological communities, and groundwater users. The assessment must include details of proposed surface and groundwater monitoring and be prepared having consideration to the requirements of the *NSW Aquifer Interference Policy*;
- identification of potential impacts of the proposal on existing flood regimes, consistent with the *Floodplain Development Manual* (Department of Natural Resources, 2005), including impacts to existing receivers and infrastructure and the future flood mitigation options for and development potential of affected land, demonstrating consideration of the changes to rainfall frequency and/or intensity as a result of climate change on the proposal. The assessment must demonstrate due consideration of flood risks during construction and in the proposal design;
- identifying potential impacts of the development on acid sulphate soils in accordance with the relevant guidelines and a description of the mitigation measures proposed to minimise potential impacts; and
- a Spoil Management Strategy detailing how spoil will be managed during construction, including likely volumes, likely nature and classification of excavated material, opportunities for recycling, potential disposal sites (including description of sites), stockpile management, and method(s) and route of transportation.

Contaminated Sites – including but not limited to:

- an assessment of contaminated sites in accordance with the guidelines

made or approved under section 105 of the *Contaminated Land Management Act 1997*. The assessment must include details of proposed remediation measures and justification for the proposed measures in terms of the proposed final use of that land;

- status of site contamination and suitability of the site for the proposal, including the suitability of the Alexandria landfill site for the St Peters interchange;
- an assessment of the potential disturbance of contaminated bed sediments in the Alexandria Canal, and interception of contaminated water from the Botany Sand Beds aquifer; and
- having reference to the assessments conducted in satisfaction of the above, consideration of whether or not a site auditor, accredited under the *Contaminated Land Management Act 1997*, has or will be engaged to issue a site audit statement to certify on the suitability of the current or proposed uses.

Heritage — including but not limited to:

- impacts to State and local non-Aboriginal heritage (including conservation areas, built heritage landscapes and archaeology) must be assessed. Where impacts to State or locally significant historic heritage are identified, the assessment must:
 - outline the proposed mitigation and management measures (including measures to avoid significant impacts and an evaluation of the effectiveness of the mitigation measures) generally consistent with the guidelines in the *NSW Heritage Manual* (Heritage Office and Department of Urban Affairs and Planning 1996),
 - be undertaken by a suitably qualified heritage consultant(s) with relevant heritage expertise (note: where archaeological excavations are proposed the relevant consultant must meet the NSW Heritage Council's Excavation Director criteria),
 - include a statement of heritage impact for all heritage items/conservation areas to be impacted (including significance assessment), This must include detailed mapping of all heritage items and how they are affected by the proposal,
 - include details of any proposed mitigation measures (architectural and landscape),
 - consider the impacts from vibration, demolition, archaeological disturbance, altered historical arrangements and access, increased traffic, landscape and vistas, and architectural noise treatment, and
 - develop an appropriate archaeological assessment methodology, including research design, in consultation with the Department and the Heritage Council of New South Wales, to guide physical archaeological test excavations and include the results of these excavations; and
- impacts to Aboriginal heritage (including cultural and archaeological significance), in particular impacts to Aboriginal objects and potential archaeological deposits (PAD), should be assessed. Where impacts are identified, the assessment shall:
 - outline the proposed mitigation and management measures (including measures to avoid significant impacts and an evaluation of the effectiveness of the measures) generally consistent with the *Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (Department of Environment and Conservation 2005) and other relevant guidelines and requirements,
 - be undertaken by a suitably qualified heritage consultant(s),
 - demonstrate effective consultation with Aboriginal stakeholders in determining and assessing impacts and developing and selecting

	<p>options and mitigation measures (including the final proposed measures),</p> <ul style="list-style-type: none"> • assess and document the archaeological and cultural heritage significance of affected sites, and • undertake appropriate archaeological investigations generally in accordance with the <i>Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW</i> (DECCW 2010), to establish the full spatial extent and significance of any archaeological evidence across each site/area of PAD, and include the results of these excavations. If an alternative excavation method is proposed, it shall be developed in consultation with OEH. <p>Environmental Risk Analysis — notwithstanding the above assessment requirements, the EIS must include an environmental risk analysis to identify potential environmental impacts associated with the proposal (construction and operation), proposed mitigation measures and potentially significant residual environmental impacts after the application of proposed mitigation measures. Where additional key environmental impacts are identified through this environmental risk analysis, an appropriately detailed impact assessment of this additional key environmental impact must be included in the EIS.</p>
Consultation	<p>During the preparation of the EIS, you must consult with the relevant local, State or Commonwealth Government authorities, service providers, community groups and affected landowners.</p> <ul style="list-style-type: none"> • local, State and Commonwealth government authorities, including the: <ul style="list-style-type: none"> ○ Environment Protection Authority, ○ Office of Environment and Heritage (including Heritage Division), ○ The Heritage Council of NSW, ○ Department of Primary Industries, ○ NSW Office of Water, ○ NSW Health (including Local Health Districts), ○ Roads and Maritime Services, ○ Transport for NSW, ○ UrbanGrowth NSW; ○ Sydney Water, ○ Canterbury City Council, ○ Hurstville City Council, ○ Rockdale City Council, ○ Marrickville Council, ○ City of Botany Bay Council, ○ City of Sydney, ○ Civil Aviation Safety Authority, and ○ Air Services Australia; • specialist interest groups, including Local Aboriginal Land Councils, Aboriginal stakeholders, and pedestrian and bicycle user groups; • utilities and service providers; and • the public, including community groups and adjoining and affected landowners. <p>The EIS must describe the consultation process and the issues raised, and identify where the design of the proposal has been amended in response to these issues. Where amendments have not been made to address an issue, a short explanation must be provided.</p>
Further consultation after 2 years	<p>If you do not lodge an EIS for the proposal within 2 years of the issue date of these SEARs, you must consult further with the Secretary in relation to the preparation of the EIS.</p>

Guidelines for preparing Assessment Documentation relevant to the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)

WestConnex New M5 Project (EPBC 2015/7520)

The WestConnex New M5 Project will be assessed under the Assessment Bilateral Agreement (2015) with NSW. These Guidelines are intended to ensure there is sufficient information in the assessment report on the impacts of this controlled action on each relevant matter of national environmental significance so the Commonwealth decision-maker may consider those impacts when determining whether or not to approve the action and, if so, on what conditions. These Guidelines do not stand alone but are a supplement to the Secretary's Environmental Assessment Requirements issued on 5 March 2015 and must be addressed in conjunction with these requirements.

1 GENERAL REQUIREMENTS - BACKGROUND AND DESCRIPTION OF THE ACTION

The Assessment Documentation must include the precise location of all works to be undertaken (including associated offsite works and infrastructure), structures to be built or elements of the action that may have impacts on matters of national environmental significance (MNES).

2 KEY ISSUES – BIODIVERSITY -MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

The Assessment Documentation must identify and/or describe each MNES protected by controlling provisions of Part 3 of the EPBC Act likely to be located in the project area or in the vicinity. For this proposal there is one MNES:

- **listed threatened species and communities (EPBC Act Section 18 and 18A).**

The Department of the Environment has provided a list of threatened species and communities that are considered to be at risk of impact from the proposal at [Attachment 1](#). This is not necessarily an inclusive list and it is the responsibility of the proponent to ensure that all EPBC Act listed threatened species and communities have been identified and assessed accordingly.

The Assessment Documentation must describe:

- i. the environment with regard to each relevant listed threatened species and community (including suitable breeding habitat, suitable foraging habitat, important populations, habitat critical for survival, etc). Consideration of, and reference to any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice, recovery plans and threat abatement plans is essential.
- ii. Details of the scope, timing/effort (survey season/s) and methodology for studies or surveys used to provide information on the EPBC Act listed species and species habitat or listed ecological communities at the site (and in areas that may be impacted by the project. Include details of:
 - best: practice survey guidelines applied; and
 - how they are consistent with (or a justification for divergence from) published Australian Government guidelines and policy statements.

3 IMPACTS

The Assessment Documentation must include a description of all of the relevant direct and indirect impacts of the action on relevant listed species and communities (identified in Section 2). Impacts during all phases of the project must be addressed, and the following information provided:

- i. a description of the impacts of the action on listed species and communities;
- ii. a detailed analysis of the nature and extent of the likely direct, indirect and consequential impacts relevant to listed species and communities, including likely short-term and long-term impacts – refer to the [Significant Impact Guidelines 1.1 - Matters of National Environmental Significance](#) for guidance on the various types of impact that need to be considered;
- iii. consideration of, and reference to any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice, recovery plans and threat abatement plans is essential.
- iv. a statement whether any relevant impacts are likely to be unknown, unpredictable or irreversible;
- v. any technical data and other information used or needed to make a detailed assessment of the relevant impacts;
- vi. an explanation of how the views of Indigenous stakeholders, directly affected by the action, have been sought and considered in the assessment if the action will have or is likely to have a significant impact on threatened species and communities that relates to their Indigenous cultural heritage. Including where relevant, how guidelines published by the Commonwealth in relation to consulting with Indigenous peoples for proposed actions that are under assessment have been considered and applied.

The Assessment Documentation must identify and address cumulative impacts to listed threatened species and communities, where potential project impacts are in addition to existing impacts of other activities (including known potential future expansions or developments by the proponent and other proponents in the region and vicinity).

The Assessment Documentation must also provide a detailed assessment of any likely impact that this proposed action may facilitate on the relevant listed threatened species and communities at the local, regional, state and national scale.

4 AVOIDANCE AND MITIGATION MEASURES / ALTERNATIVES

The Assessment Documentation must provide information on all proposed avoidance and mitigation measures to manage the relevant impacts of the action on listed threatened species and communities.

The Assessment Documentation also must take into account relevant agreements and plans that cover impacts on listed threatened species and communities including but not limited to:

- any recovery plan, conservation advice for the species or community;

- any threat abatement plan for a process that threatens the species;
- any wildlife conservation plan for the species.

The Assessment Documentation must include, and substantiate, specific and detailed descriptions of the proposed avoidance and mitigation measures, based on best available practices and must include the following elements:

- (a) A list of avoidance and mitigation measures proposed to be undertaken to prevent or minimise the relevant impacts of the action on specific listed threatened species and communities, including:
 - i. a description of proposed avoidance and mitigation measures to deal with relevant impacts of the action;
 - ii. assessment of the expected or predicted effectiveness of the mitigation measures, including the scale and intensity of impacts of the proposed action and the on-ground benefits to be gained through each of these measures; and
 - iii. a description of the outcomes that the avoidance and mitigation measures will achieve.
- (b) A detailed outline of a plan for the continuing management, mitigation and monitoring of impacts of the action on relevant listed threatened species and communities, including a description of the outcomes that will be achieved and any provisions for independent environmental auditing.
- (c) Consideration of, and reference to any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice, recovery plans and threat abatement plans is essential.

5 RESIDUAL IMPACTS / OFFSETS

The Assessment Documentation must provide details of the likely residual unavoidable impacts on listed threatened species and communities that are likely to occur after the proposed activities to avoid and mitigate all impacts are taken into account. The Assessment Documentation must:

- i. include the reasons why avoidance or mitigation of impacts is not reasonably achieved; and
- ii. identify the significant residual impacts on listed threatened species and communities.

If after all reasonable avoidance and mitigation measures have been put in place, there is a residual adverse impact on an EPBC Act listed threatened species or ecological community, offsets must be applied. The Assessment Documentation must include details of how the current published *NSW Framework for Biodiversity Assessment (FBA)* has been applied in accordance with the objects of the EPBC Act. The Assessment Documentation must include details of the offset package to compensate for significant residual impacts on EPBC listed threatened species and communities.

For the purposes of approval under the EPBC Act, it is a requirement that offsets directly contribute to the ongoing viability of the specific protected matter impacted by a proposed

action i.e. 'like for like'. In applying the FBA, residual impacts on EPBC Act listed threatened ecological communities must be offset with Plant Community Type(s) (PCT) that are ascribed to the specific EPBC listed ecological community. PCTs from a different vegetation class will not generally be acceptable as offsets for EPBC listed communities.

Any significant residual impacts not addressed by the FBA may need to be addressed in accordance with the *Environment Protection and Biodiversity Conservation Act 1999* Environmental Offset Policy. <http://www.environment.gov.au/epbc/publications/epbc-act-environmental-offsets-policy>

If EPBC Act Environmental Offset Policy is used to calculate proposed offsets for a threatened species or community please contact the Department of Planning and Environment for specific information on applying the EPBC Act offset policy calculator.

6 ENVIRONMENTAL RECORD OF PERSON(S) PROPOSING TO TAKE THE ACTION

The information provided must include details of any proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against:

- (a) the person proposing to take the action; and
- (b) for an action for which a person has applied for a permit, the person making the application.

If the person proposing to take the action is a corporation, details of the corporation's environmental policy and planning framework must also be included.

7 INFORMATION SOURCES PROVIDED IN THE ASSESSMENT DOCUMENTATION

For information given in the Assessment Documentation, state:

- (a) the source of the information;
- (b) how recent the information is;
- (c) how the reliability of the information was tested;
- (d) what uncertainties (if any) are in the information; and
- (e) what guidelines, plans and/or policies were considered.

REFERENCES

1. *Environment Protect and Biodiversity Conservation Act 1999* - section 51-55, section 96A(3)(a)(b), 101A(3)(a)(b), section 136, section 527E
2. *Environment Protect and Biodiversity Conservation Regulations 2000* - Division 3.2, 3.02(a)(b)(ii)(iii), Division 5.2, Schedule 4
3. NSW Assessment Bilateral Agreement (2015) - Item 18.1, Item 18.5, Schedule 1
4. Matters of National Environmental Significance Significant impact guidelines 1.1 (2013) EPBC Act
5. *Environment Protect and Biodiversity Conservation Act 1999* Environmental Offsets Policy October 2012

ATTACHMENT 1 – Listed threatened species and communities relevant to the construction and operation of WestConnex new M5, NSW (EPBC 2015/7520)

The construction and operation of WestConnex new M5 was determined to be a controlled action under section 75 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on 11 August 2015.

The controlled action is likely to have a direct and indirect impact on matters of national environment significance, in particular, threatened species and ecological communities (sections 18 and 18A).

A number of threatened species and ecological communities protected under Part 3 of the EPBC Act have been identified as potentially impacted by the proposed action.

The Department considers that the following threatened species and ecological communities will be impacted directly and or indirectly by the proposed action:

- Cooks River/Castlereagh Ironbark Forest of the Sydney Basin Bioregion– critically endangered
- Green and Golden Bell Frog (GGBF) (*Littoria aurea*) – vulnerable

The Department considers that the following threatened species and ecological communities may be at risk from the proposed action. The Assessment Documentation must identify whether or not a significant impact is likely for these matters and the describe the basis for the conclusion.

- Turpentine Ironbark Forest in the Sydney Basin Bioregion – critically endangered
- Bynoe's Wattle (*Acacia bynoeana*) - vulnerable
- Downy Wattle (*Acacia pubescens*) - vulnerable
- Deane's Paperbark (*Melaleuca deanei*) - vulnerable
- Hairy Geebung (*Persoonia hirsuta*) - endangered
- Spiked Rice-flower (*Pimelea spicata*) - endangered
- Magenta Lilly Pilly (*Syzygium paniculatum*) - vulnerable
- Black-eyed Susan (*Tetradthea juncea*) – vulnerable

It is the responsibility of the proponent to ensure all EPBC Act listed threatened species and ecological communities potentially impacted have been identified and assessed. Any significant residual impacts must be offset.

This page has been left blank intentionally.

Appendix C

Existing EPLs and TWA

Appendix C Existing EPLs and TWA



Healthy Environment, Healthy Community, Healthy Business

[Home](#) > [Environment protection licences](#) > [POEO Public Register](#) > [Search for licences, applications and notices](#)

Licence summary

[Search Again](#)

[Return to Previous Page](#)

Summary Licence No: 4627

[View this licence](#) (PDF document 137 kb)

Licence holder: ALEXANDRIA LANDFILL PTY LTD
Premises: ALEXANDRIA LANDFILL
 10 ALBERT STREET, ST PETERS, NSW, 2044
LGA: MARRICKVILLE **Catchment:** Sydney Coast & Georges River
Administrative fee: \$3,808.00
Licence status: Issued
Activity type: Waste disposal by application to land
Licence review: Complete date 30 Jun 2014
 Complete date 30 Jun 2009
 Complete date 01 Jul 2003
 Due date 30 Jun 2019
Pollution incident management plan: Last tested 01 Jan 2014
 Last updated 01 Jan 2014

Applications

<u>Number</u>	<u>Application type</u>	<u>Current status</u>	<u>Date received</u>
140516	s.55 Licence Transfer	Approved	18 Jun 2001
140976	s.55 Licence Transfer	Approved	19 Dec 2001

Connect

Fee

Wet
Pub

Notices

<u>Number</u>	<u>Issue date</u>	<u>Notice type</u>
1017904	31 May 2002	s.91 Clean Up Notice
1017963	06 Jun 2002	s.91 Clean Up Notice
1018247	18 Jun 2002	s.91 Clean Up Notice
1018386	21 Jun 2002	s.91 Clean Up Notice
1018818	09 Jul 2002	s.58 Licence Variation
1024148	07 Jan 2003	s.58 Licence Variation
1028703	04 Jul 2003	s.58 Licence Variation
1040317	02 Sep 2004	s.58 Licence Variation
1041133	29 Sep 2004	s.58 Licence Variation
1042998	30 Sep 2005	s.58 Licence Variation
1057971	31 Mar 2006	s.58 Licence Variation
1061862	02 Nov 2006	s.58 Licence Variation
1067504	04 Dec 2006	s.58 Licence Variation
1068196	21 Jun 2007	s.58 Licence Variation
1093194	31 Oct 2008	s.58 Licence Variation
1099148	30 Mar 2009	s.58 Licence Variation
1127043	15 Apr 2011	s.91 Clean Up Notice
1127407	21 Apr 2011	s.110 Variation of Clean Up Notice
1127781	28 Apr 2011	s.110 Variation of Clean Up Notice
1128035	03 May 2011	s.110 Variation of Clean Up Notice
1128694	21 Jun 2011	s.91 Clean Up Notice
1507165	03 Aug 2012	s.58 Licence Variation

Pollution studies and reduction programs

<u>Title</u>	<u>Program type</u>	<u>Start date</u>	<u>Complete date</u>
Improvements to design of active cell	Waste	16 Jul 2012	Conditions

Annual Returns

<u>Start date</u>	<u>End date</u>	<u>Date received</u>	<u>Non-compliance</u>	<u>LBL data</u>
01-Dec-2012	30-Nov-2013	30-Jan-2014	yes	Not available
01-Dec-2011	30-Nov-2012	30-Jan-2013	yes	Not available
01-Dec-2010	30-Nov-2011	31-Jan-2012		Not available
01-Dec-2009	30-Nov-2010	10-Feb-2011	No	Not available
01-Dec-2008	30-Nov-2009	29-Jan-2010	No	Not available
01-Dec-2007	30-Nov-2008	27-Jan-2009	No	Not available
01-Dec-2006	30-Nov-2007	01-Feb-2008	yes	Not available
01-Dec-2005	30-Nov-2006	30-Jan-2007	No	Not available
01-Dec-2004	30-Nov-2005	25-Jan-2006	yes	Not available
01-Dec-2003	30-Nov-2004	15-Apr-2005	No	Not available
01-Dec-2002	30-Nov-2003	29-Jan-2004	No	Not available
01-Dec-2001	30-Nov-2002	29-Jan-2003	No	Not available
01-Dec-2000	30-Nov-2001	30-Jan-2002	No	Not available
01-Dec-1999	30-Nov-2000			Not available

[Download
Annual
Return Form](#)

Environment Protection Licence

Licence - 4627



Licence Details

Number:	4627
Anniversary Date:	01-December

Licensee

WESTCONNEX DELIVERY AUTHORITY

LOCKED BAG 928

NORTH SYDNEY NSW 2059

Premises

ALEXANDRIA LANDFILL

10 ALBERT STREET

ST PETERS NSW 2044

Scheduled Activity

Waste Disposal (application to land)

Fee Based Activity

Scale

Waste disposal by application to land

Any annual capacity

Region

Waste & Resources - Waste Management

59-61 Goulburn Street

SYDNEY NSW 2000

Phone: (02) 9995 5000

Fax: (02) 9995 5999

PO Box A290 SYDNEY SOUTH

NSW 1232

Environment Protection Licence

Licence - 4627



INFORMATION ABOUT THIS LICENCE	4
Dictionary	4
Responsibilities of licensee	4
Variation of licence conditions	4
Duration of licence	4
Licence review	4
Fees and annual return to be sent to the EPA	4
Transfer of licence	5
Public register and access to monitoring data	5
1 ADMINISTRATIVE CONDITIONS	6
A1 What the licence authorises and regulates	6
A2 Premises or plant to which this licence applies	6
A3 Information supplied to the EPA	6
2 DISCHARGES TO AIR AND WATER AND APPLICATIONS TO LAND	7
P1 Location of monitoring/discharge points and areas	7
3 LIMIT CONDITIONS	8
L1 Pollution of waters	8
L2 Waste	8
L3 Noise limits	9
L4 Potentially offensive odour	9
4 OPERATING CONDITIONS	9
O1 Activities must be carried out in a competent manner	9
O2 Maintenance of plant and equipment	10
O3 Dust	10
O4 Processes and management	10
O5 Waste management	10
O6 Other operating conditions	12
5 MONITORING AND RECORDING CONDITIONS	12
M1 Monitoring records	12
M2 Requirement to monitor concentration of pollutants discharged	13
M3 Testing methods - concentration limits	15
M4 Recording of pollution complaints	15
M5 Telephone complaints line	16
M6 Other monitoring and recording conditions	16

Environment Protection Licence

Licence - 4627



6	REPORTING CONDITIONS	16
R1	Annual return documents	16
R2	Notification of environmental harm	17
R3	Written report	17
R4	Other reporting conditions	18
7	GENERAL CONDITIONS	18
G1	Copy of licence kept at the premises or plant	18
8	POLLUTION STUDIES AND REDUCTION PROGRAMS	19
U1	Improvements to design of active cell	19
9	SPECIAL CONDITIONS	19
E1	Definitions	19
E2	Financial assurance	19
E3	Survey plan	20
	DICTIONARY	21
	General Dictionary	21

Environment Protection Licence

Licence - 4627



Information about this licence

Dictionary

A definition of terms used in the licence can be found in the dictionary at the end of this licence.

Responsibilities of licensee

Separate to the requirements of this licence, general obligations of licensees are set out in the Protection of the Environment Operations Act 1997 ("the Act") and the Regulations made under the Act. These include obligations to:

- ensure persons associated with you comply with this licence, as set out in section 64 of the Act;
- control the pollution of waters and the pollution of air (see for example sections 120 - 132 of the Act);
- report incidents causing or threatening material environmental harm to the environment, as set out in Part 5.7 of the Act.

Variation of licence conditions

The licence holder can apply to vary the conditions of this licence. An application form for this purpose is available from the EPA.

The EPA may also vary the conditions of the licence at any time by written notice without an application being made.

Where a licence has been granted in relation to development which was assessed under the Environmental Planning and Assessment Act 1979 in accordance with the procedures applying to integrated development, the EPA may not impose conditions which are inconsistent with the development consent conditions until the licence is first reviewed under Part 3.6 of the Act.

Duration of licence

This licence will remain in force until the licence is surrendered by the licence holder or until it is suspended or revoked by the EPA or the Minister. A licence may only be surrendered with the written approval of the EPA.

Licence review

The Act requires that the EPA review your licence at least every 5 years after the issue of the licence, as set out in Part 3.6 and Schedule 5 of the Act. You will receive advance notice of the licence review.

Fees and annual return to be sent to the EPA

For each licence fee period you must pay:

- an administrative fee; and
- a load-based fee (if applicable).

Environment Protection Licence

Licence - 4627



The EPA publication “A Guide to Licensing” contains information about how to calculate your licence fees. The licence requires that an Annual Return, comprising a Statement of Compliance and a summary of any monitoring required by the licence (including the recording of complaints), be submitted to the EPA. The Annual Return must be submitted within 60 days after the end of each reporting period. See condition R1 regarding the Annual Return reporting requirements.

Usually the licence fee period is the same as the reporting period.

Transfer of licence

The licence holder can apply to transfer the licence to another person. An application form for this purpose is available from the EPA.

Public register and access to monitoring data

Part 9.5 of the Act requires the EPA to keep a public register of details and decisions of the EPA in relation to, for example:

- licence applications;
- licence conditions and variations;
- statements of compliance;
- load based licensing information; and
- load reduction agreements.

Under s320 of the Act application can be made to the EPA for access to monitoring data which has been submitted to the EPA by licensees.

This licence is issued to:

WESTCONNEX DELIVERY AUTHORITY
LOCKED BAG 928
NORTH SYDNEY NSW 2059

subject to the conditions which follow.

Environment Protection Licence

Licence - 4627



1 Administrative Conditions

A1 What the licence authorises and regulates

A1.1 This licence authorises the carrying out of the scheduled activities listed below at the premises specified in A2. The activities are listed according to their scheduled activity classification, fee-based activity classification and the scale of the operation.

Unless otherwise further restricted by a condition of this licence, the scale at which the activity is carried out must not exceed the maximum scale specified in this condition.

Scheduled Activity	Fee Based Activity	Scale
Waste Disposal (application to land)	Waste disposal by application to land	Any annual capacity

A2 Premises or plant to which this licence applies

A2.1 The licence applies to the following premises:

Premises Details
ALEXANDRIA LANDFILL
10 ALBERT STREET
ST PETERS
NSW 2044
LOT 100 DP 845651, PART LOT 11 DP 1013168
AS SHOWN AS "LANDFILL PREMISES" ON APPROVED SURVEY PLAN AS BEING USED FOR THE SCHEDULED ACTIVITIES AUTHORISED BY THIS LICENCE. NOTE: DEFINITIONS OF APPROVED SURVEY PLANS IN CONDITION E3

A2.2 The Licensee may vary the area of premises that are subject to this licence and upon which scheduled activities authorised by this licence are carried out by lodging with the EPA an application for variation under section 58 of the Act of the area of the premises together with a Survey Plan.

Note: Licence 12594 does not apply to the area of Lot 11 DP 1013168 and Lot 100 DP 845651 used for the scheduled activities authorised by this licence as shown on the Approved Survey Plan.

A3 Information supplied to the EPA

A3.1 Works and activities must be carried out in accordance with the proposal contained in the licence application, except as expressly provided by a condition of this licence.

In this condition the reference to "the licence application" includes a reference to:

- a) the applications for any licences (including former pollution control approvals) which this licence replaces under the Protection of the Environment Operations (Savings and Transitional) Regulation 1998; and

Environment Protection Licence

Licence - 4627



b) the licence information form provided by the licensee to the EPA to assist the EPA in connection with the issuing of this licence.

A3.2 The following documents (and any future amendments to them) are not to be taken as part of the documentation in A4.1, other than those parts specifically referenced in this licence.

A3.3 a) Albert Street Disposal Depot Landfill Environmental management Plan, dated December 1997;

b) Alexandria Landfill Site Revised Surface Water & Leachate Management Plan dated September 2004, prepared by Ian Grey Groundwater Consulting Pty Limited dated September 2004 (Report ID AJ001/Rp003 Rev D). An updated Figure 2 emailed to the DEC on 1 June 2005 from Ian Grey Groundwater Consulting Pty Limited.

Note: For the purposes of this licence the abbreviation "LEMP" is defined as the document titled Albert Street Disposal Depot Landfill Environmental Management Plan dated December 1997.

2 Discharges to Air and Water and Applications to Land

P1 Location of monitoring/discharge points and areas

P1.1 The following points referred to in the table are identified in this licence for the purposes of the monitoring and/or the setting of limits for discharges of pollutants to water from the point.

P1.2 The following utilisation areas referred to in the table below are identified in this licence for the purposes of the monitoring and/or the setting of limits for any application of solids or liquids to the utilisation area.

Water and land

EPA Identification no.	Type of Monitoring Point	Type of Discharge Point	Location Description
2	Groundwater quality monitoring		Groundwater monitoring bore as labelled as "MW01" on map titled "Figure 5: Leachate & Groundwater Management Features" contained in the report titled "Alexandria Landfill Site Revised Surface Water & Leachate Management Plan September 2004"
3	Groundwater quality monitoring		Groundwater monitoring bore as labelled as "MW02s" on map titled "Figure 5: Leachate & Groundwater Management Features" contained in the report titled "Alexandria Landfill Site Revised Surface Water & Leachate Management Plan September 2004"

Environment Protection Licence

Licence - 4627



4	Groundwater quality monitoring	Groundwater monitoring bore as labelled as "MW02d" on map titled "Figure 5: Leachate & Groundwater Management Features" contained in the report titled "Alexandria Landfill Site Revised Surface Water & Leachate Management Plan September 2004"
5	Groundwater quality monitoring	Groundwater monitoring bore as labelled as "MW03" on map titled "Figure 5: Leachate & Groundwater Management Features" contained in the report titled "Alexandria Landfill Site Revised Surface Water & Leachate Management Plan September 2004"
6	Groundwater quality monitoring	Groundwater monitoring bore as labelled as "MW04b" on map titled "Figure 5: Leachate & Groundwater Management Features" contained in the report titled "Alexandria Landfill Site Revised Surface Water & Leachate Management Plan September 2004"
7	Leachate quality monitoring	Leachate sump as labelled as "Leachate Sump" on map titled "Figure 1: Site Layout" contained in the report titled "Alexandria Landfill Site Revised Surface Water & Leachate Management Plan September 2004"

3 Limit Conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

L2 Waste

L2.1 The licensee must not cause, permit or allow any waste to be received at the premises, except the wastes expressly referred to in the column titled "Waste" and meeting the definition, if any, in the column titled "Description" in the table below.

Any waste received at the premises must only be used for the activities referred to in relation to that waste in the column titled "Activity" in the table below.

Any waste received at the premises is subject to those limits or conditions, if any, referred to in relation to that waste contained in the column titled "Other Limits" in the table below.

This condition does not limit any other conditions in this licence.

Environment Protection Licence

Licence - 4627



Code	Waste	Description	Activity	Other Limits
NA	General solid waste (non-putrescible)			No garden and wood waste is to be accepted at the Premises.
NA	Waste tyres			NA
NA	Asbestos waste			NA
NA	Waste			NA

- L2.2 The licensee must not dispose of any tyres on the premises which;
- have a diameter of less than 1.2 metres; and
 - are delivered at the premises in a load containing more than 5 whole tyres; and
 - became waste in the Sydney Metropolitan Area.

- L2.3 Tyres stockpiled on the premises must:
- not exceed fifty (50) tonnes of tyres at any one time; and
 - be located in a clearly defined area away from the tipping face; and
 - be managed to control vermin; and
 - be managed to prevent any tyres from catching fire.

L3 Noise limits

- L3.1 Noise from the premises must not exceed an LA10 (15 minute) noise emission criterion of 50 dB(A), except as expressly provided by this licence.

L4 Potentially offensive odour

- L4.1 No condition of this licence identifies a potentially offensive odour for the purposes of section 129 of the Protection of the Environment Operations Act 1997.

Note: Section 129 of the Protection of the Environment Operations Act 1997, provides that the licensee must not cause or permit the emission of any offensive odour from the premises but provides a defence if the emission is identified in the relevant environment protection licence as a potentially offensive odour and the odour was emitted in accordance with the conditions of a licence directed at minimising odour.

4 Operating Conditions

O1 Activities must be carried out in a competent manner

- O1.1 Licensed activities must be carried out in a competent manner. This includes:
- the processing, handling, movement and storage of materials and substances used to carry out the activity; and
 - the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

Environment Protection Licence

Licence - 4627



O2 Maintenance of plant and equipment

- O2.1 All plant and equipment installed at the premises or used in connection with the licensed activity:
- a) must be maintained in a proper and efficient condition; and
 - b) must be operated in a proper and efficient manner.

O3 Dust

- O3.1 All operations and activities occurring at the premises must be carried out in a manner that will minimise the emission of dust from the premises.

O4 Processes and management

Note: The EPA would vary condition O6.4 to permit the water to be managed as stormwater provided the licensee provides evidence to demonstrate that the water does not contain leachate.

- O4.1 The licensee must take all practicable steps to control entry to the premises.

O5 Waste management

- O5.1 There must be no incineration or burning of any waste at the premises.
- O5.2 The licensee must fill and cap quadrants B, then C (as shown in map titled "Figure 1: Site Layout" contained in the report titled "Alexandria Landfill Site Revised Surface Water & Leachate Management Plan" dated September 2004). No landfilling of waste must occur in more than one quadrant at any time.
- O5.3 The licensee must not commence landfilling in quadrant C until capping works for quadrants A and B are approved by the EPA.
- O5.4 Cover material must be :
- a) Daily cover
Daily cover material must be either:
 - i) virgin excavated natural material, or
 - ii) approved alternative daily cover.

Cover material must be applied to a minimum depth of 15 centimetres over all exposed landfilled waste prior to ceasing operations at the end of each day.

b) Intermediate cover

Cover material must be applied to a depth of 30 centimetres over surfaces of the landfilled waste at the premises which are to be exposed for more than 90 days.

c) Cover material stockpile

Environment Protection Licence

Licence - 4627



At least two weeks cover material must be available at the premises under all weather conditions. This material may be won on site, or alternatively a cover stockpile must be maintained adjacent to the tipping face.

O5.5 d) The licensee may conduct a trial using timber cover plates as alternative daily cover.

e) The licensee must inform the EPA in writing of the date the trial commences and carry out the trial for a period of 6 months from the date of commencement, unless the trial is abandoned by the licensee. The trial may commence anytime after 2 July 2007 and must end by 31 January 2008.

f) The timber cover plates may only be used as alternative daily cover according to the terms and conditions outlined in the EPA's letter dated 4 December 2006 (EPA ref DOC06/57269) and the letter dated 17 November 2006 prepared by The Odour Unit to the licensee titled "Revised Proposal for Odour Emissions Study Trial of Current and Alternative Day Covers for Landfill Operations at Alexandria Landfill".

g) The licensee must inform the EPA in writing the dates that odour monitoring will be undertaken with at least 24 hours prior notice.

O5.6 For the purposes of condition O5.1(a (ii)) the approved alternative daily cover is to be a combination of virgin excavated natural material and crushed bricks/concrete at a minimum ratio of 1:3 and be in accordance with specifications outlined within EPA correspondence dated 23 September 2005.

O5.7 The proposed alternative daily cover trial set out in condition O5.1 (d) – (g) inclusive is suspended until further notice in writing from the DEC.

O5.8 Landfilled waste which has been covered by daily cover must not be exhumed, except for:

- a) fire fighting reasons; or
- b) written approval from the EPA is obtained.

O5.9 Leachate must only be disposed of by pumping to sewer, or removed from the premises by tanker and disposed of lawfully off-site.

O5.10 The licensee must not cause or permit any leachate to pool in any area above the tipping face.

O5.11 All water contained within the bunded tipping face area must be managed as leachate.

O5.12 Leachate must not be used in the truck wash facility at the premises.

O5.13 Leachate must not be irrigated and/or used for dust control at the premises.

O5.14 Definition:

"Leachate" is water which has come into contact with:

- a) waste (other than inert waste); and/or
- b) the tipping face; and/or
- c) the greenwaste processing/storage areas.

"Leachate" is also liquid removed from the leachate collection system

Environment Protection Licence

Licence - 4627



“Leachate” is a reference to treated or untreated leachate.

“Treated leachate” is leachate that has been treated in the leachate pre-treatment facility required under the Sydney Water Trade Waste Agreement.

All other leachate on the premises is untreated leachate.

O5.15 The licensee must maintain the level of the leachate below -16.0 metres AHD and at least 0.5 metres below the standing water level.

O5.16 The licensee must measure the level of leachate daily, prior to pumping from the leachate sump.

O5.17 The licensee must take immediate action if methane concentrations levels exceed 500 parts per million (ppm) in any wood waste stockpile at the premises, by aerating the stockpiles to lower the methane concentrations to less than 500 ppm.

“Wood waste” is any unprocessed timber or greenwaste and any processed timber and greenwaste.

O5.18 All asbestos waste must be disposed of at the Premises in accordance with the document titled 'Filling Plan' dated May 2012 prepared by Genesis and correspondence from the Licensee dated 21 June 2012 titled 'Alexandria Landfill Pty Ltd, Disposal of Asbestos Waste EPL 4627'.

O5.19 All asbestos waste must be covered immediately to a depth of at least 0.15 metre and at the end of each day's operation, to a depth of at least 0.5 metre as per the requirements of clause 42 of the *Protection of the Environment Operations (Waste Regulation) 2005*.

O6 Other operating conditions

O6.1 The tipping face must be surrounded with a 300mm high impermeable bund which will prevent stormwater from flowing across the tipping face.

O6.2 Any stormwater which comes into contact with waste (other than inert waste), the tip face and/or the greenwaste areas must be managed in the same manner as leachate.

O6.3 Stormwater run-off from quadrant A and C must not enter quadrant B, unless otherwise approved by the EPA.

O6.4 The licensee must treat the liquid in the stormwater pond in quadrant C as leachate.

5 Monitoring and Recording Conditions

M1 Monitoring records

M1.1 The results of any monitoring required to be conducted by this licence or a load calculation protocol must be recorded and retained as set out in this condition.

Environment Protection Licence

Licence - 4627



M1.2 All records required to be kept by this licence must be:

- a) in a legible form, or in a form that can readily be reduced to a legible form;
- b) kept for at least 4 years after the monitoring or event to which they relate took place; and
- c) produced in a legible form to any authorised officer of the EPA who asks to see them.

M1.3 The following records must be kept in respect of any samples required to be collected for the purposes of this licence:

- a) the date(s) on which the sample was taken;
- b) the time(s) at which the sample was collected;
- c) the point at which the sample was taken; and
- d) the name of the person who collected the sample.

M2 Requirement to monitor concentration of pollutants discharged

M2.1 For each monitoring/discharge point or utilisation area specified below (by a point number), the licensee must monitor (by sampling and obtaining results by analysis) the concentration of each pollutant specified in Column 1. The licensee must use the sampling method, units of measure, and sample at the frequency, specified opposite in the other columns:

M2.2 Water and/ or Land Monitoring Requirements

POINT 2,3,4,5,6

Pollutant	Units of measure	Frequency	Sampling Method
Alkalinity (as calcium carbonate)	milligrams per litre	Quarterly	Grab sample
Aluminium	milligrams per litre	Yearly	Grab sample
Arsenic	milligrams per litre	Yearly	Grab sample
Barium	milligrams per litre	Yearly	Grab sample
Benzene	milligrams per litre	Yearly	Grab sample
Bicarbonate	milligrams per litre	Quarterly	Grab sample
Cadmium	milligrams per litre	Yearly	Grab sample
Calcium	milligrams per litre	Quarterly	Grab sample
Chloride	milligrams per litre	Quarterly	Grab sample
Chromium (hexavalent)	milligrams per litre	Yearly	Grab sample
Chromium (total)	milligrams per litre	Yearly	Grab sample
Cobalt	milligrams per litre	Yearly	Grab sample
Copper	milligrams per litre	Yearly	Grab sample
Ethyl benzene	milligrams per litre	Yearly	Grab sample
Fluoride	milligrams per litre	Yearly	Grab sample
Lead	milligrams per litre	Yearly	Grab sample
Magnesium	milligrams per litre	Quarterly	Grab sample
Manganese	milligrams per litre	Yearly	Grab sample
Mercury	milligrams per litre	Yearly	Grab sample
Nitrate	milligrams per litre	Yearly	Grab sample

Environment Protection Licence

Licence - 4627



Nitrite	milligrams per litre	Yearly	Grab sample
Nitrogen (ammonia)	milligrams per litre	Quarterly	Grab sample
Organochlorine pesticides	milligrams per litre	Yearly	Grab sample
Organophosphate pesticides	milligrams per litre	Yearly	Grab sample
pH	pH	Quarterly	Probe
Polycyclic aromatic hydrocarbons	milligrams per litre	Yearly	Grab sample
Potassium	milligrams per litre	Quarterly	Grab sample
Sodium	milligrams per litre	Quarterly	Grab sample
Standing Water Level	metres	Quarterly	In situ
Sulfate	milligrams per litre	Quarterly	Grab sample
Toluene	milligrams per litre	Yearly	Grab sample
Total dissolved solids	milligrams per litre	Quarterly	Grab sample
Total organic carbon	milligrams per litre	Yearly	Grab sample
Total petroleum hydrocarbons	milligrams per litre	Yearly	Grab sample
Total Phenolics	milligrams per litre	Yearly	Grab sample
Xylene	milligrams per litre	Yearly	Grab sample
Zinc	milligrams per litre	Yearly	Grab sample

POINT 7

Pollutant	Units of measure	Frequency	Sampling Method
Alkalinity (as calcium carbonate)	milligrams per litre	Quarterly	Grab sample
Aluminium	milligrams per litre	Quarterly	Grab sample
Arsenic	milligrams per litre	Quarterly	Grab sample
Barium	milligrams per litre	Quarterly	Grab sample
Benzene	milligrams per litre	Quarterly	Grab sample
Bicarbonate	milligrams per litre	Quarterly	Grab sample
Cadmium	milligrams per litre	Quarterly	Grab sample
Calcium	milligrams per litre	Quarterly	Grab sample
Chloride	milligrams per litre	Quarterly	Grab sample
Chromium (hexavalent)	milligrams per litre	Quarterly	Grab sample
Chromium (total)	milligrams per litre	Quarterly	Grab sample
Cobalt	milligrams per litre	Quarterly	Grab sample
Copper	milligrams per litre	Quarterly	Grab sample
Ethyl benzene	milligrams per litre	Quarterly	Grab sample
Fluoride	milligrams per litre	Quarterly	Grab sample
Lead	milligrams per litre	Quarterly	Grab sample
Magnesium	milligrams per litre	Quarterly	Grab sample
Manganese	milligrams per litre	Quarterly	Grab sample
Mercury	milligrams per litre	Quarterly	Grab sample

Environment Protection Licence

Licence - 4627



Nitrate	milligrams per litre	Quarterly	Grab sample
Nitrite	milligrams per litre	Quarterly	Grab sample
Nitrogen (ammonia)	milligrams per litre	Quarterly	Grab sample
Organochlorine pesticides	milligrams per litre	Quarterly	Grab sample
Organophosphate pesticides	milligrams per litre	Quarterly	Grab sample
pH	pH	Quarterly	Probe
Polycyclic aromatic hydrocarbons	milligrams per litre	Quarterly	Grab sample
Potassium	milligrams per litre	Quarterly	Grab sample
Sodium	milligrams per litre	Quarterly	Grab sample
Standing Water Level	metres	Quarterly	In situ
Sulfate	milligrams per litre	Quarterly	Grab sample
Toluene	milligrams per litre	Quarterly	Grab sample
Total dissolved solids	milligrams per litre	Quarterly	Grab sample
Total organic carbon	milligrams per litre	Quarterly	Grab sample
Total petroleum hydrocarbons	milligrams per litre	Quarterly	Grab sample
Total Phenolics	milligrams per litre	Quarterly	Grab sample
Xylene	milligrams per litre	Quarterly	Grab sample
Zinc	milligrams per litre	Quarterly	Grab sample

M3 Testing methods - concentration limits

- M3.1 Subject to any express provision to the contrary in this licence, monitoring for the concentration of a pollutant discharged to waters or applied to a utilisation area must be done in accordance with the Approved Methods Publication unless another method has been approved by the EPA in writing before any tests are conducted.

M4 Recording of pollution complaints

- M4.1 The licensee must keep a legible record of all complaints made to the licensee or any employee or agent of the licensee in relation to pollution arising from any activity to which this licence applies.
- M4.2 The record must include details of the following:
- the date and time of the complaint;
 - the method by which the complaint was made;
 - any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect;
 - the nature of the complaint;
 - the action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and
 - if no action was taken by the licensee, the reasons why no action was taken.

Environment Protection Licence

Licence - 4627



M4.3 The record of a complaint must be kept for at least 4 years after the complaint was made.

M4.4 The record must be produced to any authorised officer of the EPA who asks to see them.

M5 Telephone complaints line

M5.1 The licensee must operate during its operating hours a telephone complaints line for the purpose of receiving any complaints from members of the public in relation to activities conducted at the premises or by the vehicle or mobile plant, unless otherwise specified in the licence.

M5.2 The licensee must notify the public of the complaints line telephone number and the fact that it is a complaints line so that the impacted community knows how to make a complaint.

M5.3 The preceding two conditions do not apply until 3 months after: the date of the issue of this licence.

M6 Other monitoring and recording conditions

M6.1 The licensee must monitor the concentration of methane within all stockpiled materials which contains wood waste located over landfilled waste at the premises. The monitoring must be undertaken at least every 3 months and 5 readings must be taken at a depth of at least 50 cm into each stockpile at a height of no more than 1 metre off the surface of the landfilled waste. The monitoring results, including sampling locations and date of sampling, analysis results and instrument details (including its calibration) must be recorded by the licensee. The instrument to monitor methane must be capable of measuring methane at concentrations as low as 500 ppm.

6 Reporting Conditions

R1 Annual return documents

R1.1 The licensee must complete and supply to the EPA an Annual Return in the approved form comprising:
a) a Statement of Compliance; and
b) a Monitoring and Complaints Summary.

At the end of each reporting period, the EPA will provide to the licensee a copy of the form that must be completed and returned to the EPA.

R1.2 An Annual Return must be prepared in respect of each reporting period, except as provided below.

R1.3 Where this licence is transferred from the licensee to a new licensee:

a) the transferring licensee must prepare an Annual Return for the period commencing on the first day of the reporting period and ending on the date the application for the transfer of the licence to the new licensee is granted; and

b) the new licensee must prepare an Annual Return for the period commencing on the date the application for the transfer of the licence is granted and ending on the last day of the reporting period.

Environment Protection Licence

Licence - 4627



- R1.4 Where this licence is surrendered by the licensee or revoked by the EPA or Minister, the licensee must prepare an Annual Return in respect of the period commencing on the first day of the reporting period and ending on:
- a) in relation to the surrender of a licence - the date when notice in writing of approval of the surrender is given; or
 - b) in relation to the revocation of the licence - the date from which notice revoking the licence operates.
- R1.5 The Annual Return for the reporting period must be supplied to the EPA by registered post not later than 60 days after the end of each reporting period or in the case of a transferring licence not later than 60 days after the date the transfer was granted (the 'due date').
- R1.6 The licensee must retain a copy of the Annual Return supplied to the EPA for a period of at least 4 years after the Annual Return was due to be supplied to the EPA.
- R1.7 Within the Annual Return, the Statement of Compliance must be certified and the Monitoring and Complaints Summary must be signed by:
- a) the licence holder; or
 - b) by a person approved in writing by the EPA to sign on behalf of the licence holder.

Note: The term "reporting period" is defined in the dictionary at the end of this licence. Do not complete the Annual Return until after the end of the reporting period.

Note: An application to transfer a licence must be made in the approved form for this purpose.

R2 Notification of environmental harm

- R2.1 Notifications must be made by telephoning the Environment Line service on 131 555.
- R2.2 The licensee must provide written details of the notification to the EPA within 7 days of the date on which the incident occurred.
- R2.3 The licensee must notify the DEC as soon as practicable and in any case within 48 hours after it becomes aware of methane concentrations in any wood waste stockpiles exceeding 12,500ppm.

Note: The licensee or its employees must notify all relevant authorities of incidents causing or threatening material harm to the environment immediately after the person becomes aware of the incident in accordance with the requirements of Part 5.7 of the Act.

R3 Written report

- R3.1 Where an authorised officer of the EPA suspects on reasonable grounds that:
- a) where this licence applies to premises, an event has occurred at the premises; or
 - b) where this licence applies to vehicles or mobile plant, an event has occurred in connection with the carrying out of the activities authorised by this licence,
- and the event has caused, is causing or is likely to cause material harm to the environment (whether the harm occurs on or off premises to which the licence applies), the authorised officer may request a written report of the event.

Environment Protection Licence

Licence - 4627



R3.2 The licensee must make all reasonable inquiries in relation to the event and supply the report to the EPA within such time as may be specified in the request.

R3.3 The request may require a report which includes any or all of the following information:

- a) the cause, time and duration of the event;
- b) the type, volume and concentration of every pollutant discharged as a result of the event;
- c) the name, address and business hours telephone number of employees or agents of the licensee, or a specified class of them, who witnessed the event;
- d) the name, address and business hours telephone number of every other person (of whom the licensee is aware) who witnessed the event, unless the licensee has been unable to obtain that information after making reasonable effort;
- e) action taken by the licensee in relation to the event, including any follow-up contact with any complainants;
- f) details of any measure taken or proposed to be taken to prevent or mitigate against a recurrence of such an event; and
- g) any other relevant matters.

R3.4 The EPA may make a written request for further details in relation to any of the above matters if it is not satisfied with the report provided by the licensee. The licensee must provide such further details to the EPA within the time specified in the request.

R4 Other reporting conditions

R4.1

R4.2 The licensee must advise the DEC of the actions it will take to dispose of leachate in compliance with the conditions of this licence, in the event that it no longer has an agreement with Sydney Water to dispose of up to 792 kL/day of treated leachate to sewer.

This advice must be provided to the DEC in writing within 7 days of the licensee no longer having access to dispose of treated leachate to sewer.

R4.3 The licensee must notify the DEC as soon as practicable and in any case within 48 hours after it becomes aware that the leachate levels in the riser goes above -16.0 metres AHD and/or less than 0.5 metres to the standing groundwater level.

R4.4 The licensee must provide to the DEC each quarter, copies of a written log used to record the leachate levels in the sump.

7 General Conditions

G1 Copy of licence kept at the premises or plant

G1.1 A copy of this licence must be kept at the premises to which the licence applies.

G1.2 The licence must be produced to any authorised officer of the EPA who asks to see it.

Environment Protection Licence

Licence - 4627



- G1.3 The licence must be available for inspection by any employee or agent of the licensee working at the premises.

8 Pollution Studies and Reduction Programs

U1 Improvements to design of active cell

- U1.1 By 16 August 2012 the licensee must install the leachate drainage system (leachate sump, interception drain and injection trench) in accordance with the document titled 'Filling Plan' dated May 2012 prepared by Genesis.

Within two weeks of installing the leachate drainage system the licensee must submit to the EPA as built design drawings.

9 Special Conditions

E1 Definitions

- E1.1 Approved Survey Plan means a plan showing a survey carried out by a registered surveyor of the land comprising Lot 11 DP 1013168 and Lot 100 DP 845651 and identifying the land to be used for scheduled activities authorised by this licence and also the remainder area of land to be used for the scheduled activities authorised by Licence No. 12594 and the location of the significant physical barrier between those two areas of land, being the plan titled "Alexandria Landfill" (Reference No. 250038) dated January 2009 and lodged with the EPA on 20 February 2009 being the most recent such plan lodged under condition A2.2 and approved as a variation under section 58 of the Act by the EPA.
- E1.2 Survey Plan means a plan showing a survey carried out by a registered surveyor of the land comprising Lot 11 DP 1013168 and Lot 100 DP 845651 and identifying the land to be used for scheduled activities authorised by this licence and also the remainder area of land to be used for the scheduled activities authorised by licence 12594 and the location of the significant physical barrier between those two areas of land.

E2 Financial assurance

- E2.1 A financial assurance, in favour of the Environment Protection Authority (EPA), in the form of an irrevocable and unconditional guarantee from a bank, building society or credit union must be maintained as follows;
- a) By 25 June 2007, the licensee must provide to the EPA a financial assurance in the amount of four hundred thousand dollars (\$400,000);
 - b) By 1 June 2008, the licensee must provide to the EPA an additional financial assurance in the amount of two hundred and ten thousand dollars (\$210,000);
 - c) By 1 June 2009, the licensee must provide to the EPA an additional financial assurance in the amount

Environment Protection Licence

Licence - 4627



of two hundred and ten thousand dollars (\$210,000).

The above assurances must be replenished to the full amount should the EPA have any reason to call up the financial assurance or any part thereof to correct environmental problems which have not been remedied by the occupier upon being given notice to do so.

E3 Survey plan

E3.1 The licensee shall by no later than 1 February each year during the currency of this licence provide to the EPA a new survey plan.

Note: Definition of survey plan is provided in condition E3.

Environment Protection Licence

Licence - 4627



Dictionary

General Dictionary

3DGM [in relation to a concentration limit]	Means the three day geometric mean, which is calculated by multiplying the results of the analysis of three samples collected on consecutive days and then taking the cubed root of that amount. Where one or more of the samples is zero or below the detection limit for the analysis, then 1 or the detection limit respectively should be used in place of those samples
Act	Means the Protection of the Environment Operations Act 1997
activity	Means a scheduled or non-scheduled activity within the meaning of the Protection of the Environment Operations Act 1997
actual load	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
AM	Together with a number, means an ambient air monitoring method of that number prescribed by the <i>Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales</i> .
AMG	Australian Map Grid
anniversary date	The anniversary date is the anniversary each year of the date of issue of the licence. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act.
annual return	Is defined in R1.1
Approved Methods Publication	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
assessable pollutants	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
BOD	Means biochemical oxygen demand
CEM	Together with a number, means a continuous emission monitoring method of that number prescribed by the <i>Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales</i> .
COD	Means chemical oxygen demand
composite sample	Unless otherwise specifically approved in writing by the EPA, a sample consisting of 24 individual samples collected at hourly intervals and each having an equivalent volume.
cond.	Means conductivity
environment	Has the same meaning as in the Protection of the Environment Operations Act 1997
environment protection legislation	Has the same meaning as in the Protection of the Environment Administration Act 1991
EPA	Means Environment Protection Authority of New South Wales.
fee-based activity classification	Means the numbered short descriptions in Schedule 1 of the Protection of the Environment Operations (General) Regulation 2009.
general solid waste (non-putrescible)	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997

Environment Protection Licence



Licence - 4627

flow weighted composite sample	Means a sample whose composites are sized in proportion to the flow at each composites time of collection.
general solid waste (putrescible)	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
grab sample	Means a single sample taken at a point at a single time
hazardous waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
licensee	Means the licence holder described at the front of this licence
load calculation protocol	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
local authority	Has the same meaning as in the Protection of the Environment Operations Act 1997
material harm	Has the same meaning as in section 147 Protection of the Environment Operations Act 1997
MBAS	Means methylene blue active substances
Minister	Means the Minister administering the Protection of the Environment Operations Act 1997
mobile plant	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
motor vehicle	Has the same meaning as in the Protection of the Environment Operations Act 1997
O&G	Means oil and grease
percentile [in relation to a concentration limit of a sample]	Means that percentage [eg.50%] of the number of samples taken that must meet the concentration limit specified in the licence for that pollutant over a specified period of time. In this licence, the specified period of time is the Reporting Period unless otherwise stated in this licence.
plant	Includes all plant within the meaning of the Protection of the Environment Operations Act 1997 as well as motor vehicles.
pollution of waters [or water pollution]	Has the same meaning as in the Protection of the Environment Operations Act 1997
premises	Means the premises described in condition A2.1
public authority	Has the same meaning as in the Protection of the Environment Operations Act 1997
regional office	Means the relevant EPA office referred to in the Contacting the EPA document accompanying this licence
reporting period	For the purposes of this licence, the reporting period means the period of 12 months after the issue of the licence, and each subsequent period of 12 months. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act.
restricted solid waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
scheduled activity	Means an activity listed in Schedule 1 of the Protection of the Environment Operations Act 1997
special waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
TM	Together with a number, means a test method of that number prescribed by the <i>Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales</i> .

Environment Protection Licence

Licence - 4627



TSP	Means total suspended particles
TSS	Means total suspended solids
Type 1 substance	Means the elements antimony, arsenic, cadmium, lead or mercury or any compound containing one or more of those elements
Type 2 substance	Means the elements beryllium, chromium, cobalt, manganese, nickel, selenium, tin or vanadium or any compound containing one or more of those elements
utilisation area	Means any area shown as a utilisation area on a map submitted with the application for this licence
waste	Has the same meaning as in the Protection of the Environment Operations Act 1997
waste type	Means liquid, restricted solid waste, general solid waste (putrescible), general solid waste (non - putrescible), special waste or hazardous waste

Mr Bernie Weir

Environment Protection Authority

(By Delegation)

Date of this edition: 15-January-2001

Environment Protection Licence

Licence - 4627



End Notes

- 1 Licence transferred through application 140516, approved on 18-Jun-2001, which came into effect on 01-Dec-2000.
- 2 Licence varied by change to Common Name field, issued on 16-Jan-2002, which came into effect on 16-Jan-2002.
- 3 Licence transferred through application 140976, approved on 25-Jan-2002, which came into effect on 23-Jan-2002.
- 4 Licence varied by correction of File Number , issued on 04-Apr-2002, which came into effect on 04-Apr-2002.
- 5 Licence varied by notice 1024148, issued on 07-Jan-2003, which came into effect on 07-Jan-2003.
- 6 Licence varied by notice 1028703, issued on 04-Jul-2003, which came into effect on 29-Jul-2003.
- 7 Licence varied by notice 1040317, issued on 02-Sep-2004, which came into effect on 27-Sep-2004.
- 8 Licence varied by notice 1041133, issued on 29-Sep-2004, which came into effect on 24-Oct-2004.
- 9 Licence varied by notice 1042998, issued on 30-Sep-2005, which came into effect on 04-Oct-2005.
- 10 Licence varied by notice 1057971, issued on 31-Mar-2006, which came into effect on 25-Apr-2006.
- 11 Licence varied by notice 1061862, issued on 02-Nov-2006, which came into effect on 02-Nov-2006.
- 12 Licence varied by notice 1067504, issued on 04-Dec-2006, which came into effect on 04-Dec-2006.
- 13 Licence varied by notice 1068196, issued on 21-Jun-2007, which came into effect on 21-Jun-2007.
- 14 Licence varied by notice 1093194, issued on 31-Oct-2008, which came into effect on 31-Oct-2008.
- 15 Condition A1.3 Not applicable varied by notice issued on <issue date> which came into effect on <effective date>
- 16 Licence varied by notice 1099148, issued on 30-Mar-2009, which came into effect on 30-Mar-2009.
- 17 Licence varied by Correction to EPA Region data record., issued on 25-Jun-2010, which came into effect on 25-Jun-2010.
- 18 Licence varied by correction to DECCW Region data record, issued on 07-Jul-2010, which came into effect on 07-Jul-2010.

Environment Protection Licence

Licence - 4627



19 Licence varied by notice 1507165 issued on 03-Aug-2012

20 Licence transferred through application 1529361 approved on 23-Mar-2015 , which came into effect on 23-Mar-2015

Clean-Up Notice



BOILING PTY LTD,
ABN 72 087 444 460,
PO BOX 1040,
MASCOT NSW 1460

Attention: Mr. IAN MALOUF

Notice Number 1128662
File Number LIC06/161-09
Date 08-Jun-2011

NOTICE OF CLEAN-UP ACTION

BACKGROUND

- A. The Environment Protection Authority ("EPA") is responsible for the administration and enforcement of the *Protection of the Environment Operations Act 1997* ("POEO Act").
- B. This Notice relates to Alexandria Recycling Centre located at 10-16 Albert Street, St Peters ("the Premises").
- C. Boiling Pty Ltd holds Environment Protection Licence No. 12594 that permits waste storage and resource recovery at the Premises. Licence condition L5.1 of Environment Protection Licence No. 12594 only permits or allows, garden waste, wood waste, metal waste, glass waste, plastic waste, building and demolition waste and general or specific exempted waste that meets all conditions of a resource recovery exemption under Clause 51a of the Protection of the Environment Operations (Waste) Regulation 2005 to be received at the Premises.
- D. Alexandria Landfill Pty Ltd holds Environment Protection Licence No. 4627 that permits waste disposal (application to land) of general solid waste (non-putrescible), waste tyres and asbestos waste at Alexandria Landfill located at 10 Albert St, St Peters ("Alexandria Landfill"). Alexandria Landfill adjoins the Premises.
- E. The EPA is the appropriate regulatory authority for the activities at the Premises and the Landfill .
- F. On 19 May 2011, EPA authorised officers undertook an inspection of the Premises and observed several large stockpiles near the western boundary of the Premises. Visual inspections of two stockpile areas (Area 1 (photos 1 & 2) and Area 2 (Photo 3) located on map 1) identified fragments of suspected asbestos sheeting. EPA's Environmental Forensic and Analytical Science Section have provided laboratory results for the samples taken in Area 1 and 2 confirming eleven out of twelve samples positively contain asbestos.
- G. EPA officers verbally requested that the areas identified by EPA authorised officers in Paragraph F be restricted and no further waste is added, removed or processed in Areas 1 and 2.
- H. Area 2 consists of a number of stockpiles joined together. The EPA understands that these stockpiles have been generated by the processing of waste contained within Area 2 (photo 3).

Clean-Up Notice



- I. Given that the stockpile containing suspected asbestos fragments and the other stockpiles within Area 2 were processes from one stockpile. The EPA reasonably suspects that each stockpile contained within Area 2 contains asbestos.
- J. On 20 May 2011 EPA officers conducted an inspection of the Premises and observed a large stockpile (Area 3 (photo 4) located on map 1). Area 3 consisted of soil, bricks, tiles and concrete. EPA's Environmental Forensic and Analytical Science Section have provided laboratory results for the samples taken in Area 3 confirming two out of three samples positively contain asbestos.
- K. EPA officers verbally requested that the areas identified by EPA authorised officers in paragraph J be restricted and no further waste is added, removed or processed in Areas 3.
- L. During the same inspection EPA authorised officers observed approximately eight stockpiles of orange-brown-black sandy material containing black sludge (Area 4 (photo 5-6) located on map 2) . An oily sheen was observed in the leachate surrounding the stockpile. Representatives of the licensee advised EPA authorised officers that the Stockpiles were foundry sands. EPA authorised officers were advised by representatives of the Licensee that the foundry sands were processed with waste soil, shredded wood waste and garden waste.
- M. EPA authorised officers took samples of the foundry sands. Preliminary results from EPA's Environmental Forensic and Analytical Science Section indicate that the foundry sands may be Restricted Solid Waste with elevated levels of Benzo(a)pyrene, lead, pH and nickel. The EPA is waiting for further analysis and test results to confirm the waste classification.
- N. During the inspection of the premises on 20 May 2011, the EPA observed that one of the stockpiles of waste in Area 2 where asbestos was found as described in Paragraph F, had been moved. An employee of the Licensee was unable to advise EPA authorised officers where the waste had been moved to. A further inspection of the Premises and the Landfill on 3 June 2011, the same employee advised EPA authorised officers that the stockpile had been moved to the Landfill where the waste was stockpiled on the Landfill (Photo 7). During the same inspection of the Premises on 20 May 2011, employees of the Licensee started excavating waste in Area 1. EPA authorised officers requested that no further waste is to be moved, added, removed or processed in Area 1.
- O. During an inspection of the Premises on 3 June 2011, EPA authorised officers were advised by the employee of the Licensee that further waste had been added to the stockpile in Area 3. EPA authorised officers requested that no further waste is to be moved, added, removed or processed in Area 1.
- P. During the same inspection EPA authorised officers took GPS readings of the stockpiles and has accurately transferred the data to Map 1.
- Q. Asbestos is classified as "special waste" as defined in the POEO Act. Asbestos cannot lawfully be stored or transferred or recovered by ways of separating or processing at the Premises. Foundry sands are classified as general solid waste however preliminary results indicate that the waste may be Restricted Solid Waste. Foundry sands are not permitted to be accepted at the Premises.
- R. The EPA reasonably suspects that a pollution incident has occurred at the Premises, in that waste containing asbestos and foundry sands has been transported and deposited at the Premises without lawful authority.
- S. The EPA reasonably suspects that Boiling Pty Ltd has caused the pollution incident referred to in paragraph Q above, in that it has accepted waste without lawful authority.

DIRECTION TO TAKE CLEAN-UP ACTION

The EPA directs BOILING PTY LTD to take the following clean-up action:

1. **Immediately** cease stockpiling, applying, removing or disposing of any waste from areas 1-4;

Clean-Up Notice



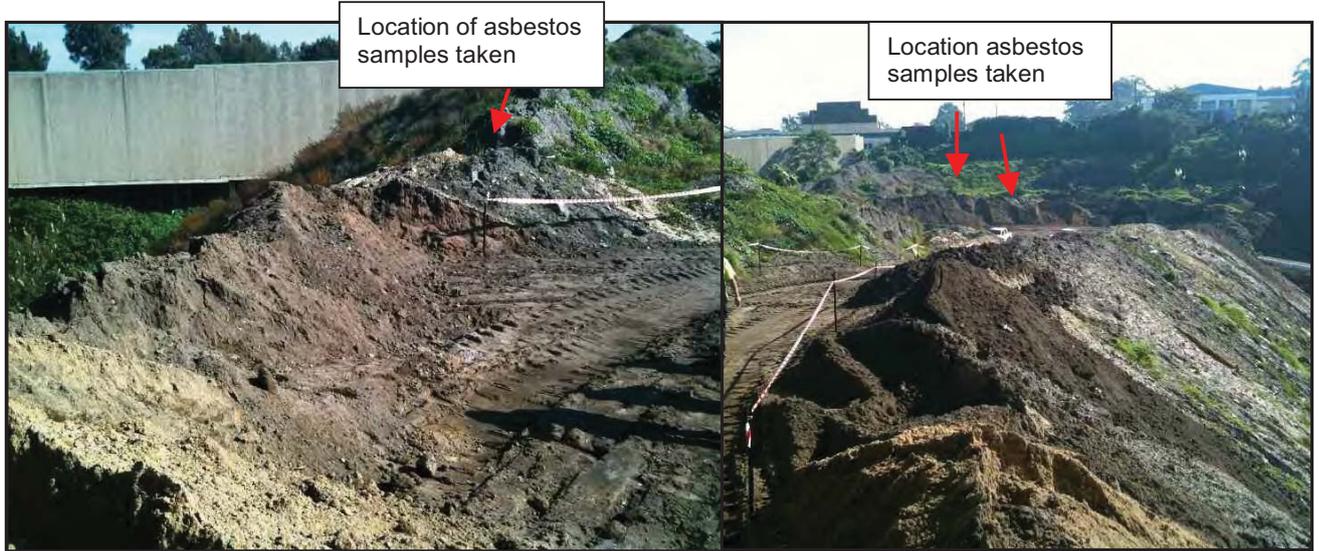
2. **Immediately** secure areas 1-4 of the Premises and any other areas where asbestos waste has been applied and restrict access;
3. By no later than **4pm, 29 June 2011**, provide to the Manager of Waste Operations PO Box A290 Sydney South NSW 1232 with an asbestos report. The Asbestos report must:
 - i Contain details of the nature and extent of asbestos and asbestos contaminated material (including friable and bonded asbestos) in areas 1-3;
 - ii Be prepared by an independent and suitably qualified expert, consultant and/ or an occupational (asbestos) hygienist; and
 - iii Must be sufficient in scope to provide a statistically valid assessment of asbestos contamination (included friable and bonded asbestos) of areas 1-3; and
 - iv Must include a visual walkover of areas 1-3 to identify any pieces of bonded asbestos on the surface of the stockpiles.
4. By no later than **4pm, 29 June 2011** provide to the Manager of Waste Operations PO Box A290 Sydney South NSW 1232 a report on any movement, blending or processing that has occurred in Areas 1-4 prior to the issue of this Clean-Up Notice. Details must include:
 - i How much waste has been blended, moved or processed in Areas 1-4?;
 - ii How much waste has been added and removed to and from the stockpiles in Areas 1-4?;
 - iii Where has the waste was transported off-site in after processing, moving and blending in Areas 1-4?;
 - iv Details of who did the processing, moving and blending in Areas 1-4?; and
 - v Details of what transport companies have transported waste to and from the Premises in Areas 1-4?

Clean-Up Notice

Map 1- Approximate location of stockpiles containing asbestos and foundry sands



Clean-Up Notice



Photos 1 & 2: Area 1



Photo 3: Area 2



Photo 4: Area 3

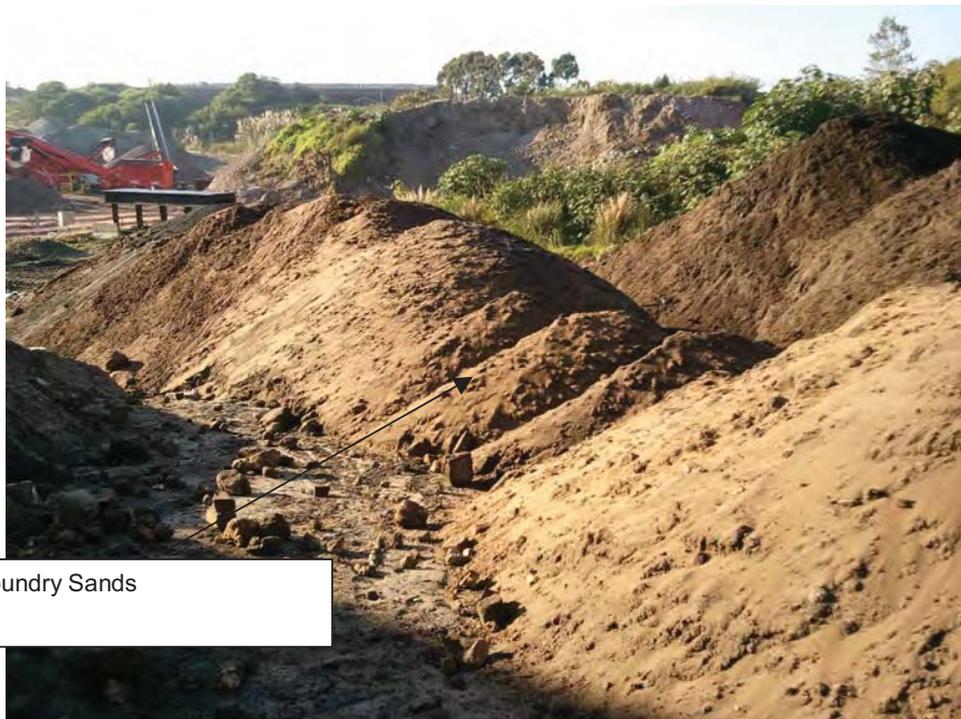
Clean-Up Notice



Environment,
Climate Change
& Water



Photo 5: Black sludgy material – Foundry sands – Area 4



Area 4: Foundry Sands

Photo 6: Foundry Sands

Clean-Up Notice



Area 7: Photo taken on 3 June 2011. Asbestos found in one of the waste stockpiles in Area 2 on 19 May 2011. the waste stockpile had been moved on 20 May 2011. During the inspections on 3 June 2011, the Licensee advised that the stockpile had been moved to the Landfill. However the waste had not been landfilled or covered with VENM as required by *clause 42(4)(d) of the Protection of the Environment Operations (Waste) Regulation 2005*.

FEE TO BE PAID

- You are required by law to pay a fee of \$444 for the administrative costs of issuing this notice.
- It is an offence not to pay this fee. However you can apply for an extension of time to pay the fee or for the fee to be waived. At the end of this notice there is information about how and when to pay the fee and how to apply for an extension or a waiver of the fee.

.....
Ms Julie Currey
Head Sydney (Landfills & AWTs)
Waste Operations (Sydney)
(By Delegation)

Clean-Up Notice



INFORMATION ABOUT THIS CLEAN-UP NOTICE

- This notice is issued under section 91 of the Protection of the Environment Operations Act 1997.
- It is an offence against the Act not to comply with a clean-up notice unless you have a reasonable excuse.

Penalty for not complying with this notice

- The maximum penalty for a corporation is \$1,000,000 and a further \$120,000 for each day the offence continues. The maximum penalty for an individual is \$250,000 and a further \$60,000 for each day the offence continues.

Cost recovery from the person who caused the incident

- If you comply with this clean-up notice but you are not the person who caused the pollution incident to which the notice relates, you have a right to go to court to recover your costs of complying with the notice from the person who caused the incident.

Deadline for paying the fee

- The fee must be paid by **no later than 30 days after the date of this notice**, unless the EPA extends the time to pay the fee, or waives the fee.

How to pay the fee

- Possible methods of payment are listed on the last page of the attached invoice/statement.
- Please include the payment slip from the attached invoice/statement with your payment.

How to apply for an extension of time to pay/waive the fee

- Any application for and extension of time to pay the fee or for the fee to be waived should be made in writing to the EPA and sent to Manager Waste Operations, PO Box A290, Sydney South NSW 1232. The application should set out clearly why you think your application should be granted.

Other costs

- The Protection of the Environment Operations Act allows the EPA to recover from you reasonable costs and expenses it incurs in monitoring action taken under this notice, ensuring the notice is complied with and associated matters. (If you are going to be required to pay these costs and expenses you will later be sent a separate notice called a "Notice Requiring Payment of Reasonable Costs and Expenses").

Continuing obligation

- Under section 319A of the Act, your obligation to comply with the requirements of this notice continues until the notice is complied with, even if the due date for compliance has passed.

Variation of this notice

- This notice may only be varied by subsequent notices issued by EPA.

Environment Protection Licence



Licence - 12594

Licence Details	
Number:	12594
Anniversary Date:	01-December

Licensee
WESTCONNEX DELIVERY AUTHORITY
LOCKED BAG 928
NORTH SYDNEY NSW 2059

Premises
ALEXANDRIA RECYCLING CENTRE
10-16 ALBERT STREET
ST PETERS NSW 2044

Scheduled Activity
Resource Recovery
Waste Storage

Fee Based Activity	Scale
Recovery of general waste	> 0 T recovered
Waste storage - other types of waste	> 0 T stored

Region
Waste & Resources - Waste Management
59-61 Goulburn Street
SYDNEY NSW 2000
Phone: (02) 9995 5000
Fax: (02) 9995 5999
PO Box A290 SYDNEY SOUTH
NSW 1232

Environment Protection Licence



Licence - 12594

INFORMATION ABOUT THIS LICENCE	4
Dictionary	4
Responsibilities of licensee	4
Variation of licence conditions	4
Duration of licence	4
Licence review	4
Fees and annual return to be sent to the EPA	4
Transfer of licence	5
Public register and access to monitoring data	5
1 ADMINISTRATIVE CONDITIONS	6
A1 What the licence authorises and regulates	6
A2 Premises or plant to which this licence applies	6
A3 Other activities	6
A4 Information supplied to the EPA	6
A5 Other administrative conditions	7
2 DISCHARGES TO AIR AND WATER AND APPLICATIONS TO LAND	7
P1 Location of monitoring/discharge points and areas	7
3 LIMIT CONDITIONS	9
L1 Pollution of waters	9
L2 Waste	9
L3 Hours of operation	11
L4 Potentially offensive odour	12
L5 Other limit conditions	12
4 OPERATING CONDITIONS	12
O1 Activities must be carried out in a competent manner	12
O2 Maintenance of plant and equipment	12
O3 Dust	13
O4 Emergency response	13
O5 Processes and management	13
O6 Waste management	14
O7 Other operating conditions	14
5 MONITORING AND RECORDING CONDITIONS	15
M1 Monitoring records	15
M2 Requirement to monitor concentration of pollutants discharged	15

Environment Protection Licence



Licence - 12594

M3	Testing methods - concentration limits	17
M4	Weather monitoring	18
M5	Recording of pollution complaints	18
M6	Telephone complaints line	18
M7	Other monitoring and recording conditions	19
6	REPORTING CONDITIONS	19
R1	Annual return documents	19
R2	Notification of environmental harm	20
R3	Written report	20
R4	Other reporting conditions	21
7	GENERAL CONDITIONS	21
G1	Copy of licence kept at the premises or plant	21
8	POLLUTION STUDIES AND REDUCTION PROGRAMS	22
U1	Stockpile Markers	22
U2	Improvements to Stormwater System	22
9	SPECIAL CONDITIONS	22
E1	Financial assurance	22
E2	Survey plan	22
E3	Definitions	23
DICTIONARY		24
	General Dictionary	24

Environment Protection Licence

Licence - 12594



Information about this licence

Dictionary

A definition of terms used in the licence can be found in the dictionary at the end of this licence.

Responsibilities of licensee

Separate to the requirements of this licence, general obligations of licensees are set out in the Protection of the Environment Operations Act 1997 ("the Act") and the Regulations made under the Act. These include obligations to:

- ensure persons associated with you comply with this licence, as set out in section 64 of the Act;
- control the pollution of waters and the pollution of air (see for example sections 120 - 132 of the Act);
- report incidents causing or threatening material environmental harm to the environment, as set out in Part 5.7 of the Act.

Variation of licence conditions

The licence holder can apply to vary the conditions of this licence. An application form for this purpose is available from the EPA.

The EPA may also vary the conditions of the licence at any time by written notice without an application being made.

Where a licence has been granted in relation to development which was assessed under the Environmental Planning and Assessment Act 1979 in accordance with the procedures applying to integrated development, the EPA may not impose conditions which are inconsistent with the development consent conditions until the licence is first reviewed under Part 3.6 of the Act.

Duration of licence

This licence will remain in force until the licence is surrendered by the licence holder or until it is suspended or revoked by the EPA or the Minister. A licence may only be surrendered with the written approval of the EPA.

Licence review

The Act requires that the EPA review your licence at least every 5 years after the issue of the licence, as set out in Part 3.6 and Schedule 5 of the Act. You will receive advance notice of the licence review.

Fees and annual return to be sent to the EPA

For each licence fee period you must pay:

- an administrative fee; and
- a load-based fee (if applicable).

Environment Protection Licence



Licence - 12594

The EPA publication “A Guide to Licensing” contains information about how to calculate your licence fees. The licence requires that an Annual Return, comprising a Statement of Compliance and a summary of any monitoring required by the licence (including the recording of complaints), be submitted to the EPA. The Annual Return must be submitted within 60 days after the end of each reporting period. See condition R1 regarding the Annual Return reporting requirements.

Usually the licence fee period is the same as the reporting period.

Transfer of licence

The licence holder can apply to transfer the licence to another person. An application form for this purpose is available from the EPA.

Public register and access to monitoring data

Part 9.5 of the Act requires the EPA to keep a public register of details and decisions of the EPA in relation to, for example:

- licence applications;
- licence conditions and variations;
- statements of compliance;
- load based licensing information; and
- load reduction agreements.

Under s320 of the Act application can be made to the EPA for access to monitoring data which has been submitted to the EPA by licensees.

This licence is issued to:

WESTCONNEX DELIVERY AUTHORITY
LOCKED BAG 928
NORTH SYDNEY NSW 2059

subject to the conditions which follow.

Environment Protection Licence



Licence - 12594

1 Administrative Conditions

A1 What the licence authorises and regulates

A1.1 This licence authorises the carrying out of the scheduled activities listed below at the premises specified in A2. The activities are listed according to their scheduled activity classification, fee-based activity classification and the scale of the operation.

Unless otherwise further restricted by a condition of this licence, the scale at which the activity is carried out must not exceed the maximum scale specified in this condition.

Scheduled Activity	Fee Based Activity	Scale
Resource Recovery	Recovery of general waste	> 0 T recovered
Waste Storage	Waste storage - other types of waste	> 0 T stored

A2 Premises or plant to which this licence applies

A2.1 The licence applies to the following premises:

Premises Details
ALEXANDRIA RECYCLING CENTRE
10-16 ALBERT STREET
ST PETERS
NSW 2044
LOT 100 DP 845651, PART LOT 11 DP 1013168
THAT PART OF LOT 11 DP1013168 & LOT 100 DP845651 AS SHOWN AS "RECYLCING PREMISES" ON APPROVED SURVEY PLAN AS BEING USED FOR THE SCHEDULED ACTIVITIES AUTHORISED BY THIS LICENCE

A3 Other activities

A3.1 The Licensee may vary the are of premises that are subject to this licence and upon which scheduled activities authorised by this licence are carried out by lodging with the EPA an application for variation under section 58 of the Act of the area of the premises together with a Survey Plan.

Note: Licence 4627 does not apply to the area of Lot 11 DP 1013168 and Lot 100 DP 845651 used for the scheduled activities authorised by this licence as shown on the Approved Survey Plan.

A4 Information supplied to the EPA

A4.1 Works and activities must be carried out in accordance with the proposal contained in the licence application, except as expressly provided by a condition of this licence.

In this condition the reference to "the licence application" includes a reference to:

Environment Protection Licence



Licence - 12594

- a) the applications for any licences (including former pollution control approvals) which this licence replaces under the Protection of the Environment Operations (Savings and Transitional) Regulation 1998; and
- b) the licence information form provided by the licensee to the EPA to assist the EPA in connection with the issuing of this licence.

A4.2 The following documents (and any future amendments to them) are not to be taken as part of the documentation in A4.1, other than those parts specifically referenced in this licence.

- a) Alexandria Landfill Site Revised Surface Water & Leachate Management Plan dated September 2004, prepared by Ian Grey Consulting Pty Limited (Report ID AJ001/Rp003 Rev D). An updated Figure 2 emailed to the DEC on 1 June 2005 from Ian Grey Groundwater Consulting Pty Limited).

A5 Other administrative conditions

A5.1 The licence operates subject to the Development Consents for Lot 1 in DP 1013168 and Lot 100 in DP 845651 granted by the Land and Environment Court of New South Wales on 28 September 2006 (Court numbers No.11646 of 2004 and 10079 of 2005) which Consents are limited to a period of 5 years from the date of the Consent.

Note: If an application for an extension of time under the condition of the consent is lodged with the consent authority at least 3 months before the required cessation of the development under the condition of the consent, the development can continue to be carried out until such time as that modification application is finally determined.

A5.2 The licensee must cease the activities allowed by this license within 6 months of the cessation of the current solid waste landfill operation if the solid waste landfill ceases operation prior to the 5 year development consent

2 Discharges to Air and Water and Applications to Land

P1 Location of monitoring/discharge points and areas

P1.1 The following points referred to in the table below are identified in this licence for the purposes of monitoring and/or the setting of limits for the emission of pollutants to the air from the point.

<i>Air</i>			
EPA identification no.	Type of Monitoring Point	Type of Discharge Point	Location Description
7	Dust Monitoring Point - DG1		Adjacent to weighbridge as identified in the diagram attached to the letter to the Environment Protection Authority dated 30 January 2012
8	Dust Monitoring Point - DG2		Southern boundary close to "Sealed Air" as identified in the diagram attached to the letter to the Environment Protection Authority dated 30 January 2012

Environment Protection Licence

Licence - 12594



9	Dust Monitoring Point - DG3	Southwest boundary close to Canal Road as identified in the diagram attached to the letter to the Environment Protection Authority dated 30 January 2012
10	Dust Monitoring Point - DG4	Adjacent to Sequential Batch Reactor and workshop as identified in the diagram attached to the letter to the Environment Protection Authority dated 30 January 2012

P1.2 The following points referred to in the table are identified in this licence for the purposes of the monitoring and/or the setting of limits for discharges of pollutants to water from the point.

P1.3 The following utilisation areas referred to in the table below are identified in this licence for the purposes of the monitoring and/or the setting of limits for any application of solids or liquids to the utilisation area.

Water and land

EPA Identification no.	Type of Monitoring Point	Type of Discharge Point	Location Description
1	Groundwater quality monitoring		Groundwater monitoring bore as labelled as "MW01" on map titled "Figure 5: Leachate & Groundwater Management Features" contained in the report titled "Alexandria Landfill Site Revised Surface Water & Leachate Management Plan September 2004".
2	Groundwater quality monitoring		Groundwater monitoring bore as labelled as "MW02s) on map titled "Figure 5: Leachate & Groundwater Management Features" contained in the report titled "Alexandria Landfill Site Revised Surface Water & Leachate Management Plan September 2004".
3	Groundwater quality monitoring		Groundwater monitoring bore as labelled as "MW02s) on map titled "Figure 5: Leachate & Groundwater Management Features" contained in the report titled "Alexandria Landfill Site Revised Surface Water & Leachate Management Plan September 2004".
4	Groundwater quality monitoring		Groundwater monitoring bore as labelled as "MW03) on map titled "Figure 5: Leachate & Groundwater Management Features" contained in the report titled "Alexandria Landfill Site Revised Surface Water & Leachate Management Plan September 2004".

Environment Protection Licence

Licence - 12594



5	Groundwater quality monitoring	Groundwater monitoring bore as labelled as "MW04b) on map titled "Figure 5: Leachate & Groundwater Management Features" contained in the report titled "Alexandria Landfill Site Revised Surface Water & Leachate Management Plan September 2004".
6	Leachate quality monitoring	Leachate sump as labelled as "Leachate Sump") on map titled "Figure 1: Leachate & Groundwater Management Features" contained in the report titled "Alexandria Landfill Site Revised Surface Water & Leachate Management Plan September 2004".

3 Limit Conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

L2 Waste

L2.1 The licensee must not cause, permit or allow any waste to be received at the premises, except the wastes expressly referred to in the column titled "Waste" and meeting the definition, if any, in the column titled "Description" in the table below.

Any waste received at the premises must only be used for the activities referred to in relation to that waste in the column titled "Activity" in the table below.

Any waste received at the premises is subject to those limits or conditions, if any, referred to in relation to that waste contained in the column titled "Other Limits" in the table below.

This condition does not limit any other conditions in this licence.

Code	Waste	Description	Activity	Other Limits
NA	Foundry Sands	As defined in the foundry sand in recovered aggregate exemption 2008	Waste storage Resource recovery	N/A
NA	Soils	Soil that meet the CT1 thresholds for General Solid Waste in Table 1 of the Waste Classification Guidelines as in force from time to time with the exception of the	Resource recovery Waste storage	Arsenic: 40mg/kg Cadmium: 2mg/kg Copper: 200mg/kg

Environment Protection Licence

Licence - 12594



		maximum threshold values for contaminants specified in the 'Other Limits' column		Mercury: 1.5mg/kg Zinc: 600mg/kg Petroleum Hydrocarbons C6-C9: 150mg/kg Petroleum Hydrocarbons C10-C36: 16 Polycyclic aromatic hydrocarbons: 80mg/kg Polychlorinated biphenyls (individual): 1mg/kg No Acid Sulfate Soil or Potential Acid Sulfate Soil is to be received at the Premises. Soil thresholds will be subject to review from time-to-time
NA	Garden waste	As defined in Schedule 1 of the POEO Act, as in force from time to time	Resource recovery Waste storage	Maximum of 240,000 tonnes of waste may be processed per annum
NA	Wood waste	As defined in Schedule 1 of the POEO Act, as in force from time to time	Resource recovery Waste storage	Maximum of 240,000 tonnes of waste may be processed per annum
NA	Metal waste	As defined in Schedule 1 of the POEO Act, as in force from time to time	Resource recovery Waste storage	Maximum of 240,000 tonnes of waste may be processed per annum
NA	Glass	As defined in Schedule 1 of the POEO Act, as in force from time to time	Resource recovery Waste storage	Maximum of 240,000 tonnes of waste may be processed per annum
NA	Plastic	As defined in Schedule 1 of the POEO Act, as	Resource recovery Waste storage	Maximum of 240,000 tonnes

Environment Protection Licence

Licence - 12594



		in force from time to time		of waste may be processed per annum
NA	Building and demolition waste	As defined in Schedule 1 of the POEO Act, as in force from time to time	Resource recovery Waste storage	Maximum of 240,000 tonnes of waste may be processed per annum
NA	General or Specific exempted waste	Waste that meets all the conditions of a resource recovery exemption under Clause 51A of the Protection of the Environment Operations (Waste) Regulation 2005	As specified in each particular resource recovery exemption	NA
NA	Waste	Any waste received on site that is below licensing thresholds in Schedule 1 of the POEO Act, as in force from time to time	-	NA

L2.2 No disposal or landfilling of waste must occur at the premises.

L2.3 Stockpiles of waste or recovered material (including stockpiled materials already processed on site) must not exceed the following limits at any time:

- a) Wood waste for reuse – 2,000 tonnes;
- b) Shredded wood waste and garden waste – 2,000 tonnes
- c) Metal – 500 tonnes
- d) Glass – 500 tonnes
- e) Plastic – 500 tonnes
- f) Building and Demolition Waste – 180,000 tonnes

L2.4 Stockpiles of processed or unprocessed waste (except for bitumen) with particle size of which is less than 20mm shall only be located within the Pit Area of the Premises as shown on “Plan 1 - General Layout – Proposed Waste Transfer Station” dated 27/10/2005 within development consent No. 11646 of 2004 issued by the Land and Environment Court of New South Wales on 28 September 2006.

L3 Hours of operation

L3.1 Activities covered by this licensee must be carried out between the following hours:

- a) for processing of materials and arrival and departure of trucks:
700 hrs to 1800 hrs Mondays to Fridays;
730 hrs to 1600 hrs Saturdays;
- b) for inward movement of goods only (no processing or outwards goods movement):
900 hrs to 1500 hrs Sundays;

Environment Protection Licence



Licence - 12594

c) for inwards movements of goods only (no processing or outwards goods movement):
900 hrs to 1500 hrs on public holidays for trucks of not more than two tonnes; and

d) for maintenance and office activities:
700 hrs to 1900 hrs Mondays to Fridays;
730 hrs to 1700 hrs Saturdays; and
900 hrs to 1500 hrs Sundays and public holidays.

L4 Potentially offensive odour

L4.1 No condition of this licence identifies a potentially offensive odour for the purposes of section 129 of the Protection of the Environment Operations Act 1997.

Note: Section 129 of the Protection of the Environment Operations Act 1997, provides that the licensee must not cause or permit the emission of any offensive odour from the premises but provides a defence if the emission is identified in the relevant environment protection licence as a potentially offensive odour and the odour was emitted in accordance with the conditions of a licence directed at minimising odour.

L5 Other limit conditions

Stockpile Height

L5.1 The height of any stockpile of waste within 50 metres of properties located at 2 Bishop Street, St Peters must not exceed 3 metres.

4 Operating Conditions

O1 Activities must be carried out in a competent manner

O1.1 Licensed activities must be carried out in a competent manner.

This includes:

- a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and
- b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

O2 Maintenance of plant and equipment

O2.1 All plant and equipment installed at the premises or used in connection with the licensed activity:

- a) must be maintained in a proper and efficient condition; and
- b) must be operated in a proper and efficient manner.

Environment Protection Licence



Licence - 12594

O3 Dust

- O3.1 Dust spray systems must be installed and operating to minimise dust from all stockpiles and processing areas at the facility.
- O3.2 Dust sprays and/or dust collection systems must be installed and operating on all crushing, grinding and screening equipment at the facility.
- O3.3 The licensee must ensure that all stockpiles are wetted prior to waste being removed from them for processing, and that during processing, they are kept wet and high-pressure water sprays are utilised to prevent the migration of dust.
- O3.4 The vehicle routes in use around the premises, except for concrete handstands, are to be kept damp from 700 hrs to 1700hrs Monday to Fridays and 700hrs to 1600hrs Saturdays.

O4 Emergency response

- O4.1 The licensee must maintain, and implement as necessary, a current emergency response plan for the premises. The licensee must keep the emergency response plan on the premises at all times. The emergency response plan must document systems and procedures to deal with all types of incidents (e.g. spills, explosions or fire) that may occur at the premises or that may be associated with activities that occur at the premises and which are likely to cause harm to the environment. If a current emergency response plan does not exist at the date on which this condition is attached to the licence, the licensee must develop an emergency response plan within three months of that date.

Preventing Fires

- O4.2 All operations and activities occurring at the premises must be carried out in a manner that will prevent and minimise the risk of fire at the premises.
- O4.3 The licensee must extinguish fires at the premises as soon as possible.

O5 Processes and management

Surface Water and Leachate Management Plan

- O5.1 The licensee must operate the facility in accordance with the document titled "Alexandria Landfill Site Revised Surface Water and Leachate Management Plan" dated September 2004, prepared by Ian Grey Consulting Pty Limited (Report ID AJ001/Rp003 Rev D).
- O5.2 All stormwater and stormwater treatment devices (including drainage systems, sumps and traps) must be regularly maintained.

Processes and Management

- O5.3 The licensee must ensure that all waste stored or processed at the premises is assessed and classified in accordance with the DECC Waste Classification Guidelines as in force from time to time.

Environment Protection Licence



Licence - 12594

O6 Waste management

Closure Plan

- O6.1 The licensee must prepare and submit to the EPA within twelve months prior to the intended closure of the facility, a closure plan in accordance with section 76 of the Protection of the Environment Operations Act 1997.
- O6.2 The licensee must take immediate action if methane concentrations levels exceed 500 parts per million (ppm) in any wood waste stockpile at the premises, by aerating the stockpiles to lower the methane concentrations to less than 500ppm.

Volumetric Survey

- O6.3 The licensee must submit to the EPA's Manager Waste Operations, a volumetric survey of the premises carried out by a registered surveyor:
 - a) During June in each year and provided to the EPA in the approved form and manner by no later than 31 July in that year; and
 - b) During December in each year and provided to the EPA in the approved form and manner by no later than 31 January in that year.

Waste Processing, crushing and grinding

- O6.4 All stockpiles of waste within 75 metres of the north and north-western boundary of the Premises must be located behind the physical barriers being shipping containers and walls in accordance with specifications outlined in Dial-A-Dump Industries letter dated 26 February 2010 (EPA Reference DOC10/9109).

Management of Stockpiles

- O6.5 Waste processing, crushing and grinding activities must only occur below 8.0 metres RL and at the locations shown on "Plan 1 - General Layout – Proposed Waste Transfer Station" dated 27/10/2005 within development consent No. 11646 of 2004 issued by the Land and Environment Court of New South Wales on 28 September 2006.

O7 Other operating conditions

Wheel Wash

- O7.1 All vehicles leaving the premises must be first put through an operating wheel wash except those that have not been in the landfilling or the material processing areas.

Environment Protection Licence



Licence - 12594

5 Monitoring and Recording Conditions

M1 Monitoring records

M1.1 The results of any monitoring required to be conducted by this licence or a load calculation protocol must be recorded and retained as set out in this condition.

M1.2 All records required to be kept by this licence must be:

- in a legible form, or in a form that can readily be reduced to a legible form;
- kept for at least 4 years after the monitoring or event to which they relate took place; and
- produced in a legible form to any authorised officer of the EPA who asks to see them.

M1.3 The following records must be kept in respect of any samples required to be collected for the purposes of this licence:

- the date(s) on which the sample was taken;
- the time(s) at which the sample was collected;
- the point at which the sample was taken; and
- the name of the person who collected the sample.

M2 Requirement to monitor concentration of pollutants discharged

M2.1 For each monitoring/discharge point or utilisation area specified below (by a point number), the licensee must monitor (by sampling and obtaining results by analysis) the concentration of each pollutant specified in Column 1. The licensee must use the sampling method, units of measure, and sample at the frequency, specified opposite in the other columns:

M2.2 Air Monitoring Requirements

POINT 7,8,9,10

Pollutant	Units of measure	Frequency	Sampling Method
PM10	grams per square metre per month	Quarterly	Australian Standard 3580.10.1-2003

M2.3 Water and/ or Land Monitoring Requirements

POINT 1,2,3,4,5

Pollutant	Units of measure	Frequency	Sampling Method
Alkalinity (as calcium carbonate)	milligrams per litre	Quarterly	Grab sample
Aluminium	milligrams per litre	Yearly	Grab sample
Arsenic	milligrams per litre	Yearly	Grab sample
Barium	milligrams per litre	Yearly	Grab sample
Benzene	milligrams per litre	Yearly	Grab sample

Environment Protection Licence



Licence - 12594

Bicarbonate	milligrams per litre	Quarterly	Grab sample
Cadmium	milligrams per litre	Yearly	Grab sample
Calcium	milligrams per litre	Quarterly	Grab sample
Chloride	milligrams per litre	Quarterly	Grab sample
Chromium (hexavalent)	milligrams per litre	Yearly	Grab sample
Chromium (total)	milligrams per litre	Yearly	Grab sample
Cobalt	milligrams per litre	Yearly	Grab sample
Copper	milligrams per litre	Yearly	Grab sample
Ethyl benzene	milligrams per litre	Yearly	Grab sample
Fluoride	milligrams per litre	Yearly	Grab sample
Lead	milligrams per litre	Yearly	Grab sample
Magnesium	milligrams per litre	Quarterly	Grab sample
Manganese	milligrams per litre	Yearly	Grab sample
Mercury	milligrams per litre	Yearly	Grab sample
Nitrate	milligrams per litre	Yearly	Grab sample
Nitrogen (ammonia)	milligrams per litre	Quarterly	Grab sample
Organochlorine pesticides	milligrams per litre	Yearly	Grab sample
Organophosphate pesticides	milligrams per litre	Yearly	Grab sample
pH	pH	Quarterly	Probe
Polycyclic aromatic hydrocarbons	milligrams per litre	Yearly	Grab sample
Potassium	milligrams per litre	Quarterly	Grab sample
Sodium	milligrams per litre	Quarterly	Grab sample
Standing Water Level	metres	Quarterly	In situ
Sulfate	milligrams per litre	Quarterly	Grab sample
Toluene	milligrams per litre	Yearly	Grab sample
Total dissolved solids	milligrams per litre	Quarterly	Grab sample
Total organic carbon	milligrams per litre	Yearly	Grab sample
Total petroleum hydrocarbons	milligrams per litre	Yearly	Grab sample
Total Phenolics	milligrams per litre	Yearly	Grab sample
Xylene	milligrams per litre	Yearly	Grab sample
Zinc	milligrams per litre	Yearly	Grab sample

POINT 6

Pollutant	Units of measure	Frequency	Sampling Method
Alkalinity (as calcium carbonate)	milligrams per litre	Quarterly	Grab sample
Aluminium	milligrams per litre	Quarterly	Grab sample
Arsenic	milligrams per litre	Quarterly	Grab sample
Barium	milligrams per litre	Quarterly	Grab sample
Benzene	milligrams per litre	Quarterly	Grab sample

Environment Protection Licence



Licence - 12594

Bicarbonate	milligrams per litre	Quarterly	Grab sample
Cadmium	milligrams per litre	Quarterly	Grab sample
Calcium	milligrams per litre	Quarterly	Grab sample
Chloride	milligrams per litre	Quarterly	Grab sample
Chromium (hexavalent)	milligrams per litre	Quarterly	Grab sample
Chromium (total)	milligrams per litre	Quarterly	Grab sample
Cobalt	milligrams per litre	Quarterly	Grab sample
Copper	milligrams per litre	Quarterly	Grab sample
Ethyl benzene	milligrams per litre	Quarterly	Grab sample
Fluoride	milligrams per litre	Quarterly	Grab sample
Lead	milligrams per litre	Quarterly	Grab sample
Magnesium	milligrams per litre	Quarterly	Grab sample
Manganese	milligrams per litre	Quarterly	Grab sample
Mercury	milligrams per litre	Quarterly	Grab sample
Nitrate	milligrams per litre	Quarterly	Grab sample
Nitrogen (ammonia)	milligrams per litre	Quarterly	Grab sample
Organochlorine pesticides	milligrams per litre	Quarterly	Grab sample
Organophosphate pesticides	milligrams per litre	Quarterly	Grab sample
pH	pH	Quarterly	Probe
Polycyclic aromatic hydrocarbons	milligrams per litre	Quarterly	Grab sample
Potassium	milligrams per litre	Quarterly	Grab sample
Sodium	milligrams per litre	Quarterly	Grab sample
Standing Water Level	metres	Quarterly	In situ
Sulfate	milligrams per litre	Quarterly	Grab sample
Toluene	milligrams per litre	Quarterly	Grab sample
Total dissolved solids	milligrams per litre	Quarterly	Grab sample
Total petroleum hydrocarbons	milligrams per litre	Quarterly	Grab sample
Total Phenolics	milligrams per litre	Quarterly	Grab sample
Xylene	milligrams per litre	Quarterly	Grab sample
Zinc	milligrams per litre	Quarterly	Grab sample

M3 Testing methods - concentration limits

M3.1 Subject to any express provision to the contrary in this licence, monitoring for the concentration of a pollutant discharged to waters or applied to a utilisation area must be done in accordance with the Approved Methods Publication unless another method has been approved by the EPA in writing before any tests are conducted.

Note: The *Protection of the Environment Operations (Clean Air) Regulation 2010* requires testing for certain purposes to be conducted in accordance with test methods contained in the publication "Approved

Environment Protection Licence

Licence - 12594



Methods for the Sampling and Analysis of Air Pollutants in NSW".

M4 Weather monitoring

M4.1

Parameter	Units of Measure	Frequency	Averaging Period	Sampling Method
Rainfall	mm	Daily		AM-4
Wind Speed @ 2 metres	m/s	Continuous	3 hourly	AM-2 & AM-4
Wind Direction & 2 metres		Continuous	3 hourly	AM-2 & AM-4
Temperature @ 2 metres	degree C	Continuous	3 hourly	AM-4

M4.2 The licensee must monitor (by sampling and obtaining results by analysis) the parameters specified in Column 1. The licensee must use the sampling method, units of measure, averaging period and sample at the frequency specified opposite in the other columns.

M5 Recording of pollution complaints

M5.1 The licensee must keep a legible record of all complaints made to the licensee or any employee or agent of the licensee in relation to pollution arising from any activity to which this licence applies.

M5.2 The record must include details of the following:

- a) the date and time of the complaint;
- b) the method by which the complaint was made;
- c) any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect;
- d) the nature of the complaint;
- e) the action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and
- f) if no action was taken by the licensee, the reasons why no action was taken.

M5.3 The record of a complaint must be kept for at least 4 years after the complaint was made.

M5.4 The record must be produced to any authorised officer of the EPA who asks to see them.

M6 Telephone complaints line

M6.1 The licensee must operate during its operating hours a telephone complaints line for the purpose of receiving any complaints from members of the public in relation to activities conducted at the premises or by the vehicle or mobile plant, unless otherwise specified in the licence.

Environment Protection Licence



Licence - 12594

- M6.2 The licensee must notify the public of the complaints line telephone number and the fact that it is a complaints line so that the impacted community knows how to make a complaint.
- M6.3 The preceding two conditions do not apply until 3 months after: the date of the issue of this licence.

M7 Other monitoring and recording conditions

Wood Waste Stockpile Monitoring

- M7.1 The licensee must monitor the concentration of methane within all stockpiled waste and materials which contain wood waste located over landfilled waste at the premises. The monitoring must be undertaken at least every 3 months and 5 readings must be taken at a depth of at least 50cm into each stockpile at a height of no more than 1 metre off the surface of the landfilled waste. The monitoring results, including sampling locations and date of sampling, analysis results and instrument details (including its calibration) must be recorded by the licensee. The instrument to monitor methane must be capable of measuring methane at concentrations as low as 500ppm.

Soil Classification Records

- M7.2 Soil Classification Records

The licensee must keep a record of each load of Soil, as referred to under Condition L2.1, that is received at the premises. The record must include, but not necessarily be limited to, the following:

- (a) a copy of the waste classification report in accordance with the Waste Classification Guidelines, including the classification and the limits specified in the L2.1 table;
- (b) the quantity (in tonnes) of the Soil received;
- (c) the date and time that the Soil were received;
- (d) the registration number of the vehicle transporting the Soil to the premises;
- (e) the source(s) and address from where the Soil were received; and
- (f) the name and contact details of the company or individual delivering the Soil to the premises.

The record must be retained at the premises for at least 4 years after the receipt of the load of the soil. The record must be produced to any authorised officer of the EPA upon request.

6 Reporting Conditions

R1 Annual return documents

- R1.1 The licensee must complete and supply to the EPA an Annual Return in the approved form comprising:
 - a) a Statement of Compliance; and
 - b) a Monitoring and Complaints Summary.At the end of each reporting period, the EPA will provide to the licensee a copy of the form that must be completed and returned to the EPA.

- R1.2 An Annual Return must be prepared in respect of each reporting period, except as provided below.

Note: The term "reporting period" is defined in the dictionary at the end of this licence. Do not complete the

Environment Protection Licence



Licence - 12594

Annual Return until after the end of the reporting period.

R1.3 Where this licence is transferred from the licensee to a new licensee:

- a) the transferring licensee must prepare an Annual Return for the period commencing on the first day of the reporting period and ending on the date the application for the transfer of the licence to the new licensee is granted; and
- b) the new licensee must prepare an Annual Return for the period commencing on the date the application for the transfer of the licence is granted and ending on the last day of the reporting period.

Note: An application to transfer a licence must be made in the approved form for this purpose.

R1.4 Where this licence is surrendered by the licensee or revoked by the EPA or Minister, the licensee must prepare an Annual Return in respect of the period commencing on the first day of the reporting period and ending on:

- a) in relation to the surrender of a licence - the date when notice in writing of approval of the surrender is given; or
- b) in relation to the revocation of the licence - the date from which notice revoking the licence operates.

R1.5 The Annual Return for the reporting period must be supplied to the EPA by registered post not later than 60 days after the end of each reporting period or in the case of a transferring licence not later than 60 days after the date the transfer was granted (the 'due date').

R1.6 The licensee must retain a copy of the Annual Return supplied to the EPA for a period of at least 4 years after the Annual Return was due to be supplied to the EPA.

R1.7 Within the Annual Return, the Statement of Compliance must be certified and the Monitoring and Complaints Summary must be signed by:

- a) the licence holder; or
- b) by a person approved in writing by the EPA to sign on behalf of the licence holder.

R2 Notification of environmental harm

R2.1 Notifications must be made by telephoning the Environment Line service on 131 555.

R2.2 The licensee must provide written details of the notification to the EPA within 7 days of the date on which the incident occurred.

Note: The licensee or its employees must notify all relevant authorities of incidents causing or threatening material harm to the environment immediately after the person becomes aware of the incident in accordance with the requirements of Part 5.7 of the Act.

R3 Written report

R3.1 Where an authorised officer of the EPA suspects on reasonable grounds that:

- a) where this licence applies to premises, an event has occurred at the premises; or
- b) where this licence applies to vehicles or mobile plant, an event has occurred in connection with the carrying out of the activities authorised by this licence,

Environment Protection Licence



Licence - 12594

and the event has caused, is causing or is likely to cause material harm to the environment (whether the harm occurs on or off premises to which the licence applies), the authorised officer may request a written report of the event.

R3.2 The licensee must make all reasonable inquiries in relation to the event and supply the report to the EPA within such time as may be specified in the request.

R3.3 The request may require a report which includes any or all of the following information:

- a) the cause, time and duration of the event;
- b) the type, volume and concentration of every pollutant discharged as a result of the event;
- c) the name, address and business hours telephone number of employees or agents of the licensee, or a specified class of them, who witnessed the event;
- d) the name, address and business hours telephone number of every other person (of whom the licensee is aware) who witnessed the event, unless the licensee has been unable to obtain that information after making reasonable effort;
- e) action taken by the licensee in relation to the event, including any follow-up contact with any complainants;
- f) details of any measure taken or proposed to be taken to prevent or mitigate against a recurrence of such an event; and
- g) any other relevant matters.

R3.4 The EPA may make a written request for further details in relation to any of the above matters if it is not satisfied with the report provided by the licensee. The licensee must provide such further details to the EPA within the time specified in the request.

R4 Other reporting conditions

Methane in wood waste stockpile

R4.1 The licensee must notify the EPA as soon as practicable and in any case within 48 hours after it becomes aware of methane concentrations in any wood waste stockpile exceeding 12,500ppm.

7 General Conditions

G1 Copy of licence kept at the premises or plant

G1.1 A copy of this licence must be kept at the premises to which the licence applies.

G1.2 The licence must be produced to any authorised officer of the EPA who asks to see it.

G1.3 The licence must be available for inspection by any employee or agent of the licensee working at the premises.

Environment Protection Licence



Licence - 12594

8 Pollution Studies and Reduction Programs

U1 Stockpile Markers

- U1.1 By 10 April 2012, the licensee must install a permanent stockpile height marker for all stockpiles located within 50 metres of properties located at 2 Bishop Street, St Peters that shows the height of 3 metres so that a visual check can be made against the marker to determine the height of the stockpiles.

U2 Improvements to Stormwater System

- U2.1 By 17 September 2012 the licensee must install the new stormwater drain and dam system in accordance with the document titled 'Filling Plan' dated May 2012 prepared by Genesis.

Within two weeks of installing the stormwater drain and dam the licensee must submit to the EPA as built design drawings.

9 Special Conditions

E1 Financial assurance

- E1.1 A financial assurance, in favour of the Environment Protection Authority (EPA), in the form of an irrevocable and unconditional guarantee from a bank, building society or credit union must be maintained as follows;

a) By 25 June 2007, the licensee must provide to the EPA a financial assurance in the amount of sixty thousand dollars (\$60,000);

b) By 1 June 2008, the licensee must provide to the EPA an additional financial assurance in the amount of sixty thousand dollars (\$60,000);

c) By 1 June 2009, the licensee must provide to the EPA an additional financial assurance in the amount of sixty thousand dollars (\$60,000).

The above assurances must be replenished to the full amount should the EPA have any reason to call up the financial assurance or any part thereof to correct environmental problems which have not been remedied by the occupier upon being given notice to do so.

E2 Survey plan

- E2.1 The licensee shall on the commencement date of this licence and by not later than each subsequent 1 February during the currency of this licence provide to the EPA a survey plan.

Note: Definition of survey plan in condition E3.

Environment Protection Licence

Licence - 12594



E3 Definitions

E3.1 In this licence, the following phases are defined as follows:

E3.2 Approved Survey Plan means a plan showing a survey carried out by a registered surveyor of the land comprising Lot 11 DP 1013168 and Lot 100 DP 845651 and identifying the land to be used for scheduled activities authorised by this licence and also the remainder area of land to be used for the scheduled activities authorised by licence 4627 and the location of the significant physical barrier between those two areas of land, being the plan titled "Alexandria Landfill" (Reference No. 250038) dated January 2009 and lodged with the EPA on 20 February 2009 being the most recent such plan lodged under condition A2.2 and approved as a variation under section 58 of the Act by the EPA.

E3.3 Survey Plan means a plan showing a survey carried out by a registered surveyor of the land comprising Lot 11 DP 1013168 and Lot 100 DP 845651 and identifying the land to be used for scheduled activities authorised by this licence and also the remainder area of land to be used for the scheduled activities authorised by licence No. 4627 and the location of the significant physical barrier between those two areas of land.

Environment Protection Licence



Licence - 12594

Dictionary

General Dictionary

3DGM [in relation to a concentration limit]	Means the three day geometric mean, which is calculated by multiplying the results of the analysis of three samples collected on consecutive days and then taking the cubed root of that amount. Where one or more of the samples is zero or below the detection limit for the analysis, then 1 or the detection limit respectively should be used in place of those samples
Act	Means the Protection of the Environment Operations Act 1997
activity	Means a scheduled or non-scheduled activity within the meaning of the Protection of the Environment Operations Act 1997
actual load	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
AM	Together with a number, means an ambient air monitoring method of that number prescribed by the <i>Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales</i> .
AMG	Australian Map Grid
anniversary date	The anniversary date is the anniversary each year of the date of issue of the licence. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act.
annual return	Is defined in R1.1
Approved Methods Publication	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
assessable pollutants	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
BOD	Means biochemical oxygen demand
CEM	Together with a number, means a continuous emission monitoring method of that number prescribed by the <i>Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales</i> .
COD	Means chemical oxygen demand
composite sample	Unless otherwise specifically approved in writing by the EPA, a sample consisting of 24 individual samples collected at hourly intervals and each having an equivalent volume.
cond.	Means conductivity
environment	Has the same meaning as in the Protection of the Environment Operations Act 1997
environment protection legislation	Has the same meaning as in the Protection of the Environment Administration Act 1991
EPA	Means Environment Protection Authority of New South Wales.
fee-based activity classification	Means the numbered short descriptions in Schedule 1 of the Protection of the Environment Operations (General) Regulation 2009.
general solid waste (non-putrescible)	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997

Environment Protection Licence



Licence - 12594

flow weighted composite sample	Means a sample whose composites are sized in proportion to the flow at each composites time of collection.
general solid waste (putrescible)	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
grab sample	Means a single sample taken at a point at a single time
hazardous waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
licensee	Means the licence holder described at the front of this licence
load calculation protocol	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
local authority	Has the same meaning as in the Protection of the Environment Operations Act 1997
material harm	Has the same meaning as in section 147 Protection of the Environment Operations Act 1997
MBAS	Means methylene blue active substances
Minister	Means the Minister administering the Protection of the Environment Operations Act 1997
mobile plant	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
motor vehicle	Has the same meaning as in the Protection of the Environment Operations Act 1997
O&G	Means oil and grease
percentile [in relation to a concentration limit of a sample]	Means that percentage [eg.50%] of the number of samples taken that must meet the concentration limit specified in the licence for that pollutant over a specified period of time. In this licence, the specified period of time is the Reporting Period unless otherwise stated in this licence.
plant	Includes all plant within the meaning of the Protection of the Environment Operations Act 1997 as well as motor vehicles.
pollution of waters [or water pollution]	Has the same meaning as in the Protection of the Environment Operations Act 1997
premises	Means the premises described in condition A2.1
public authority	Has the same meaning as in the Protection of the Environment Operations Act 1997
regional office	Means the relevant EPA office referred to in the Contacting the EPA document accompanying this licence
reporting period	For the purposes of this licence, the reporting period means the period of 12 months after the issue of the licence, and each subsequent period of 12 months. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act.
restricted solid waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
scheduled activity	Means an activity listed in Schedule 1 of the Protection of the Environment Operations Act 1997
special waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
TM	Together with a number, means a test method of that number prescribed by the <i>Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales</i> .

Environment Protection Licence



Licence - 12594

TSP	Means total suspended particles
TSS	Means total suspended solids
Type 1 substance	Means the elements antimony, arsenic, cadmium, lead or mercury or any compound containing one or more of those elements
Type 2 substance	Means the elements beryllium, chromium, cobalt, manganese, nickel, selenium, tin or vanadium or any compound containing one or more of those elements
utilisation area	Means any area shown as a utilisation area on a map submitted with the application for this licence
waste	Has the same meaning as in the Protection of the Environment Operations Act 1997
waste type	Means liquid, restricted solid waste, general solid waste (putrescible), general solid waste (non - putrescible), special waste or hazardous waste

Mr Stephen Beaman

Environment Protection Authority

(By Delegation)

Date of this edition: 21-June-2007

End Notes

- 1 Licence fee period changed by notice 1090787 approved on .
- 2 Licence varied by notice 1093242, issued on 31-Oct-2008, which came into effect on 31-Oct-2008.
- 3 Condition A1.3 Not applicable varied by notice issued on <issue date> which came into effect on <effective date>
- 4 Licence varied by notice 1099150, issued on 30-Mar-2009, which came into effect on 30-Mar-2009.
- 5 Licence varied by notice 1110780, issued on 02-Mar-2010, which came into effect on 02-Mar-2010.
- 6 Licence varied by notice 1123991, issued on 11-Feb-2011, which came into effect on 11-Feb-2011.
- 7 Licence varied by notice 1504464 issued on 15-Mar-2012
- 8 Licence varied by notice 1507603 issued on 08-Aug-2012
- 9 Licence transferred through application 1529358 approved on 23-Mar-2015 , which came into effect on 24-Mar-2015



[Home](#) > [Environment protection licences](#) > [POEO Public Register](#) >
[Search for licences, applications and notices](#)

Licence summary

[Search Again](#)
[Return to Previous](#)

Summary Licence No: 12594

[View this licence](#) (PDF document 143 kb)

Licence holder: BOILING PTY LTD

Premises: ALEXANDRIA RECYCLING CENTRE
 10-16 Albert Street, ST PETERS, NSW, 2044

LGA: MARRICKVILLE **Catchment:** Sydney Coast & Georges River

Administrative fee: \$1,904.00

Licence status: Issued

Activity type: Waste storage - other types of waste
 Recovery of general waste

Licence review: Complete date 08 Aug 2012

Due date 08 Aug 2017

Pollution incident management plan: Yet to be confirmed

Notices

<u>Number</u>	<u>Issue date</u>	<u>Notice type</u>
1093242	31 Oct 2008	s.58 Licence Variation
1099150	30 Mar 2009	s.58 Licence Variation
1110780	02 Mar 2010	s.58 Licence Variation
1123991	11 Feb 2011	s.58 Licence Variation
1128662	08 Jun 2011	s.91 Clean Up Notice
1500750	02 Sep 2011	s.91 Clean Up Notice
1502233	02 Nov 2011	s.110 Variation of Clean Up Notice
1504464	15 Mar 2012	s.58 Licence Variation
1505382	05 Apr 2012	Penalty Notice
1507603	08 Aug 2012	s.58 Licence Variation
1520084	03 Jul 2014	s.110 Variation of Clean Up Notice

Pollution studies and reduction programs

<u>Title</u>	<u>Program type</u>	<u>Start date</u>	<u>Complete date</u>	<u>Condit</u>
Improvements to Stormwater System	Water	25 Jul 2012		

Annual Returns

<u>Start date</u>	<u>End date</u>	<u>Date received</u>	<u>Non-compliance</u>	<u>LBL data</u>	Download Annual Return For
01-Dec-2013	30-Nov-2014				
01-Dec-2012	30-Nov-2013	30-Jan-2014		Not available	
01-Dec-2011	30-Nov-2012	30-Jan-2013	yes	Not available	
01-Dec-2010	30-Nov-2011	31-Jan-2012		Not available	
01-Dec-2009	30-Nov-2010	10-Feb-2011		Not available	
01-Dec-2008	30-Nov-2009	29-Jan-2010	No	Not available	
21-Jun-2008	30-Nov-2008	27-Jan-2009	No	Not available	
21-Jun-2007	20-Jun-2008	19-Aug-2008	yes	Not available	

Consent to Discharge Industrial Trade Wastewater

SYDNEY WATER CORPORATION

and

ALEXANDRIA LANDFILL PTY LTD

A.C.N. 098 849 971

Trading as

ALEXANDRIA LANDFILL PTY LTD

A.B.N. 26 098 849 971

ACTIVITY: GARBAGE TIP (GE06)

RISK INDEX: 05

CONSENT NO: 29304

CONNECTION NO: 2

PROPERTY NUMBER: 4059264

This CONSENT is made on
Executed for and on behalf of
Sydney Water Corporation

day: month: year:

By

.....
(Signature)
Sally Armstrong
Manager, Business Customer Services

In the presence of:

Witness

.....
(Signature)

Executed for and on behalf of
the Customer:

.....
(Print name of witness)

By

.....
(Signature)
IAN MALOUF SOLE DIRECTOR/SECRETARY
(Print name and position of person signing)
who warrants s/he has sufficient authority to execute this consent.

In the presence of:

Witness

.....
(Signature)
JACQUELINE BRAUMAN
(Print name of witness)

This consent must be executed by the Customer prior to execution by Sydney Water and submitted by the Customer to Sydney Water for its consideration. Submission of a consent executed by the Customer under no circumstances obliges Sydney Water to enter into or complete the consent. Submission of an executed consent by the Customer constitutes an application for a consent which Sydney Water may in its reasonable discretion reject, or with the consent of the Customer modify any of the proposed terms thereto.

SCHEDULE 1
(SUBJECT TO PUBLIC DISCLOSURE)

TRADE WASTEWATER WHICH MAY BE DISCHARGED

1. Trade wastewater substances

- (a) The Customer may discharge trade wastewater into the Sewer in a manner whereby the substance characteristics of the trade wastewater are of a type and discharged at a rate, level or concentration equal to or less than that described in this schedule.
- (b) The Customer must not discharge trade wastewater into the Sewer in a manner whereby the trade wastewater discharged;
 - (i) contains, possesses or produces a substance characteristic not provided in, or which may be determined as being contrary to that described in this schedule.
 - (ii) is at or of a rate, level, or concentration not provided in, or which may be determined as being contrary to, that described in this schedule.

SUBSTANCE	LTADM (kg/day)	MDM (kg/day)	Standard (mg/L)
AMMONIA (AS N)	1.50000	25.00000	100.000
SUSPENDED SOLIDS	5.00000	20.00000	600.000
TOTAL DISSOLVED SOLIDS	450.00000	674.00000	10000.000
BARIUM	0.21000	1.00000	5.000
IRON	0.70000	4.00000	50.000

RECONCILIATION PROCEDURES:

LONG TERM AVERAGE DAILY MASS:

The Long Term Average Daily Mass is a twelve month arithmetic average of ALL daily mass discharges as calculated for each composite sample. The Daily Mass discharged is to be calculated for each of the above substances, and checked against the above Long Term Average Daily Mass (kg/day) on the basis of average concentrations of substances discharged (mg/L) over any 24 hour period as determined from composite samples, obtained by either the Customer (in accordance with Schedule 2) or Sydney Water, or a combination of sample results by both.

This average concentration (mg/L) is to be multiplied by the total discharge (kL) as recorded by the Customer's discharge flow meter over the 24 hour period in order to calculate the Daily Mass of substances discharged (kg). Exceeding the Long Term Average Daily Mass does not constitute a Breach, but may incur a Critical Mass Charge as detailed in Schedule 3.

ACCEPTANCE STANDARD:

The Composite Sample Concentration is to be determined for each of the above substances, and checked against the above Acceptance Standard (mg/L) for each sample obtained. Exceeding the Acceptance Standard constitutes a Breach and will also incur an increased Quality Charge as detailed in Schedule 3.

The Discrete Sample Concentration is to be determined for each of the substances identified at Schedule 2, 2 (b) and checked against the above Acceptance Standard (mg/L) for each sample obtained. Exceeding the Acceptance Standard constitutes a Breach.

MAXIMUM DAILY MASS:

The Daily Mass discharged is to be calculated for each of the above substances, and checked against the above Maximum Daily Mass (kg/day) on the basis of average concentrations of substances discharged (mg/L) over any 24 hour period as determined from composite samples, obtained by either the Customer (in accordance with Schedule 2) or Sydney Water, or a combination of sample results by both.

This average concentration (mg/L) is to be multiplied by the total discharge (kL) as recorded by the Customer's discharge flow meter over the 24hour period in order to calculate the Daily Mass of substances discharged (kg). Exceeding the Maximum Daily Mass constitutes a Breach.

2. The trade wastewater discharged must at all times have the following properties:

- Temperature - Not to exceed 38 degrees Celsius.
- Colour - Determined on a system specific basis
- pH - Within the range 7.0 to 10.0.
- Fibrous material - None which could cause an obstruction to Sydney Water's sewerage system.
- Gross solids (other than faecal) - A maximum linear dimension of less than 20 mm, a maximum cross section dimension of 6 mm, and a quiescent settling velocity of less than 3 m/h.
- Flammability - Where flammable and/or explosive substances may be present, the Customer must demonstrate to the satisfaction of Sydney Water that there is no possibility of explosions or fires occurring in the sewerage system. The flammability of the discharge must never exceed 5% of the Lower Explosive Limit (LEL) at 25° Celsius.

3. Rate of discharge of waste to sewer:

- (a) Instantaneous maximum rate of gravitated discharge 6.0 litres per second
- (b) Maximum daily discharge 620.0 kilolitres
- (c) Average daily discharge 121.0 kilolitres

RECONCILIATION PROCEDURE:

The data obtained from applying these procedures is to be checked by the interface of a chart recorder to the Customer's flow metering equipment, or by the installation of flow metering equipment by Sydney Water, for a minimum of 7 days.

SCHEDULE 2
(SUBJECT TO PUBLIC DISCLOSURE)

SAMPLING, ANALYSIS, FLOW RATES AND VOLUME DETERMINATION

1. The Customer must provide and make available for the purpose of sampling and analysis;
 - (a) Sampling point located at the pretreatment discharge excluding domestic sewage prior to the point of connection to the Sewer.
 - (b) Equipment necessary to allow collection of composite automatic samples on either a flow proportional or a time basis.
2. The Customer is to undertake collection and analysis of samples in accordance with the schedule detailed below:
 - (a) Composite samples are to be obtained:
 - (i) over one full production day by combining equal volumes taken at 5 kilolitre intervals. The volumes are to be such that at least 5,000 millilitres are obtained over the full day. The reading of the flowmeter meter is to be obtained at the commencement and conclusion of the sampling day.
 - (ii) on 12 July 2011 and every 22 days thereafter. If trade wastewater is not discharged on this day, then the sample is to be taken on the next day that trade wastewater is discharged. Trade wastewater includes all non-domestic wastewater discharged to sewer from the premises, including cleaning waste.
 - (b) Discrete samples are to be obtained as detailed below, and analysed according to the procedures and methods specified in Sydney Water's published analytical methods, to determine the concentrations or levels of the following substance characteristics:

pH	at the start and finish of each sample day
AMMONIA (AS N)	at the finish of each sample day
 - (c) Composite samples are to be analysed according to the procedures and methods specified in Sydney Water's published analytical methods, or methods otherwise agreed to and detailed hereunder, to determine the concentrations or levels of the following substance characteristics:

AMMONIA (AS N)
SUSPENDED SOLIDS
TOTAL DISSOLVED SOLIDS
BARIUM
IRON
 - (d) The Customer, or the laboratory contracted by the customer, is to submit results of analyses to Sydney Water within 21 days from the date the sample was taken. All analysis results are to be submitted on the sample analysis report provided as appendices 1 and 2 to this Consent OR in such format as may be specified from time to time by Sydney Water.
 - (e) All data requested on the sample analysis report must be provided.
 - (f) Sydney Water must be notified in writing within 7 days of;
 - (i) any failure to obtain samples in accordance with the provisions of Schedule 2; or
 - (ii) any loss of any analytical data.

Where data is unavailable, lost or not provided, the Quality Charge and Critical Substance Charge, as detailed in Schedule 3, will be assessed on the basis of the highest Composite Sample concentration recorded in the 12 months prior to the date of the missing sample data.
3. The volume of wastewater discharged must be obtained from the reading of the total flow on the Customer's flowmetering system.

The rate of waste discharged is to be obtained by the reading of the instantaneous flow rate indicator on

the Customer's flowmetering system, or from any chart recorder interfaced to the Customer's flowmetering system.

The flowmetering system is to be calibrated at least annually at the Customer's expense, by a person or company approved by Sydney Water and a copy of the calibration certificate supplied to Sydney Water within one month of the certificate being received by the Customer.

If the Customer's flowmetering system fails to record data for any period, Sydney Water is to be advised in writing by the Customer within 7 days of any such failure becoming known by the Customer. An estimate of any data not recorded is to be made as follows:

Average of the waste discharged, registered for the four weeks before and/or after the failure to record.

SCHEDULE 3

(SUBJECT TO PUBLIC DISCLOSURE)

PAYMENTS

The charges are effective from 1 July 2011 and will continue until otherwise advised by Sydney Water.

All trade waste fees and charges are subject to CPI adjustments from 1 July each year in accordance with Determination No 1, 2008 made by the Independent Pricing and Regulatory Tribunal (IPART).

1. CHARGES FOR TRADE WASTEWATER DISCHARGE

Sydney Water will conduct a reading of the Customer's discharge meter at approximately 90 day intervals. The volume of trade wastewater discharged for the period since the previous reading will be calculated.

Charges are based on the Daily Mass calculated from composite samples and corresponding meter readings for each sampling day in the billing period, and calculated in accord with (c), (d), (e), and (f) below. The charge for each sampling day is then multiplied by a flow weighting factor to give a flow weighted charge. The total charge for each substance for the billing period is equal to the sum of the flow weighted charges for the billing period.

Total Charge = the sum of the flow weighted charges for the billing period

Flow Weighted Charge = (charge for all sample days) x (flow weighting factor) and:

Flow Weighting Factor =
$$\frac{\text{(total volume discharged during billing period)}}{\text{(sum of volumes discharged during all sample days during billing period)}}$$

In this formula volume discharged refers to the volume of trade wastewater discharged.

(a) Mass Discharged:

For each substance, the Mass Discharged is calculated by multiplying the Composite Sample concentration by the Trade Wastewater discharge for that sample day.

(b) Chargeable Tradewaste Mass:

(i) For the following substances, the Chargeable Tradewaste Mass is equal to the Mass Discharged:

SUBSTANCE
BARIUM
IRON

(ii) For the following substances, the Chargeable Tradewaste Mass is calculated by subtracting the Equivalent Domestic Mass from the Mass Discharged. The Equivalent Domestic Mass is defined as the Domestic Concentration multiplied by the Trade Wastewater discharge.

SUBSTANCE	DOMESTIC CONCENTRATION mg/L
AMMONIA (AS N)	35.000
SUSPENDED SOLIDS	200.000
TOTAL DISSOLVED SOLIDS	450.000

If the resulting Chargeable Tradewaste Mass is zero or negative, then no Quality or Critical Mass charges will apply for that substance for that sample day.

(iii) Where a Critical Mass Charge applies, the Chargeable Tradewaste Mass will be reduced in accord with paragraph (d) (iv), below.

(c) Quality Charge:

- (i) For the following substances, the Quality Charge is determined by multiplying the Chargeable Tradewaste Mass by the Rate for that substance:

SUBSTANCE	STANDARD MASS CHARGING RATE \$ per kg
AMMONIA (AS N)	2.0730
SUSPENDED SOLIDS	0.8870
TOTAL DISSOLVED SOLIDS	0.0059
BARIUM	13.8970
IRON	1.3840

- (ii) For the following substances, the Quality Charge is determined by multiplying the Chargeable Tradewaste Mass by the Rate, where the Rate is a function of the composite sample concentration recorded for that sample day:

SUBSTANCE	STANDARD MASS CHARGING RATE \$ per kg
N/A	N/A

(d) Critical Mass Charge:

- (i) Where the customer has been notified that a given substance is Critical or Over Capacity and the Mass Discharged is greater than the 1.5 times the Long Term Average Daily Mass (LTADM) for that substance, then the Chargeable Critical Mass is calculated by subtracting 1.5 times LTADM from the Mass Discharged, except where (ii), below, applies.
- (ii) Where the customer has been notified that a given substance is Critical or Over Capacity and the Equivalent Domestic Mass is greater than 1.5 times the LTADM the Chargeable Critical Mass is calculated by subtracting the Equivalent Domestic Mass from the Mass Discharged.
- (iii) Where the customer has been notified that a given substance is Critical or Over Capacity and paragraph (i) or (ii) above applies, the Chargeable Tradewaste Mass calculated in (b), above, will be reduced by the Chargeable Critical Mass.
- (iv) The Critical Mass Charge Rate is a function of the Rate and Mass Discharged and LTADM for that substance:

SUBSTANCE STATUS	CHARGING RATE MULTIPLIER	MASS AFFECTED BY CHARGING RATE MULTIPLIER
Critical	2.00	Mass discharged >1.50 LTADM
Over Capacity	3.00	Mass discharged >1.50 LTADM

- (v) The Critical Mass Charge is the product of the Chargeable Critical Mass, the rate for that substance and the charging rate multiplier.

(e) Concentration Breach Charge:

Where the Composite Sample concentration is greater than the Acceptance Standards specified in Schedule 1 (with the exception of sulphate), any charges calculated in (c) or (d) above will be doubled for that sampling day.

(f) Failure to collect required samples:

Where the Customer fails to collect and analyse samples in accord with this consent the above charges will be assessed on the basis of the highest composite concentrations recorded for any billing period within the previous 12 months and the average daily discharge for the current billing period.

2. CHARGES FOR INSPECTIONS

- (a) If, in the opinion of Sydney Water, it is necessary for a Customer Service Representative to exercise rights under clause 6.1, the Customer will incur no liability for payment for any such exercise unless Customer Service Representative has already exercised rights under clause 6.1 on 5 occasions within a period of one year.
- (b) If it is necessary, in the opinion of Sydney Water, to carry out more than 5 inspections within a period of one year, the additional inspections will be charged. The rate for additional inspections is \$78.50 per

hour per Sydney Water employee attending, up to a maximum of two employees, with a minimum charge of \$39.55.

- (c) Any inspection required following up an alleged breach or a default notice will result in a fee payable even if the number of inspections nominated in paragraph 2 (a) has not been exceeded.
- (d) For the purposes of 2 (a) and 2 (b), above, one year is defined as the period from 1 July to 30 June the following year.

3. CHARGES FOR ADMINISTRATION OF TRADEWASTE CONSENT

A consent fee of \$591.25 per quarter is payable from 1 July 2011.

4. CHARGES FOR VARIATION OR RENEWAL OF TRADEWASTE CONSENT

Where a Variation is made to the Consent a fee of \$343.35 will be payable. There will be no charge for renewal.

5. CHARGES FOR PROCESSING GREASE TRAP WASTE

Charges for processing grease trap waste under the 'Wastesafe' Management System are as follows:
(Not Applicable)

6. PAYMENT OF FEES AND CHARGES

An account will be issued for all fees and charges. Any fees or charges payable by the Customer must be paid by the Customer within 30 days of the receipt by the Customer of the account detailing those fees and charges.

**SCHEDULE 4
ADDITIONAL REQUIREMENTS**

1. EFFLUENT IMPROVEMENT PROGRAM

N/A

2. WASTE MANAGEMENT PLAN

The existing pre-treatment will result in the generation of 0.1 tonne per annum of waste substances in the form of a sludge containing generally solids. The waste substances are, and will continue to be disposed of, in compliance with the requirements of the Department of Environment and Climate Change.

3. OTHER REQUIREMENTS

1) Tipping Bucket Rain Gauge

The tipping bucket rain gauge is to be maintained in a clean and working manner at all times.

The rain gauge is to be set at a 203 mm rainfall catch and after 2 tips the controller will set the pump timer to a 4 hour time delay for discharge of the first flush.

The rain gauge is to be calibrated at least annually at the Customer's expense, by a person or company approved by Sydney Water and a copy of the calibration certificate supplied to Sydney Water within one month of the certificate being received by the Customer.

4. BACKFLOW REQUIREMENTS

a) A Backflow Containment Device must be installed and maintained at the water meter outlet/property boundary in accordance with Sydney Waters Backflow Containment Policy.

b) Individual Backflow and Zone protection is required on any tap located within 5 metres of any Trade Waste Apparatus

SCHEDULE 5
APPARATUS, PLANT AND EQUIPMENT

EXISTING: COLLECTION WELL 30 kL
1 X 80 KL BIOLOGICAL TREATMENT PLANT (BATCH DISCHARGE)
1 X 100 KL biological treatment plant (batch discharge)
1 X RAINFALL SENTINEL MEA 2211
1 X ABB MAGMASTER ELECTROMAGNETIC FLOW METER

PROPOSED: n/a

**SCHEDULE 6
SPECIAL CONDITIONS**

1. DANGEROUS DISCHARGES

In this Schedule, the term "may pose a danger to the environment, the Sewer or workers at a sewage treatment plant";

- (a) means an occurrence whereby matter is discharged to the Sewer which either alone or in conjunction with other matter discharged cannot be adequately treated or may cause corrosion or a blockage, explosion or the production of dangerous gases in the Sewer or may adversely affect the operation of a sewer or sewage treatment plant; and
- (b) includes, but not so as to restrict the generality of paragraph (a), matter or substances, which is or are
 - (i) toxic or corrosive;
 - (ii) petroleum hydrocarbons;
 - (iii) heavy metals;
 - (iv) volatile solvents;
 - (v) phenolic compounds;
 - (vi) organic compounds.

2. UNINTENDED DISCHARGES

- (a) For purposes of avoiding unintended discharges to the Sewer or the stormwater drainage system, all matter and substances on the Premises must be processed, handled, moved and stored in a proper and efficient manner.
- (b) Any substance on the Premises which, if discharged to the Sewer, may pose a danger to the environment, the Sewer or workers at a sewage treatment plant or may harm any sewage treatment process must be handled, moved and stored in areas where leaks, spillages or overflows cannot drain by gravity or by automated or other mechanical means to the Sewer or the stormwater drainage system.

3. NOTIFICATION

In the event of a discharge of matter to the sewer that poses or may pose a danger to the environment, the Sewer or workers at a sewage treatment plant the Customer must immediately notify:

(a) MALABAR STP CONTROL ROOM TEL: (02) 9931 8319 FAX: (02) 9931 8366

(b) BUSINESS CUSTOMER SERVICES
DACEYVILLE OFFICE: TEL: (02) 9694 6500 FAX: (02) 9662 0419

(c) BUSINESS CUSTOMER SERVICES EMERGENCY CONTACT
CITY & EAST TEL: 0408 256 470

(d) BUSINESS CUSTOMER SERVICES EMERGENCY CONTACT
ALTERNATE CONTACT TEL: 0418 221 516

4. PROVISION OF SAFE ACCESS

The Customer shall provide safe access to Sydney Water employees visiting the site. In the event that unsafe conditions are identified the Customer must take reasonable steps to correct unsafe conditions and create safe access.

5. ELECTRONIC REPORTING OF SAMPLE ANALYSIS RESULTS

Sydney Water reserves the right to vary this consent to specify the option of reporting by electronic mail as outlined in Schedule 2, 2 (d).

SCHEDULE 7

1. Premises for which Consent is granted
10-34 ALBERT ST, ST PETERS NSW 2044
2. Industrial or other commercial activities for which Consent granted
GARBAGE TIP (GE06)
3. Discharge point for which Consent granted
BOUNDARY TRAP
4. The date for purposes of clause 3.1 is 1 July 2011
5. The period for purposes of clause 3.2 is 24 months.
6. The receiving Treatment Plant is MALABAR Sewage Treatment Plant

**SCHEDULE 8
NOTICES AND COMMUNICATION ADDRESSES**

SYDNEY WATER: CUSTOMER SERVICE REPRESENTATIVE
BUSINESS CUSTOMER SERVICES
71 GARDENERS RD,
DACEYVILLE 2032
TEL: (02) 9694 6500
FAX: 1300 364 403
A.H: 132 092

CUSTOMER: GENERAL MANAGER
ALEXANDRIA LANDFILL PTY LTD
PO BOX 1040
MASCOT NSW 1460
TEL: 9519 9999
FAX: 9516 5559

**SCHEDULE 9
AUTHORISED OFFICERS**

SYDNEY WATER: MANAGER
BUSINESS CUSTOMER SERVICES
71 GARDENERS RD,
DACEYVILLE 2032
TEL: (02) 9694 6500
FAX: 1300 364 403
A.H: 132 092

Postal Address: PO BOX 399
PARRAMATTA NSW 2124

Email: Sally.armstrong@sydneywater.com.au

CUSTOMER: GENERAL MANAGER
ALEXANDRIA LANDFILL PTY LTD
10-36 ALBERT STREET
ST PETERS NSW 2044
TEL: 9519 9999
FAX: 9516 5559

Email:

**SCHEDULE 10
NOMINATED REPRESENTATIVES**

SYDNEY WATER: BUSINESS MANAGER - SALES & SERVICE
BUSINESS CUSTOMER SERVICES
71 GARDENERS RD,
DACEYVILLE 2032
TEL: (02) 9694 6500
FAX: 1300 364 403
A.H: 132 092

CUSTOMER: CHRISTOPHER BIGGS
ALEXANDRIA LANDFILL PTY LTD
10-36 ALBERT STREET
ST PETERS NSW 2044
TEL: 9519 9999
FAX: 9516 5559

**APPENDIX 1
SAMPLE ANALYSIS REPORT (COMPOSITE) DISCHARGE METER**

Consent Number: 29304	
Company Name: ALEXANDRIA LANDFILL PTY LTD	
Company Address: 10-34 ALBERT ST, ST PETERS NSW 2044	
Sample Type:	
<input type="checkbox"/> 6 (composite, manual time based)	Start date: ___/___/___
<input type="checkbox"/> 7 (composite, manual flow proportional)	Finish date: ___/___/___
<input type="checkbox"/> 8 (composite, automatic time based)	Start time: ___:___ am/pm
<input type="checkbox"/> 9 (composite, automatic flow proportional)	Finish time: ___:___ am/pm
grabs taken in sample period: _____	Initial meter reading: _____ kL
sample intervals min/kL _____	Final Meter reading: _____ kL
mL per grab: _____	Volume discharged: _____ kL

Laboratory:		
	Acceptance Standard	Measured Units
Substance	Acceptance Standard (mg/L)	Measured Concentration(mg/L)
AMMONIA (AS N)	100.000	
SUSPENDED SOLIDS	600.000	
TOTAL DISSOLVED SOLIDS	10 000.000	
BARIUM	5.000	
IRON	50.000	

COPY OF ORIGINAL ANALYTICAL LABORATORY REPORT TO BE ATTACHED
NOTE: LABORATORY REPORT MUST CERTIFY NATA REGISTRATION FOR EACH ANALYSIS
 Comments: _____

Customer Signature: _____ Date: ___/___/___
 Designation: _____

OFFICE USE ONLY

TERRITORY: D7

Sample No:

--	--	--	--	--

PLEASE RETURN TO:
 businesscustomers.labdata@sydneywater.com.au

**APPENDIX 2
SAMPLE ANALYSIS REPORT (DISCRETE SAMPLE)**

Consent Number:	29304
Company Name:	ALEXANDRIA LANDFILL PTY LTD
Company Address:	10-34 ALBERT ST, ST PETERS NSW 2044

Sample Type: DISCRETE
Date
Time

Laboratory:

Substance	Acceptance Standard (units or mg/L)	Measured Units or Concentration.
pH at start	7 - 10	
pH at finish	7 - 10	
NH3 at finish	100.000	

COPY OF ORIGINAL ANALYTICAL LABORATORY REPORT TO BE ATTACHED
NOTE: LABORATORY REPORT MUST CERTIFY NATA REGISTRATION FOR EACH ANALYSIS
Comments: _____

Customer Signature: _____ Date: ___/___/___
Designation: _____

OFFICE USE ONLY

TERRITORY: D7

Sample No:

--	--	--	--	--

PLEASE RETURN TO
businesscustomers.labdata@sydneywater.com.au

Appendix D

Technical Memos and Diagrams

Appendix D Technical Memos and Diagrams

Memorandum

To	Duncan Shires	Page	1
CC	Simon Tsui		
Subject	Leachate Management System - Alexandria Landfill, 10-16 Albert Street, St Peters		
From	Kate McGrath, Anthony Davis		
File/Ref No.	60327128_FinalMemo_Alexandria Landfill Leachate Management System_150216	Date	16 Feb-2015

1.0 Introduction

AECOM Australia Pty Limited (AECOM) has been engaged by WestConnex Delivery Authority (WDA) to prepare this memorandum of information relevant to the design and layout of the existing Alexandria Landfill leachate management system.

1.1 Objectives

The objective of this report is to provide a desktop summary of available information relevant to the existing Alexandria Landfill leachate, groundwater and surface water management system and associated infrastructure in order that WDA:

- has a more informed understanding of the layout and capacity of the existing infrastructure used to manage leachate and groundwater at Alexandria Landfill; and
- can better evaluate the risks and liabilities associated with assuming responsibility for the ongoing operation, maintenance and compliance of the existing infrastructure used to manage leachate and groundwater.

1.2 Scope of Work

The scope of work completed includes a review and assessment of available background information relating to the existing leachate, groundwater and surface water management systems, including:

- Alexandra Landfill leachate and groundwater management system;
- Alexandra Landfill surface water and stormwater drainage system; and
- Botany Sands aquifer interception system.

1.3 Background and Information Sources

AECOM's understanding of the existing leachate/groundwater management system has been informed by the following information sources:

- Maunsell Pty Ltd, 1996. Staging for Stormwater and Leachate Disposal. February.
- Waste Services NSW, 1997. Albert Street Disposal Depot Landfill Environmental Management Plan. December.
- Woodward Clyde, 1998. Environmental Audit (1998) of the Albert Street Landfill Depot, St Peters. 10 July.
- Author unknown, 1999. A Review of the Landfill Environmental Management Plan for the Albert Street St Peters Waste Management Centre. Final Draft.
- Douglas Partners, 2000. Landfill Environment Management Plan St Peters Waste Facility.
- PPK Environment and Infrastructure Pty Ltd, 2001. St Peters Waste Management Facility Annual Environmental Monitoring Report November 1999 to October 2000.
- PPK Environment and Infrastructure Pty Ltd, 2002. St Peters Waste Management Facility Annual Environmental Monitoring Report 1 November 2000 to 30 November 2001.

- Parsons Brinckerhoff (PB), 2003. Alexandria Landfill Site Water and Leachate Plan Revised Filling Plan – October.
- IGGC, 2006. Alexandria Landfill Site Revised Surface Water and Leachate Management Plan, September 2006. September.
- IGGC, 2012. Alexandria Landfill Site Revised Surface Water and Leachate Management Plan, November 2011. January.
- IGGC, 2013. Alexandria Landfill Site Environmental Monitoring Results, Year Ending 30th November 2012.
- JPG Engineering (JPG), 2015. Alexandria Landfill Leachate Management System Inspection Notes – 12 January 2015.
- JPG Engineering (JPG), 2015. Alexandria Landfill Leachate Management System Inspection Notes – 2 February 2015.

2.0 Existing Leachate Management System

2.1 Summary

A summary of available information relating to the existing leachate system is listed below.

- The main leachate management system appears to comprise a subsurface herringbone drainage network which drains to a leachate sump located at the south-western end of the landfill. Figure 1 in Appendix A shows the indicative location of the subsurface drainage system and the leachate sump. The leachate sump is also labelled as LP01 as a leachate sampling reference name.
- An intermediate leachate riser is located within the licenced landfill premises area (refer to Figure 1 in Appendix A) and a secondary intermediate leachate riser is located between the main leachate riser and the intermediate leachate riser. The intermediate and secondary leachate riser feed into the main leachate sump.
- Leachate is pumped from the main leachate sump to the leachate treatment plant (LTP) located in the north eastern portion of the Site, as shown on Figure 1 in Appendix A. Leachate from the treatment plant is then pumped to a sewer discharge point in Albert Street under a Trade Waste Agreement (TWA) with SWC. .
- The process flow diagram from the *Alexandria Landfill Site-Recycling and Landfill Premises Revised Surface Water and Leachate Management Plan (SWLMP), November 2011* (ICCG, 2012) indicates there is a bypass option for leachate to be directly discharged to sewer. AECOM has not been provided with or reviewed any records regarding the bypass permission records from SWC. The SWLMP (IGGC, 2012) does not describe the bypass mechanism or approvals.
- Waste Assets Management Corporation (WAMC) have provided an updated process flow diagram for the leachate collection system Appendix A.

2.2 Leachate Drainage and Extraction System Design

AECOM has not been provided with any 'as built' surveys or plans of the construction of the leachate and associated drainage system.

2.2.1 Leachate Subsurface Drainage

The main leachate subsurface drainage system design comprised a 'herringbone' design. Based on the design plans (Appendix B), the herringbone system incorporates a main leachate drain of 375 mm diameter reinforced concrete pipe (RCP) with feeder herringbone drains constructed of 150 mm diameter slotted polyvinyl chloride (PVC). No 'as built' plans have been identified in the data reviewed. Given the depth of fill overlying the drainage system, there is a possibility that some of the herringbone pipework may have collapsed and been rendered ineffective. In this instance the drainage medium surrounding the herringbone system (where present) would be effectively draining subsurface leachate.

The plans attached in Appendix B (Douglas Partners, 2000), illustrate the approximate location of the herringbone system. No granular layer was reportedly present at the base of the landfill and the herringbone system.

2.2.2 Main Leachate Extraction Sump

The design plans show that the herringbone drainage system drains into the leachate sump.

Design plans prepared by Maunsell Pty Ltd (1996) indicate the leachate sump was planned to be constructed of 2.1m diameter concrete vertical pipes, with the base of the sump installed at an elevation of -39 m AHD. The design detailed two submersible pumps with an agitator at the base.

The plans indicated that, prior to installation of the leachate management system, leachate was pumped directly through a pipeline traversing the south western boundary of the site to a sewer main on the Princes Highway (near Canal Road intersection).

The design plans for the leachate sump are attached in Appendix C.

An inspection of the main leachate sump riser was completed on the 12 January and 2 February 2015 by JPG. The following observations were recorded by JPG:

- The main leachate riser pumps were observed to be operational and pumping leachate to the LTP. The riser pumps were inhibited by high level in the LTP Feed Storage Tank via existing radio telemetry systems.
- Inspection of the leachate level in the main leachate riser indicated that the maximum height of leachate in the riser does not exceed a level approximately 1.5m below existing ground level (to be confirmed). The level appeared to coincide with the set height of an internal overflow pipe installed in the riser. The purpose and function of the overflow pipe remains to be established.
- Standing water level (SWL) was measured at approximately 7 m below the top of the sump . The level probe reading in the sump was 9.97 m on 12 January 2015. The pump was run for approximately 2 minutes and the SWL level remeasured. The reading on the level probe was 10.21 m. It was noted that the recorded water level was 9 m below the top of the sump riser on 30 December 2014. The power supply for the main rise pumps is sourced from the southern batter panel which has level probe telemetry.
- The system was observed to be working automatically with what appeared to be a logical control functionality.
- Leachate is pumped to the LTP via a 110 mm OD HDPE pipeline that runs from the main leachate sump to the southwest boundary and then along the western perimeter boundary of the landfill to the LTP,
- The leachate riser system has been operating automatically which is likely to account for the 80 – 100 m³ of leachate currently being discharged to sewer (as recorded by the trade waste flowmeter).

JPG noted that the radio telemetry software was currently being sourced and will be interrogated to establish the actual functionality.

A photograph of the top of the riser of the main leachate extraction sump is shown in Plate 1 below.



Plate 1 Main leachate extraction sump riser (facing south west)

2.2.3 Secondary Leachate Riser

The secondary leachate riser or leachate affected stormwater pump is located approximately 50 m north east of the main leachate riser. The secondary leachate riser was inspected on the 2 February 2015 by JPG. JPG noted the secondary leachate riser appeared to pump to the main leachate riser via a 63 OD HDPE pipe. The system was not in operation at the time the inspection was conducted.

2.2.4 Intermediate Leachate Riser (EPL Landfill Premises Area)

A preliminary inspection of the intermediate leachate riser was undertaken by JPG on 12 January 2015 (notes provided in Appendix J). The intermediate leachate riser was located in the South West portion of the EPL landfill premises area, in the location of the former leachate pond. The intermediate leachate riser discharges to the main leachate riser via a 75 mm OD HDPE pipe. The controller for the intermediate riser pump required an access code and the pump was not running at the time of the inspection.

A photograph of the top of the riser of the main leachate extraction sump is Plate 2.



Plate 2 Intermediate leachate riser (EPL landfill premises area)

2.3 Leachate Treatment Plant

The leachate treatment plant (LTP) comprises a rotating biological contact system. It is understood that the primary function of the treatment system is to remove ammonia.

The Sydney Water Corporation (SWC) TWA (No. 29304) listed the following treatment plant components:

- 1 x 80 KL biological treatment plant (batch discharge).
- 1 x 100 KL biological treatment plant (batch discharge).
- 1 x Rainfall Sentinel MEA 2211.
- 1 x ABB Magmaster electromagnetic flow meter.

JPG inspected the LTP on the 12 January and 2 February 2015. A summary of the observations are provided in Table 1 below. Accompanying notes and a preliminary process flow sketch of the LPT is provided in Appendix J.

Table 1 LTP summary (full details in JPG notes in Appendix J)

Feature	Description
110 mm OD HDPE inlet pipe	- Pipe feeding leachate from the main leachate riser
90 mm OD HDPE inlet pipe	- Pipe potentially feeding water from the Botany Sands interception pit (to be confirmed) - This line has been set up to provide a bypass of the LTP, allowing direct discharge to sewer. - The line is currently isolated to both the Storage Tank and Sewer.
Feed Water Tank	- 27,000 L capacity water tank is fed by the 110 OD HDPE pipe and the 90 OD HDPE pipe. The tank contains float switches linked to radio telemetry.
Sequencing Batch Reactor (SBR) 1	- Out of service - Aerators on SBR 1 were running with the reactor only partially full and no feed or discharge occurring (to be investigated). At this stage it is still unclear why SBR 1 is offline. - 60m ³ operational volume - 7000 mm x 2000 mm - Mesh cover - Operating/set on 12 hr cycle
SBR 2	- Operational - 100 m ³ operational volume - Submersible aspiring aerators - 8000 x 2400 mm - Mesh cover - Operating/set on 12 hr cycle - Observed discharge rate 6.15 L - Current maximum daily treatment and discharge rate is 4 hrs per day at 6.15 l/s or 89 m ³
Bypass	- Between the 90 mm OD HDPE and outlet to sewer - Between Feed Water Tank and outlet to sewer
Radio telemetry	- Installed by Indratel Pty Ltd
Cycle Settings	- Fill tank feed – 2hrs - Aeration cycle – 8 hrs - Settle – 2 hrs - Discharge – 2 hrs
Covers	- SBRs have mesh covers to prevent foam over flow
PLC control system or fail safe feed back	- There did not appear to be any system in place (to be confirmed by JPG)

2.4 Leachate Discharge Point

2.4.1 Current Leachate Discharge to Sewer

During their preliminary inspection (notes in Appendix J), JPG noted that the discharge meter reading was 645,543 m³ and that 453 m³ of liquid had been discharged between 30 December and 12 January 2015.. JPG collected effluent samples for analysis for the trade waste analysts (results pending).

2.4.2 Trade Waste Agreement 9017

AECOM submitted a request to SWC under the Government Information (Public Access) Act 2009 (GIPA) to obtain a copy of TWA 9017 between SWC and DADI for the discharge of leachate to sewer from Alexandria Landfill.

SWC's written response on the 22 October 2014 was: *'A search of Sydney Water's records has been undertaken. Trade Waste Agreement number 9017 (on property no 4059264) for the property address 10-36 Albert Street, St. Peters was cancelled on 5th March 2012. Therefore, there was no discharge to sewer and no payments were made to Sydney Water for this property under Trade Waste Agreement 9017 in last three years.'*

Leachate discharge monitoring results were reviewed from as recently as August 2014. The monitoring results for the leachate discharge compliance are summarised in Table 4 below and in records provided in Appendix H.

2.4.3 Trade Waste Agreement 29304

The 2011 SWLMP (IGGC, 2012) stated that leachate from the treatment plant was discharged to a sewer discharge point on Albert Street under a TWA with SWC (TWA Consent No. 29304). The SWLMP stated that no reuse of treated leachate took place within Alexandria Landfill.

A copy of the SWC TWA (No. 29304) was attached to the report. A copy of the TWA is provided in Appendix E. It is understood that the existing TWA expired on 22 January 2015..

The maximum discharge allowances that were set out in the TWA (Consent 29304) are listed in Table 2 below.

Table 2 Schedule of substance threshold limits

Substance	LTADM (kg/day)	MDM (kg/day)	Standard (mg/L)
Ammonia as N	1.5	25	100
Suspended Solids	5	20	600
Total Dissolved Solids	450	674	10000
Barium	0.21	1	5
Iron	0.7	4	50

Notes: LTADM – Long Term Average Daily Mass; MDM – Maximum Daily Mass.

The SWC TWA (No. 29304) specified the following physical discharge limits for treated leachate:

- Temperature must be less than 38°C.
- pH must be in the range of 7 to 10.
- Gross solids must have a maximum linear dimension of less than 20mm, a maximum cross section dimension of 6 mm and a quiescent settling velocity of less than 3 m/h.
- The flammability of the discharge must never exceed 5% of the lower explosive limit (LEL) at 25°C.
- Maximum discharge of 620 kL/day.
- Average daily discharge of 121 kL/day.

The SWC TWA (No. 29304) specified the following sampling/monitoring regime for the Albert Street discharge point:

- Collection of composite samples over one full production day by combining equal volumes taken at 5 kL intervals totalling 5 L over one day.
- Collection of samples every 22 days or the next day that trade wastewater is discharged.
- Analysis of discrete samples for pH at the start and end of each sample day.
- Analysis of a discrete sample for ammonia (as N) at the finish of each sample day.
- Analysis of composite samples for ammonia (as N), suspended solids, total dissolved solids (TDS), barium and iron.

The SWC TWA (No. 29304) required the results to be submitted within 21 days from the date the sample was collected. Disposal fees were calculated by the sum of the flow weighted discharges for the billing period.

2.4.4 Historical Leachate Discharge Monitoring

Average daily discharge volumes of leachate to sewer reported for the years between 2004 and 2012 are summarised in Table 3 below. The data was obtained from the annual monitoring reports. It is noted that no detailed records of flow monitoring have been provided so the accuracy of the data is not known.

Table 3 Average Discharge to Sewer

Date	Average Discharge (kL/day) to Sydney Water Sewer under TWA
Dec 2004 to Nov 2005	79.9
Dec 2005 to Nov 2006	24.06
Dec 2007 to Nov 2008	9.2
Dec 2008 to Nov 2009	23.2
Dec 2009 to Nov 2010	42.9
Dec 2010 to Nov 2011	33.3
Dec 2011 to Nov 2012	17.7
Average 2004 to 2012	32.9

The most recent data available for the leachate discharge quality and volume monitoring is provided in Appendix H and summarised in Table 4 below.

Table 4 Leachate Discharge Volume and Quality Data - December 2012 to August 2014

Date	Discharge (kL/day)	Discharge - Composite Sample Results (mg/L)					Discrete Sample Result	
		TDS	SS	Barium	Iron	Ammonia as N	Ammonia as N (mg/L)	pH
3/12/2012	59	3750	34	0.9	1.83	<0.5	<0.5	8
13/02/2013	57	3620	54	1	2.96	1.4	-	8
6/3/2013	29	3670	81	1.6	4.02	0.7	<0.5	8.1-8.3
9/5/2013	31	3340	36	0.6	6.51	8	<0.5	8.2
3/06/2013	53	3650	4	0.6	0.92	1.9	1.9	8.2
25/6/2013	55	3490	29	0.7	2.55	3	<0.5	8.2
17/07/2013	49	3370	18	0.8	1.94	3.1	4.3	8.2-8.3
8/08/2013	32	3370	84	1.2	7.32	<0.5	17.7	8.2
25/03/2014	72	3630	49	1.5	4.92	78.6	77.2	8.2
27/08/2014	46	3230	18	0.6	1.23	<0.5	3	7.4

2.4.5 Leachate and Groundwater Monitoring Leachate

Groundwater water monitoring for compliance with the Environment Protection Licences (EPLs) are described in the SWLMP (IGGC, 2012) and summarised in Table 5 below.

Table 5 Leachate and groundwater monitoring

Monitoring	Frequency
Leachate volume pumped from sump/discharged to sewer	Every 22 days
Leachate level in sump	Monthly
Intercepted groundwater volume: Botany Sands 1	Monthly (volume)
Intercepted groundwater volume: Botany Sands 2	Monthly (volume)
Groundwater levels: 4 shale bores, 1 Botany Sands bore	Monthly and Quarterly

The most recent groundwater and leachate monitoring data (ICCG, 2012) are summarised in Table 6.

Table 6 Groundwater and leachate standing water levels.

Date	MW1 (shale - 29 to 35 m*)	MW2s (botany sands -5 to 8 m*)	MW2d (shale - 23 to 29 m*)	MW3 (shale - 13.4 to 18.4 m*)	MW4c (shale - 16 to 22 m*)	LP1 (leachate)	BS2 (botany sands)
21/11/2011	-4.01	-0.86	-8.53	-	-5.49	-20.77	-2.72
11/01/2012	-3.61	-0.25	-8.43	-	-5.45	-19.51	1.18
9/02/2012	-2.98	1.01	-8.44	-	-4.97	-18.59	2.27
16/03/2012	-2.56	1.23	-8.31	-	-4.9	-17.08	2.39
12/04/2012	-2.25	0.19	-8.34	-	-5.18	-20.14	-2.71
10/05/2012	-2.19	-1.02	-8.32	-	-4.99	-17.75	-2.72
7/06/2012	-2.26	-0.8	-8.23	-	-3.96	-17.02	-2.69
11/07/2012	-1.55	-0.65	-8.34	-	-4.25	-21.26	-2.69
9/08/2012	-1.5	0.03	-8.42	-	-4.36	-20	1.72
13/09/2012	-1.62	-1.1	-8.49	-	-3.98	-18.63	-2.71
9/10/2012	-1.98	-1.28	-8.45	-16.2	-3.82	-16.93	-2.72
19/11/2012	-1.24	-1.4	-8.5	-16.46	-3.74	-18.87	-2.71
2013 - 2014	No data available for review						

Notes: levels in m AHD; *screened interval (metres below ground surface)

2.5 Former Secondary Leachate System

Between approximately 2003 and 2011, a secondary leachate system was reportedly used within the active tipping area. The secondary leachate drainage system comprised an interception drain and injection trench approximately one metre wide and 7.5 metres in depth to collect shallow leachate and contaminated run off from the landfill premises (active tipping area). The surface leachate trench drained into the main leachate system by infiltration. The SWLMP (IGGC, 2012) indicated that the injection trench was no longer required and would be decommissioned as the area now drained to the leachate pond from where it was pumped to the leachate treatment plant.

Leachate generated by runoff and infiltration reportedly travelled through the waste mass to the herringbone system and the main leachate sump, from where it was pumped to the leachate pond. Prior to this the secondary leachate system consisted of a surface drain running to a sump where it was then injected in the subsurface.

In 2003 a surface drain was reportedly present running along the lower edge of the tipping area to a sump and tank where it was then reportedly injected in the subsurface by injection wells. The location of this secondary leachate system is shown on Figure 1 Appendix A.

3.0 Surface Water and Stormwater Management System

3.1 Existing System

The current surface water drainage system is summarised below in Table 7.

Table 7 Surface Water Drainage System

Area	Drainage Details
Area A – Recycling Premises: weighbridge, workshops, offices, parking	Runoff drains to stormwater drains which discharge to a main subsurface stormwater drain (a 675 mm subsurface pipe) that connects to the off-site drain in Canal Road. There is a discharge monitoring point (SW3) at the Canal Road pipe junction. The same subsurface stormwater line also drains stormwater from off-site lots (located between the site and Princes Highway).
Area B & C: Recycling Premises: stockpiling and processing area	Surface water in the recycling premises and stockpiling area discharge to stormwater after sediment control and treatment. Monitoring occurs (SW1 and SW2)
Area D: Recycling Premises: waste transfer areas	Treatment and discharge to trade waste system
Area E: Landfill premises	Treatment and discharge to trade waste system
Area F: Lower Recycling Premises: Capped & contoured stockpile area	Collection by drain and sump with sediment control and pumped discharge to stormwater with treatment and monitoring (SW4). JPG inspected the area on 15 January 2015 and noted the following: <ul style="list-style-type: none"> - A small stormwater pit with no power and appeared the level probe had been recently removed. - A main stormwater sump consisting of a concrete block sump with junction boxes in the pit filled with epoxy.

The above features are shown on Figure 1 in Appendix A and Marrickville Council stormwater plans are provided in Appendix D.

3.2 Surface Water Sampling

The surface water sampling regime is detailed in the SWLMP (IGGC, 2012). The sampling regime comprises four monitoring events per year at each designated monitoring point (SW1 to SW4) (refer to *Figure 3: Site Water Management Features Revised March 2012 (IGGC, 2012)* attached).

The SWLMP includes stormwater discharge criteria based on Pollution Reduction Plan [PRP U3 (under EPL 12594)] and ANZECC (2000) guidelines:

- ammonia – 0.91 mg/L
- pH – 6.5 to 8.5
- Dissolved oxygen – 80-110%
- TOC – 10mg/L
- lead – 0.0044 mg/L
- phenol – 0.4 mg/L
- suspended solids – 50 mg/L

A copy of PRP U3 has not been provided to AECOM for review.

4.0 Botany Sands Interception System

Inflow of groundwater from the Botany Sands aquifer into the landfill was reportedly contributing to the large volumes of leachate being generated. To reduce this, two groundwater interception systems (designated BS1 and BS2) were installed between Alexandra Canal and the landfilled area to reduce groundwater inflow into the pit [refer to *Figure 7: Leachate & Groundwater Management Features (IGGC, 2012)* provided in Appendix I].

Extraction of groundwater from the Botany Sands aquifer to the east of the landfill pit began in approximately 2001/2002. Extracted groundwater is reportedly stored in 50,000 litre capacity tanks and has historically been used for dust suppression by water cart. Excess groundwater is understood to discharge to the stormwater drainage system on Canal Road.

JPG noted in their inspection notes from 2 February 2012 that historical documentation indicates that there may be a pipeline extending from the Botany Sands Interception System to the LTP storage tank..

At the time of the JPG inspection, the system did not appear operational. The present requirement for the operation of the Botany Sands Interception System needs to be established.

4.1 Botany Sands Groundwater Interception Drain (BS1)

Botany Sands groundwater extraction system (BS1) was installed approximately 20 metres from the southern Alexandria Landfill boundary and extends approximately 20 metres in a south-westerly direction, to a depth of -10 m AHD and a width of 2 m. The bottom of the trench was installed into low permeability clays present below the permeable Botany Sands strata. A 300mm inside diameter (ID) heavy duty PVC slotted pipe was placed in the base of the trench and wrapped in geotextile to minimise blockages. The trench was subsequently backfilled with coarse brick, sand and gravel. At the northern end of the trench a concrete sump was constructed using interlocking precast sections, founded on the clay strata. The sump was perforated to allow ingress of water from the trench, and wrapped in geotextile fabric. The location of BS1 is shown on Figure 1 in Appendix A.

JPG briefly inspected BS1 on 12 January 2015 and noted that there was no power on the main panel and the groundwater pit level probes had been disconnected.

4.2 Botany Sands Collection Sump (BS2)

The second interception and extraction system (BS2) is understood to comprise a sump that pumps to one 45 kL and two 27 kL storage tanks with an overflow to the stormwater drain.

4.3 Approvals

It is noted that Clause 10.16 in the development consent conditions (Section 96 Modification Approval for 9 Canal Road, St Peters Application No: DU/2003/635/C) state that only clean and unpolluted water can be discharged to stormwater. As some historical heavy metal and ammonia concentrations exceed the proposed stormwater discharge criteria outlined in the 2011 SWLMP (IGGC, 2012), it is uncertain whether the extracted groundwater can be characterised as unpolluted.

The Land and Environment Court conditions of consent (dated 28 September 2006) state that the volume of groundwater intercepted and pumped off-site is required to be recorded weekly and only clean and unpolluted water (as defined in the Protection of the Environment Operations Act 1997) shall be permitted to discharge from the subject premises into the Councils stormwater drainage system. The conditions of consent also state that any water re-used on the site must be of a quality that would be acceptable to the SWC trade waste system; and cause no harm to the health of the persons who may come in contact with the water.

It is also noted that the groundwater extraction systems are required to be licensed. Copies of the licences have been not been sourced or reviewed .

Copies of the conditions of consent for the Alexandria Landfill are provided in Appendix G.

4.4 Extraction Volumes

Extracted volumes of water from the Botany Sands are summarised in Table 8 below. The re-use of the extracted groundwater was estimated in the SWLMP (ICCG, 2011) to be 21.4-35.7 kL/day. The SWLMP (ICCG, 2013) calculated that the sprays for dust suppression would not lead to any substantial increase in infiltration (based on an average daily evaporation rate of 4.9 mm/day over 95,000 m²).

Table 8 Average discharge volumes from Botany Sands extraction systems

Date	Botany Sands Extraction -Average Discharge (kL/day)		
	BS1	BS2	Total
Dec 2004 to Nov 2005	11.9	-	11.9
Dec 2005 to Nov 2006	24.06	-	24.06
Dec 2007 to Nov 2008	16.9	-	16.9
Dec 2008 to Nov 2009	25.6	38.1	63.7
Dec 2009 to Nov 2010	20.1	40	60.1
Dec 2010 to Nov 2011	23.3	12.5	35.8
Dec 2011 to Nov 2012	39.8	16.2	56
Average 2004 to 2012	23.1	26.7	38.4

5.0 Identified Historical and Current Leachate Management System Issues

A summary of identified issues relating to the leachate management system issues is provided below.

- Regular pumping of leachate ceased in late 2001 after problems with the pumping system and subsequent cessation of the SWC TWA. Pumping to sewer under a renewed TWA took place briefly in November and early December 2002 but was resuspended due to lack of hydraulic capacity in the sewer to accept additional load.
- Inflow of Botany Sands aquifer into the landfill (as summarised in 4.0 above).
- As a result of elevated ammonia concentrations reported at MW1 in the Alexandria landfill, PPK (2002) recommended the responsible person within Alexandria Landfill have discussions with Sydney City Council to evaluate leachate/groundwater management practices at Sydney Park and to investigate the hydrogeological connection between the Sydney Park the site. SWC requested a treatment plant to be installed at the Alexandria Landfill as a matter of urgency to reduce ammonia concentrations.
- A discharge of water occurred occasionally from the dry cleaners site on the Princes Highway onto the Alexandria Landfill (PPK, 2002). There was concern that the dry cleaners may have been contributing to the ammonia concentrations reported in landfill leachate. A discharge was observed onto the landfill from the drycleaners on 6 February 2001 with a flow rate of 5-10 L/s for one hour. A sample was collected by the Alexandria Landfill Site Manager (David Low, City of Sydney Council) and submitted to ALS for ammonia and electrical conductivity. A larger suite was not undertaken as the sample collected was only 50 ml. Results were 0.45 mg/L ammonia and 10090 µS/cm electrical conductivity. PPK noted that the water may contain other contaminants associated with dry cleaning activities.
- Negotiation with SWC allowed pumping to resume in February 2003 (due to commissioning of a Rotating Biological Contact treatment plant). Prior to recommencement of pumping higher leachate levels (height) were evident. The level of leachate was slightly higher than the Ashfield Shale groundwater level as measured in borehole MW03. It was noted that had the height of the leachate level not lowered, the leachate would have potentially migrated into the Ashfield Shale.
- On the 16 July 2012 the NSW EPA implemented a pollution reduction program under EPL 4627 (landfill premises), which stated the following:
 - By 16 August 2012 the licensee must install a leachate drainage system (comprising a leachate sump, interception drain and injection trench) in accordance with the document titled 'Filling Plan' dated May 2012 prepared by Genesis. Within two weeks of installing the leachate drainage system the licensee must submit to the EPA as built design drawings (AECOM has not reviewed these documents). It is uncertain whether the above measures have been implemented.
 - By 16 August 2012 the licensee must install the new stormwater drain and dam system in accordance with the document titled 'Filling Plan' dated May 2012 prepared by Genesis. Within two weeks of installing the stormwater drain and dam the licensee must submit to the EPA 'as built' design drawings (AECOM has not reviewed these documents). It is uncertain whether the above measures have been implemented.

- AECOM issued a request under the GIPA Act 2009 to obtain a copy of the SWC TWC for the property address 10-36 Albert Street, St. Peters (Alexandria Landfill Pty Ltd). SWC advised that the TWA was cancelled on 5th March 2012.
- AECOM understands that the existing TWA for the Alexandria Landfill (29304) was cancelled on 22 January 2015.
- The most recent reported ammonia concentration's in leachate (reported by IGGC in 2013) ranged from 168 mg/L to 232 mg/L, which exceeds the ammonia limit of 100 mg/L from the most recent copy of the SWC TWA (provided in IGGC 2011 report) . Post-treatment leachate discharge monitoring results reported composite results for ammonia ranging from <0.5 mg/L to 77.2 mg/L. The laboratory reports, field records and quality assurance/quality control results were not available for review.

6.0 Conclusions and Recommendations

The overall conclusions on the review of the leachate management system are listed below.

- A leachate collection and treatment system is present at the site, and appears to be operational based on preliminary inspections undertaken by JPG. JPG noted that the system will require repairs and modifications.
- It is uncertain whether the system is adequately treating collected leachate to comply with the requirements of the TWA.
- It is unclear whether groundwater from the Botany Sands aquifer is being lawfully extracted under a licence from the NSW Office of Water or whether the discharged water fully complies with the development consent conditions.

Based on the available information the below is recommended to be undertaken:

- Sampling and analysis of untreated and treated leachate samples to evaluate the effectiveness of the treatment system.
-
- Negotiate a new TWA with SWC as the existing EPL was cancelled on the 22 January 2015.
- Engage an engineer experienced in the operation and design of biological contact treatment plants to assess the current capability and condition of the plant to provide recommendations and cost estimates for upgrades or repair to meet discharge standards (if required).
- Investigate whether a groundwater extraction permit is in place with the NSW Office of Water (NOW) for the extraction of groundwater from the Botany Sands aquifer and whether the quality of the water is appropriate for disposal to the Canal Road stormwater system.

7.0 References

Author unknown, 1999. A Review of the Landfill Environmental Management Plan for the Albert Street St Peters Waste Management Centre. Final Draft.

Douglas Partners, 2000. Landfill Environment Management Plan St Peters Waste Facility.

IGGC, 2006. Alexandria Landfill Site Revised Surface Water and Leachate Management Plan, September 2006. September.

IGGC, 2012. Alexandria Landfill Site Revised Surface Water and Leachate Management Plan, November 2011. January.

IGGC, 2013. Alexandria Landfill Site Environmental Monitoring Results, Year Ending 30th November 2012.

JPG Alexandria Landfill Leachate Management Systems Inspection Notes (15 January 2015)

JPG Alexandria Landfill Leachate Management Systems Inspection Notes (2 February 2015)

Maunsell Pty Ltd, 1996. Staging for Stormwater and Leachate Disposal. February.

PPK Environment and Infrastructure Pty Ltd, 2001. St Peters Waste Management Facility Annual Environmental Monitoring Report November 1999 to October 2000.

PPK Environment and Infrastructure Pty Ltd, 2002. St Peters Waste Management Facility Annual Environmental Monitoring Report 1 November 2000 to 30 November 2001.

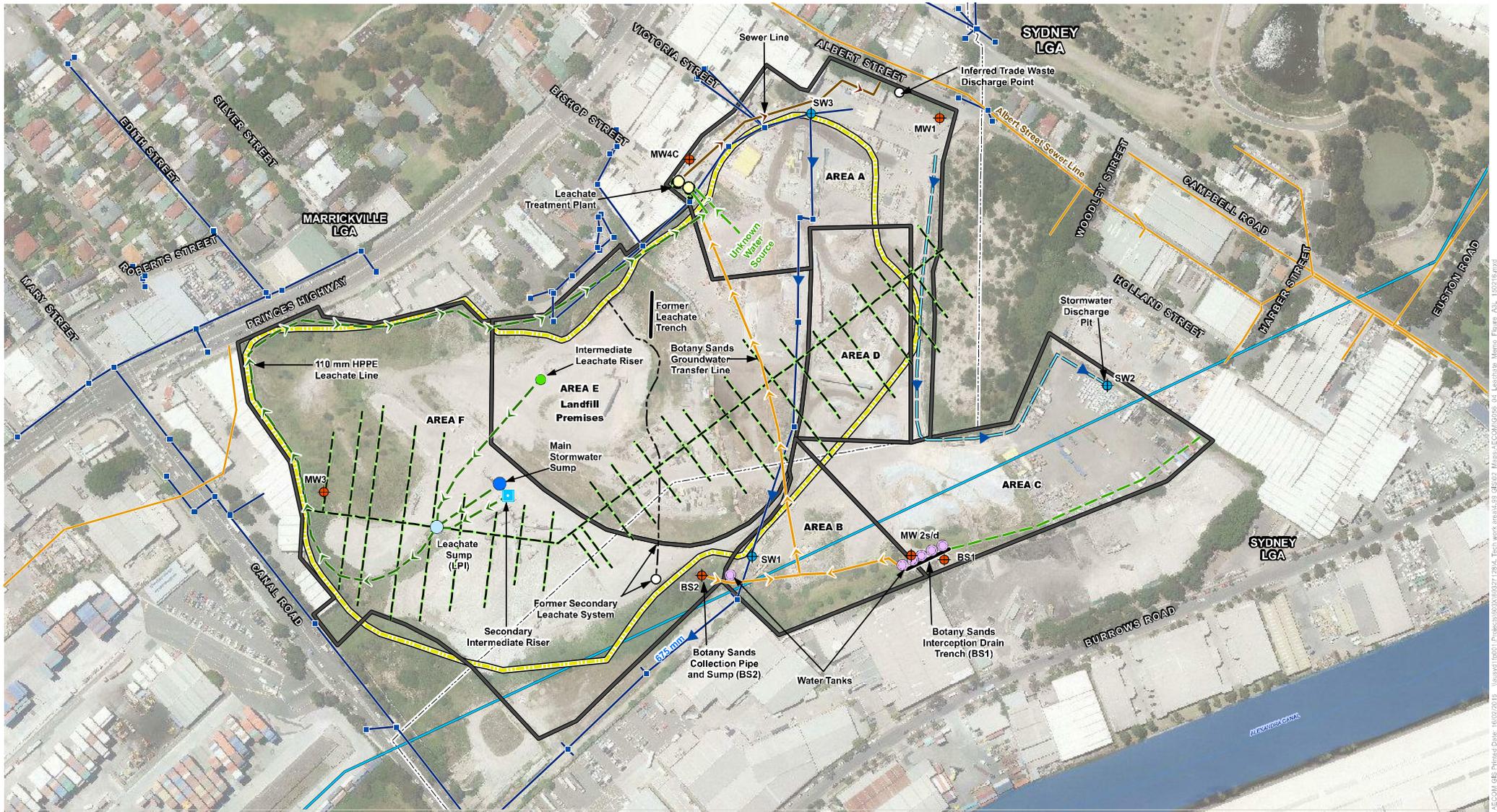
Parsons Brinckerhoff (PB), 2003. Alexandria Landfill Site Water and Leachate Plan Revised Filling Plan – October.

Waste Service NSW, 1997. Albert Street Disposal Depot Landfill Environmental Management Plan. December.

Woodward Clyde, 1998. Environmental Audit (1998) of the Albert Street Landfill Depot, St Peters. 10 July.

Appendix A

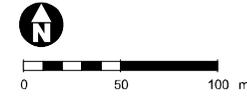
Site Layout and Draft Leachate Process Flow Diagram



- KEY**
- Area Boundaries
 - Quarry Pit Extent
 - Local Government Area
 - Desalination Pipeline
 - Stormwater Drainage Line
 - Stormwater Drainage Line
 - Concrete Dish Drain
 - ◆ Groundwater Sampling Location
 - Indicative Location of Herringbone Drainage
 - Former Surface Drain
 - Stormwater Drainage Line
 - Botany Sands Transfer Line
 - Leachate Transfer Line
 - Sewer Discharge Line

WestConnex
Building for the future

AECOM



Disclaimer
Map produced by AECOM on behalf of WestConnex Development Authority.
Map data copyright 2014 WestConnex Delivery Authority, NSW. Spatial data used under licence from Land and Property Management Authority, NSW 3/2014.
AECOM/DA makes no representations or warranties of any kind, about the accuracy, reliability, completeness, suitability or fitness for purpose in relation to the map content.



CONFIDENTIAL GIS MAP

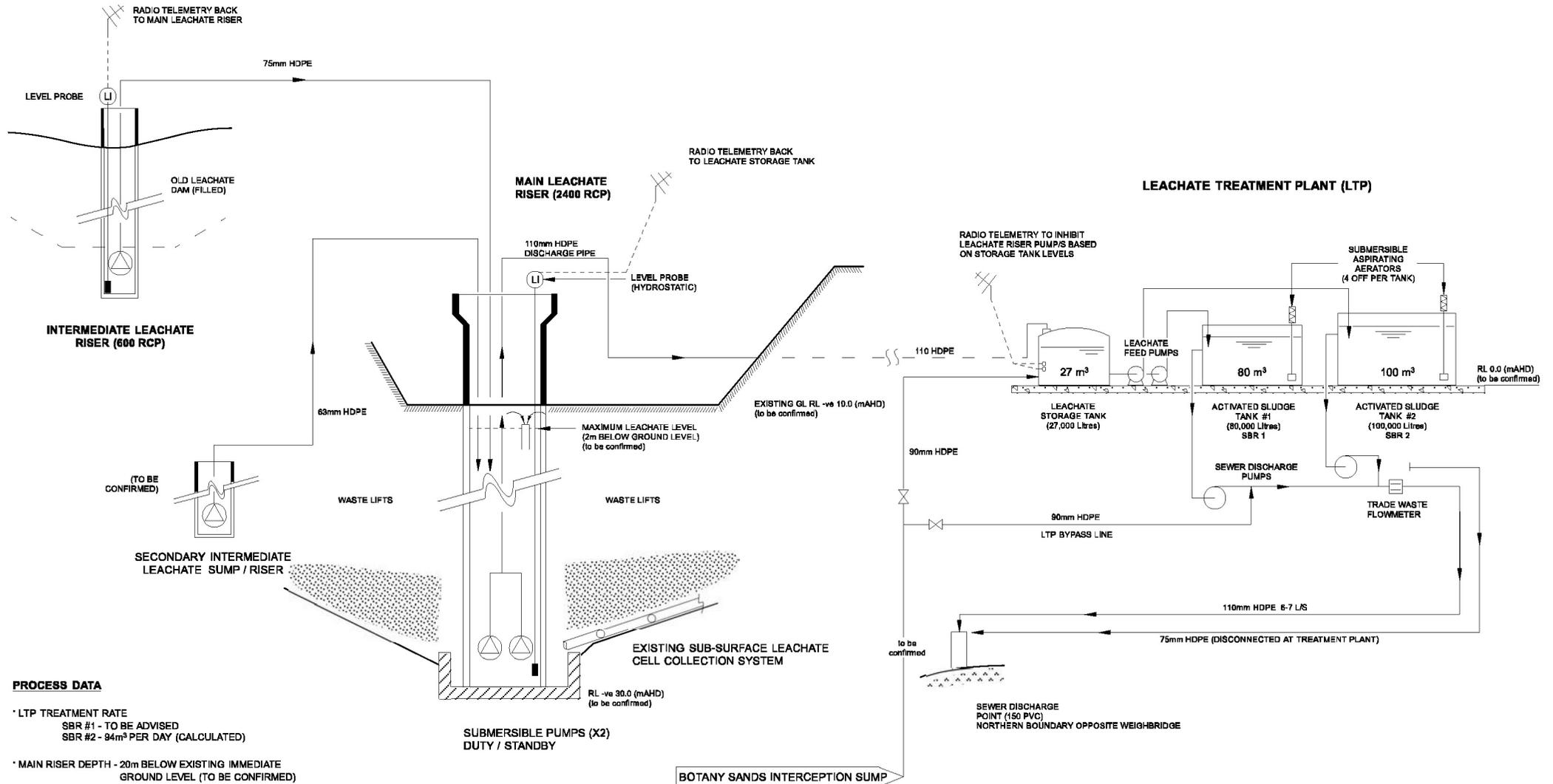
SCALE	1:2,750	A3
SHEET	1 of 1	COORDINATE SYSTEM GDA 1994 MGA Zone 56
TITLE	WestConnex Motorway Leachate Memo Figure	
PROJECT	WESTCONNEX STAGE 2 TA	
CLIENT	WESTCONNEX DELIVERY AUTHORITY	
DRAWN	PROJECT # 60327128	MAP # Project
CHECK	DATE 16/02/2015	G056 04 60327128

AECOM GIS, Printed Date: 16/02/2015, Mapset: 04, Project: 60327128, Tech: work area, SE GIS/ITZ_MapsetAECOM/056_04/Leachate_Memo_Figure_A3.mxd, 16/02/15.rvt

**ST PETERS INTERCHANGE
WESTCONNEX DELIVERY AUTHORITY**

DRAFT PROCESS FLOW DIAGRAM

**ALEXANDRIA LANDFILL LEACHATE
COLLECTION & TREATMENT SYSTEMS**



PROCESS DATA

- LTP TREATMENT RATE
SBR #1 - TO BE ADVISED
SBR #2 - 94m³ PER DAY (CALCULATED)
- MAIN RISER DEPTH - 20m BELOW EXISTING IMMEDIATE GROUND LEVEL (TO BE CONFIRMED)

NOTE: THIS DRAWING IS FOR PRELIMINARY INFORMATION ONLY. FINAL DETAILS ARE TO BE CONFIRMED. NOT TO BE USED FOR CONSTRUCTION PURPOSES.

PROCESS CONSULTANT / CONTRACTOR

JPG ENGINEERING
Purpose Built Process Plant & Equipment,
Industrial Water Treatment
Unit 1/8 Pioneer Drive Bellambi NSW 2158
T (02) 4284 2122 F (02) 4284 2133
M 0408 210 474 E jpg@jpgeng.com

MANAGING CONTRACTOR

**Waste Assets
Management
Corporation**
NSW GOVERNMENT

LEVEL 4, 10 VALENTINE AVE
PARRAMATTA NSW 2124
T: (02) 9685 4868
F: (02) 9687 6670

REV	DATE	REVISION	BY	CHKD	APPR'D
01	10/02/15	TELEMETRY DETAIL ADDED	EL	JPG	EDG
00	09/02/15	ORIGINAL DRAFT	EL	JPG	EDG

DESIGNED BY
JG

DRAWN BY
JG/EL

SCALE
NTS

JOB NO.
J1430

DATE
09/02/15

SHEET SIZE
A3

CLIENT/PROJECT:
**WestConnex Delivery Authority
St Peters Interchange
Alexandria Landfill Leachate Systems**

TITLE:
**DRAFT PROCESS FLOW
DIAGRAM**

This drawing is the property of JPG Engineering and must not be copied, reproduced or used in whole or part without written permission of JPG Engineering

DRAWING No:
AL - LS01

SHT No.
1 of 1

ISSUE:
01

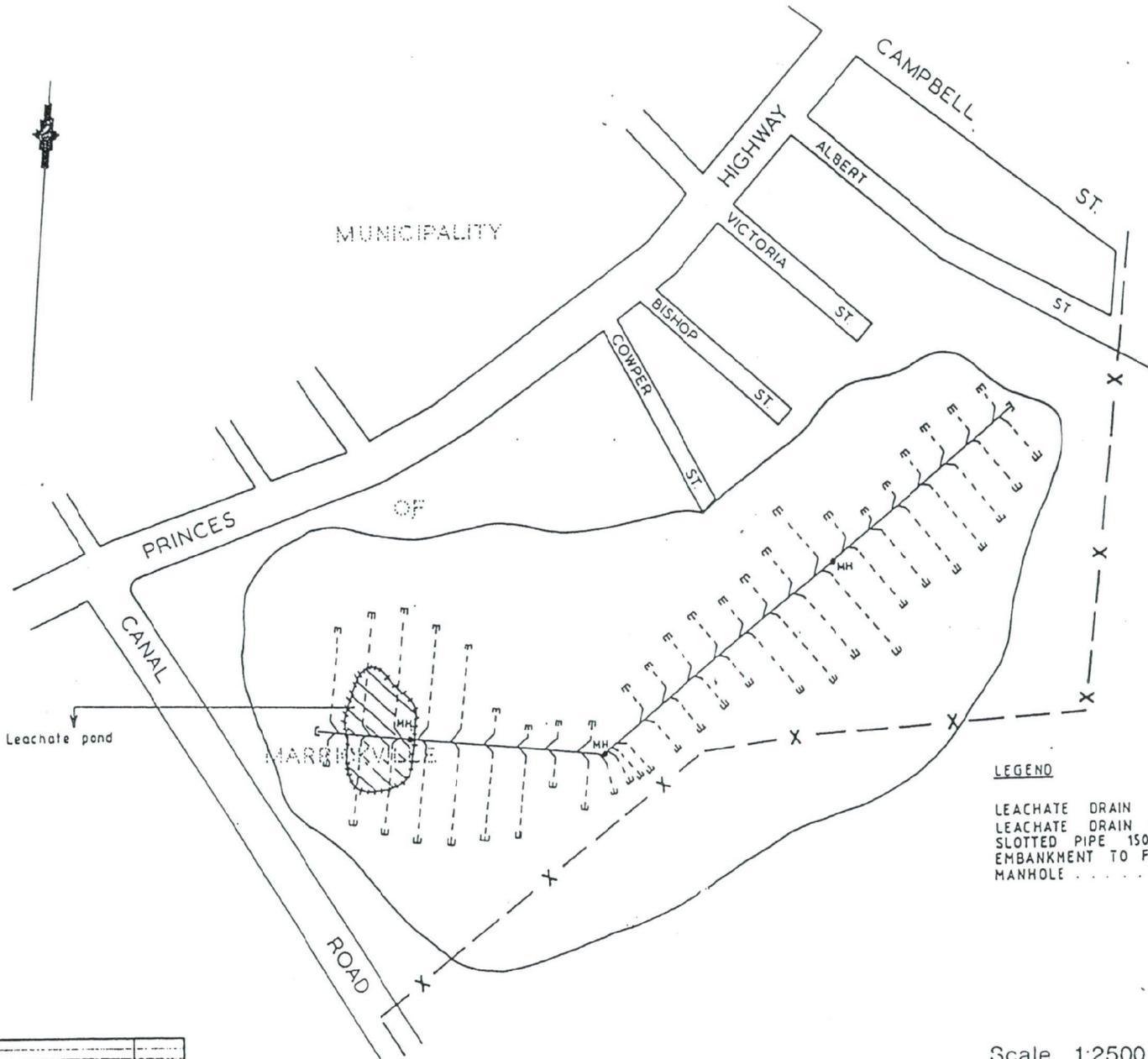
Appendix B

Herringbone Leachate Drainage Design Plans



MUNICIPALITY

CITY
OF
SYDNEY



Leachate pond

MARSHVILLE

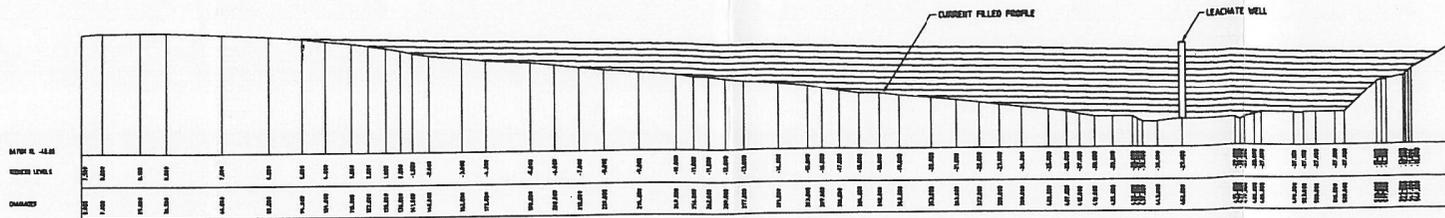
LEGEND

- LEACHATE DRAIN 375 Ø RCP
- LEACHATE DRAIN CORRUGATED PVC
- SLOTTED PIPE 150 Ø
- EMBANKMENT TO FORM POND
- MANHOLE

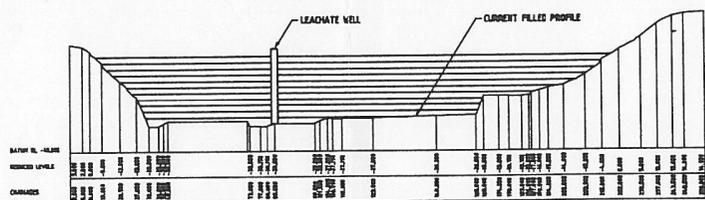
Scale 1:2500

WASTE SERVICE NSW	
ST PETERS LANDFILL	
LEACHATE COLLECTION SYSTEM	
(SOURCE: SYDNEY CITY COUNCIL)	
	FIGURE 3

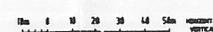
Leachate Sump Design Plans



SECTION A
CPI



SECTION B
CPI



REV.	DATE	DESCRIPTION	REV. NO.	P.D.

SCALE		
AS SHOWN		
QUALITY RECORD	PREPARED	CHECKED
DESIGN	S.P.	
DRAWING	D.J.M.	

CONSULTANT

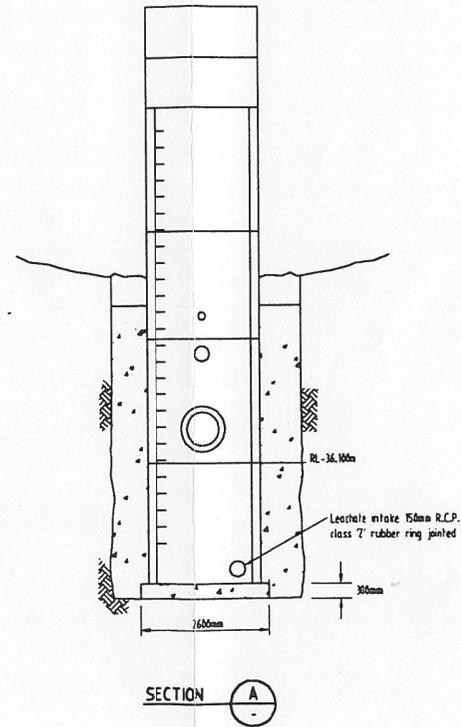
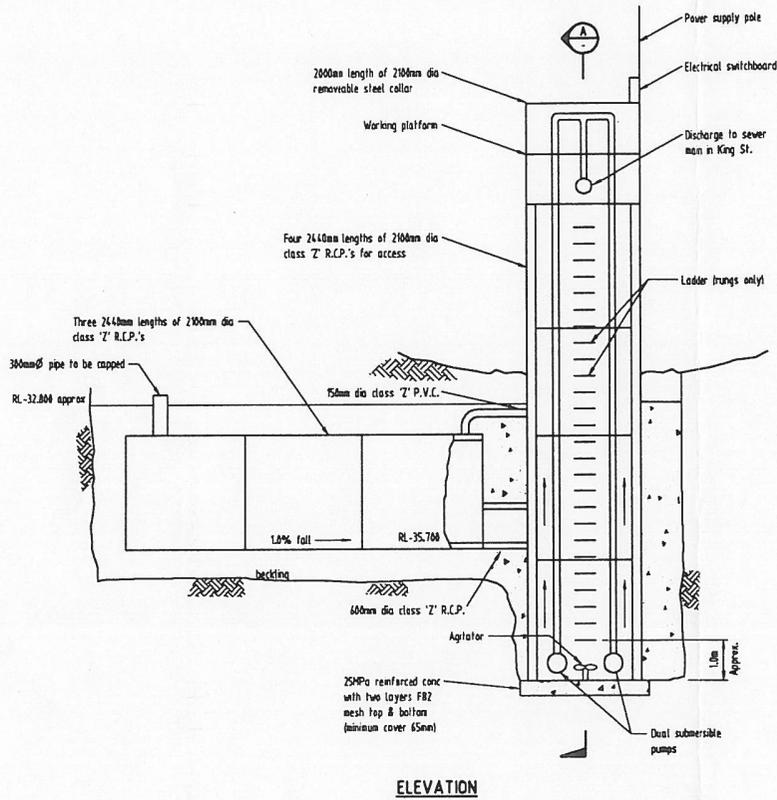
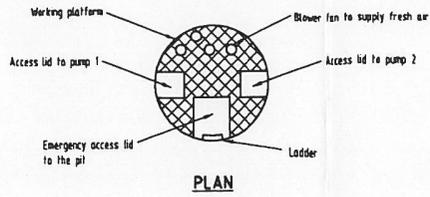
MAUNSELL PROPRIETARY LIMITED
A.C.N 064 846 834

APPROVED _____ DATE _____

CLIENT
SYDNEY CITY COUNCIL

PROJECT FILE		DATE OF ISSUE	
ST PETERS WASTE DISPOSAL		A1	
DRAWING FILE		DATE PLOTTED	
LONGITUDINAL SECTIONS			
DRG. NO.	36495/CP2	REV.	0
DRG. STATUS		CONCEPT	

© COPYRIGHT MAUNSELL PROPRIETARY LIMITED 2004 THIS DRAWING IS CONFIDENTIAL AND SHALL BE USED ONLY FOR THE PURPOSE OF THE PROJECT.



REV.	DATE	DESCRIPTION	WAR NO.	P.D.

SCALE	0.5m	1	1.5	2.0	2.5m
QUALITY RECORD	PREPARED	CHECKED			
DESIGN	S.P.				
DRAWING	D.M.				

CONSULTANT

MAUNSELL PROPRIETARY LIMITED

A.C.N 004 848 834

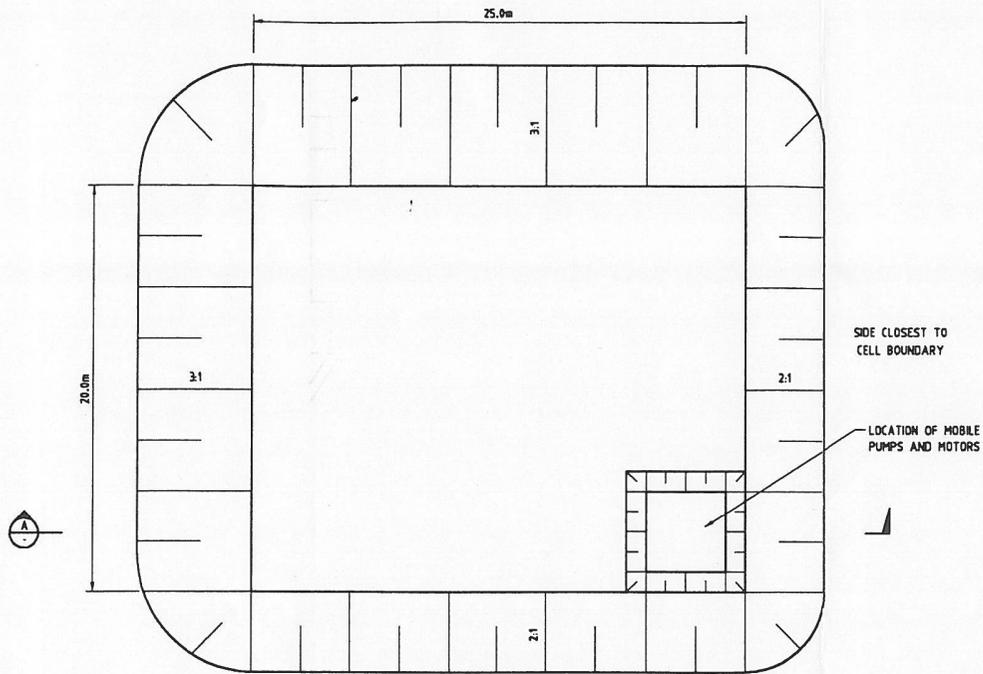
APPROVED _____ DATE _____

CLIENT

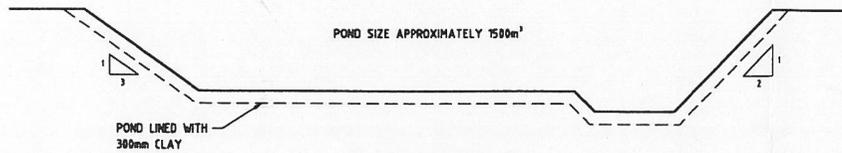
SYDNEY CITY COUNCIL

© COPYRIGHT MAUNSELL PROPRIETARY LIMITED 1994 THIS DRAWING IS CONFIDENTIAL AND SHALL BE USED ONLY FOR THE PURPOSE OF THE PROJECT

PROJECT TITLE	DATE OF ISSUE	SIZE
ST PETERS WASTE DISPOSAL		A1
DRAWING TITLE	DATE PLOTTED	
LEACHATE WELL DETAILS		
DWG NO.	REV.	
36495/CP3	0	
DWG STATUS		
CONCEPT		

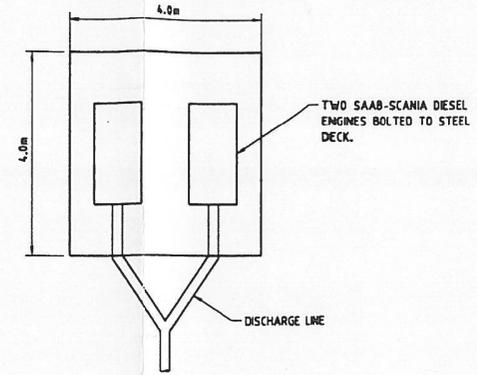


SIDE CLOSEST TO CLIFF
PLAN

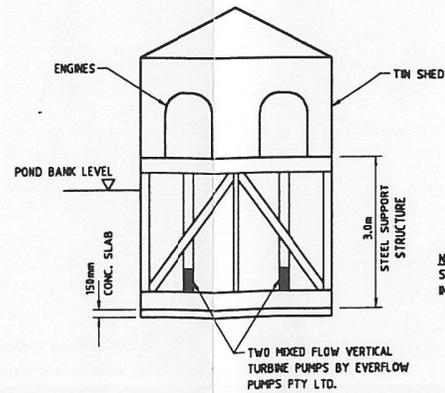


SECTION A

1.25m 0 1.25 2.5 3.75 5.0 6.25m HORIZONTAL
0.5M 0.0 0.5 1.0 1.5 2.0 2.5 VERTICAL



PLAN



ELEVATION

0.5m 0 0.5 1.0 1.5 2.0 2.5m

NOTE:
STRUCTURE TO BE READILY DEMOUNTABLE INTO COMPONENTS.

REV.	DATE	DESCRIPTION	WAR NO.	P.D.

SCALE AS SHOWN		
QUALITY RECORD	PREPARED	CHECKED
DESIGN	S.P.	
DRAWING	D.M.	

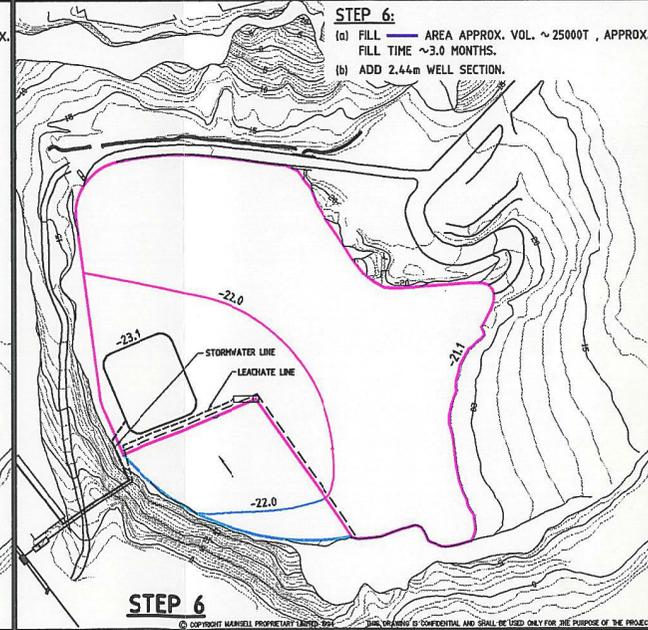
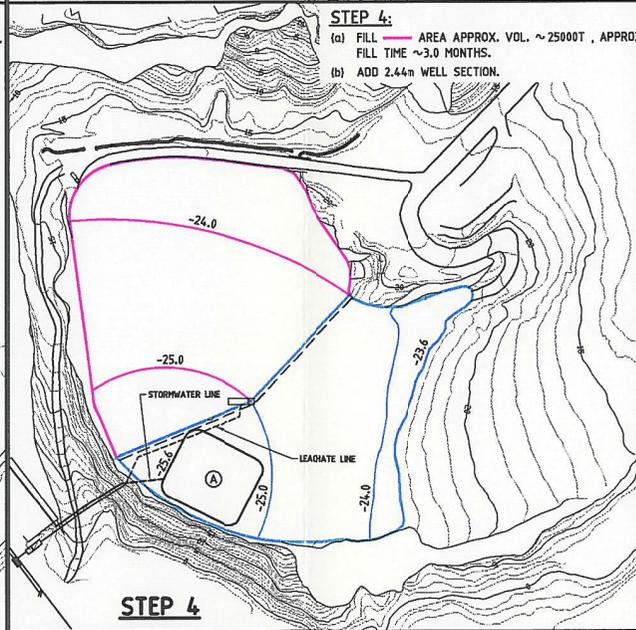
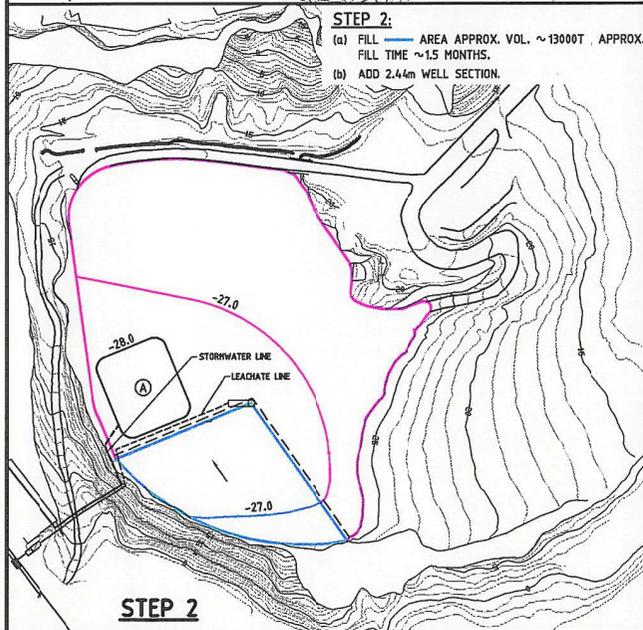
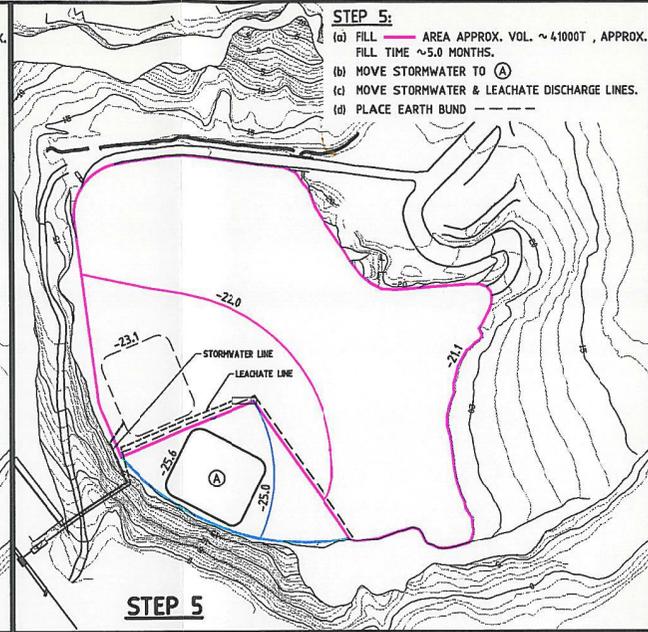
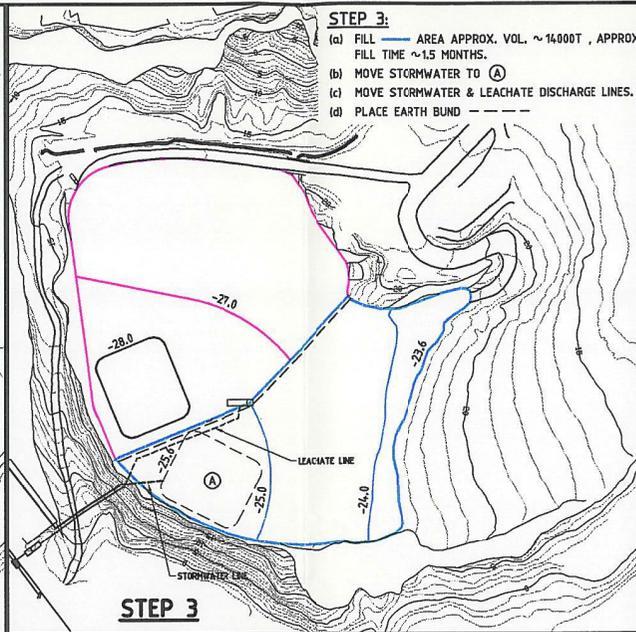
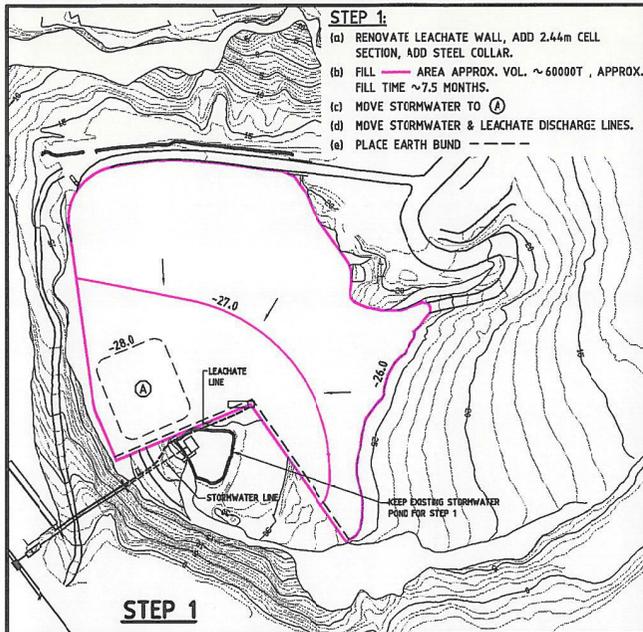
CONSULTANT
MAUNSELL PROPRIETARY LIMITED
A.C.N. 006 848 824

CLIENT
SYDNEY CITY COUNCIL

PROJECT FILE
ST PETERS WASTE DISPOSAL
DRAWING FILE
STORMWATER POND & PUMP DETAILS

DATE OF ISSUE	SIZE
	A1
CAD REFERENCE A\36495\CP4	DATE PLOTTED
DWG NO. 36495/CP4	REV 0
DWG STATUS	CONCEPT

© COPYRIGHT MAUNSELL PROPRIETARY LIMITED 1994 THIS DRAWING IS CONFIDENTIAL AND SHALL BE USED ONLY FOR THE PURPOSE OF THE PROJECT



REV.	DATE	DESCRIPTION	W/N	P/D.

NOTE:
FILL TIMES BASED ON ACCEPTANCE OF '00000Tpa.
VOLUMES BASED ON A DENSITY OF 0.75T/m³

SCALE	10m 0 10 20 30 40 50m		
CONSULTANT	MAUNSELL PROPRIETARY LIMITED		
QUALITY RECORD	PREPARED	CHECKED	
DESIGN	S.P.		
DRAWING	D.J.L.		
THE APPROVAL SIGNATURE IS EVIDENCE THAT THE DESIGN AND DRAWING HAVE BEEN WORKED AS CONFORMING WITH THE REQUIREMENTS OF THE CLIENT BRIEF.			
APPROVED		DATE	

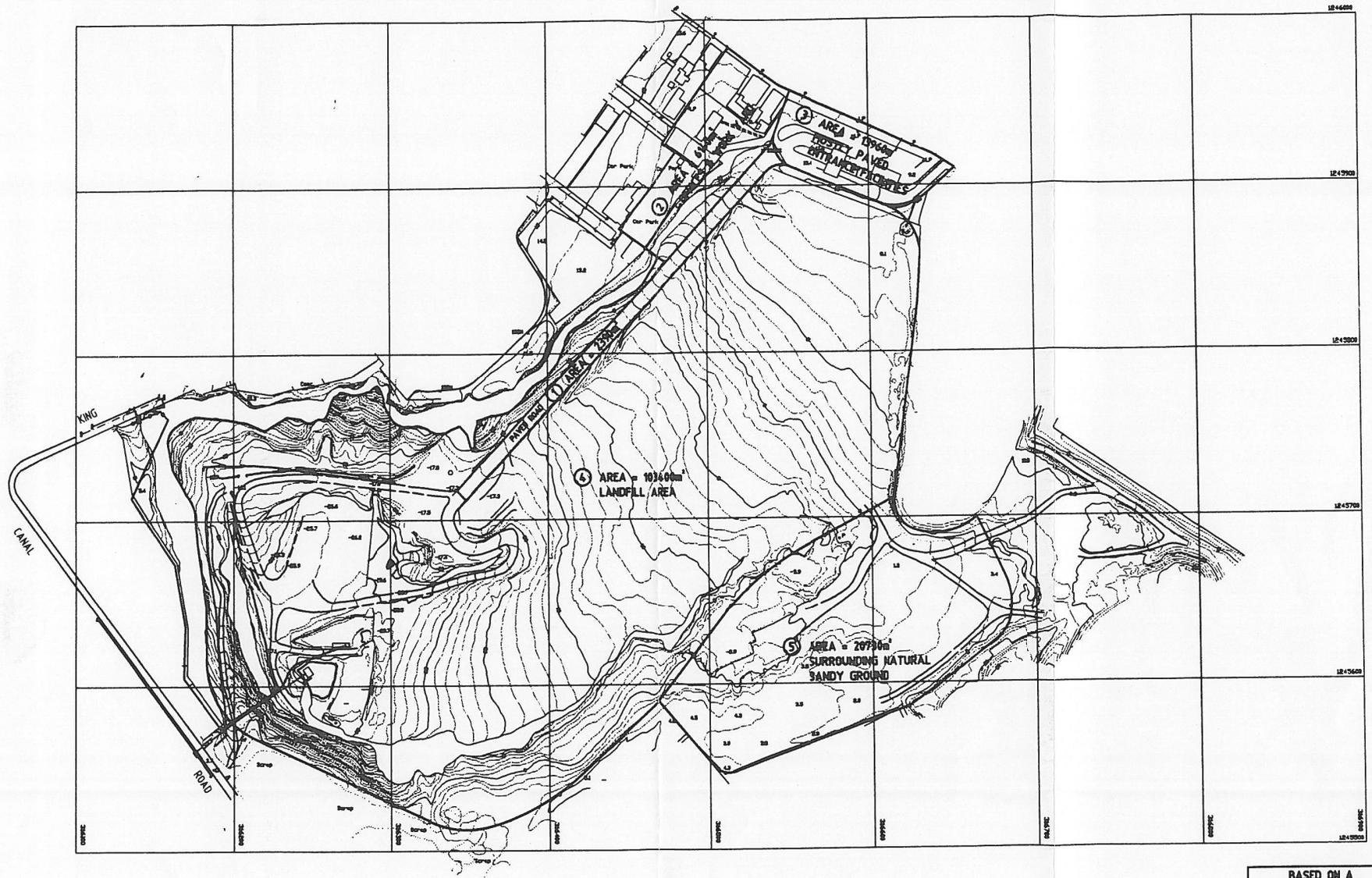
MAUNSELL PROPRIETARY LIMITED
A.C.N. 004 846 824

CLIENT
SYDNEY CITY COUNCIL

PROJECT TITLE
ST PETERS WASTE DISPOSAL DEPOT

DRAWING TITLE
INITIAL STAGING PLANS

DATE OF ISSUE		SIZE	A1
CAD REFERENCE	J:\36495\CP5	DATE PLOTTED	
DWG NO.	36495/CP5	REV.	0
DWG STATUS	CONCEPT		



BASED ON A
DRAWING SUPPLIED BY
GASCO PTY LTD

REV.	DATE	DESCRIPTION	PAGE NO.	TOTAL PAGES

DATE	1	2	3	4	5	6	7	8	9	10
QUALITY CHECKED										
DESIGNER CHECK										
PROJECT DIRECTOR APPROVAL										

MAINSIELL
PROPRIETARY
LIMITED



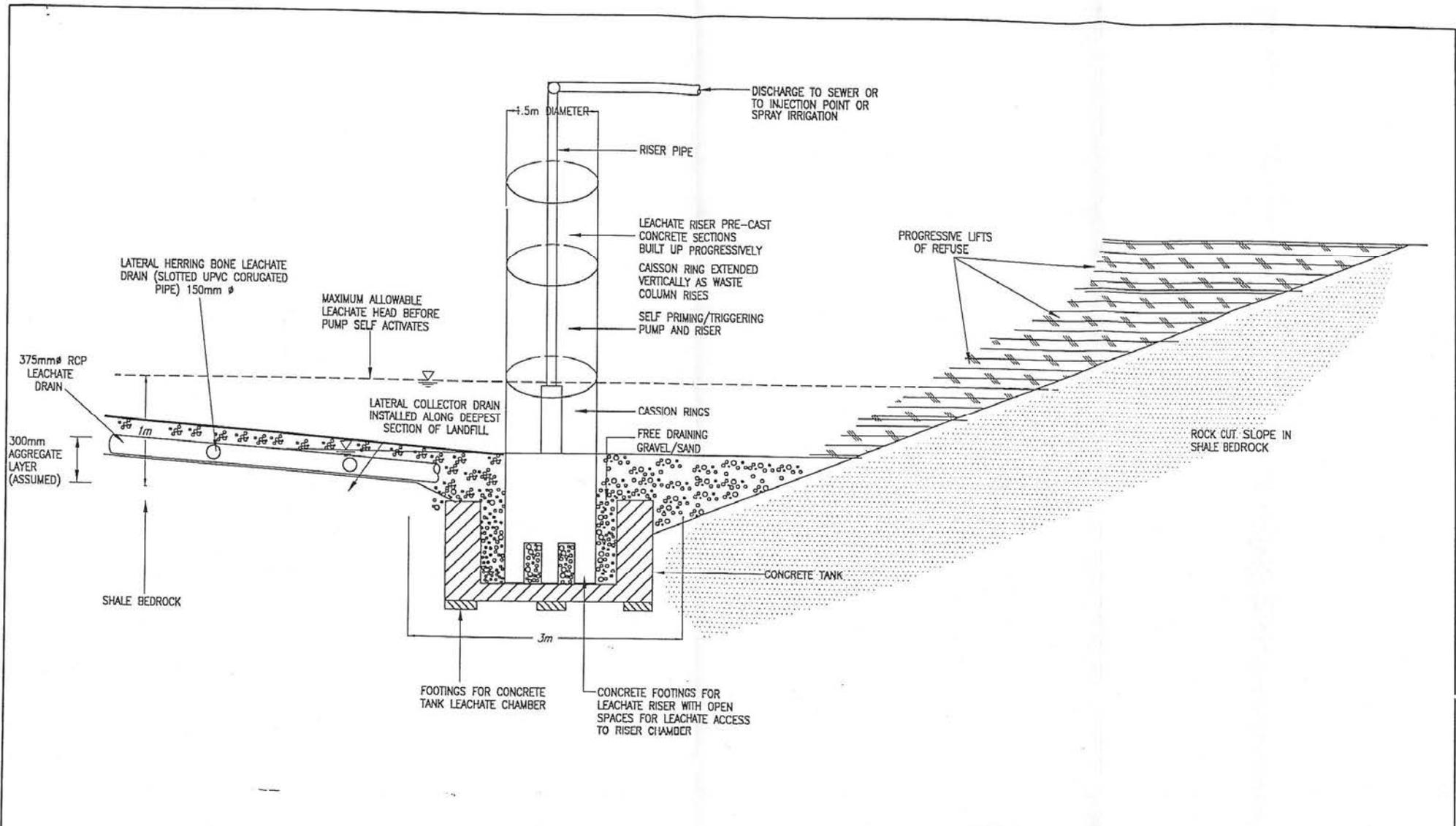
A.O.N. 004 046 034

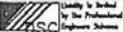
SYDNEY CITY COUNCIL

ST PETERS WASTE DISPOSAL DEPOT
HYDROLOGIC AREAS

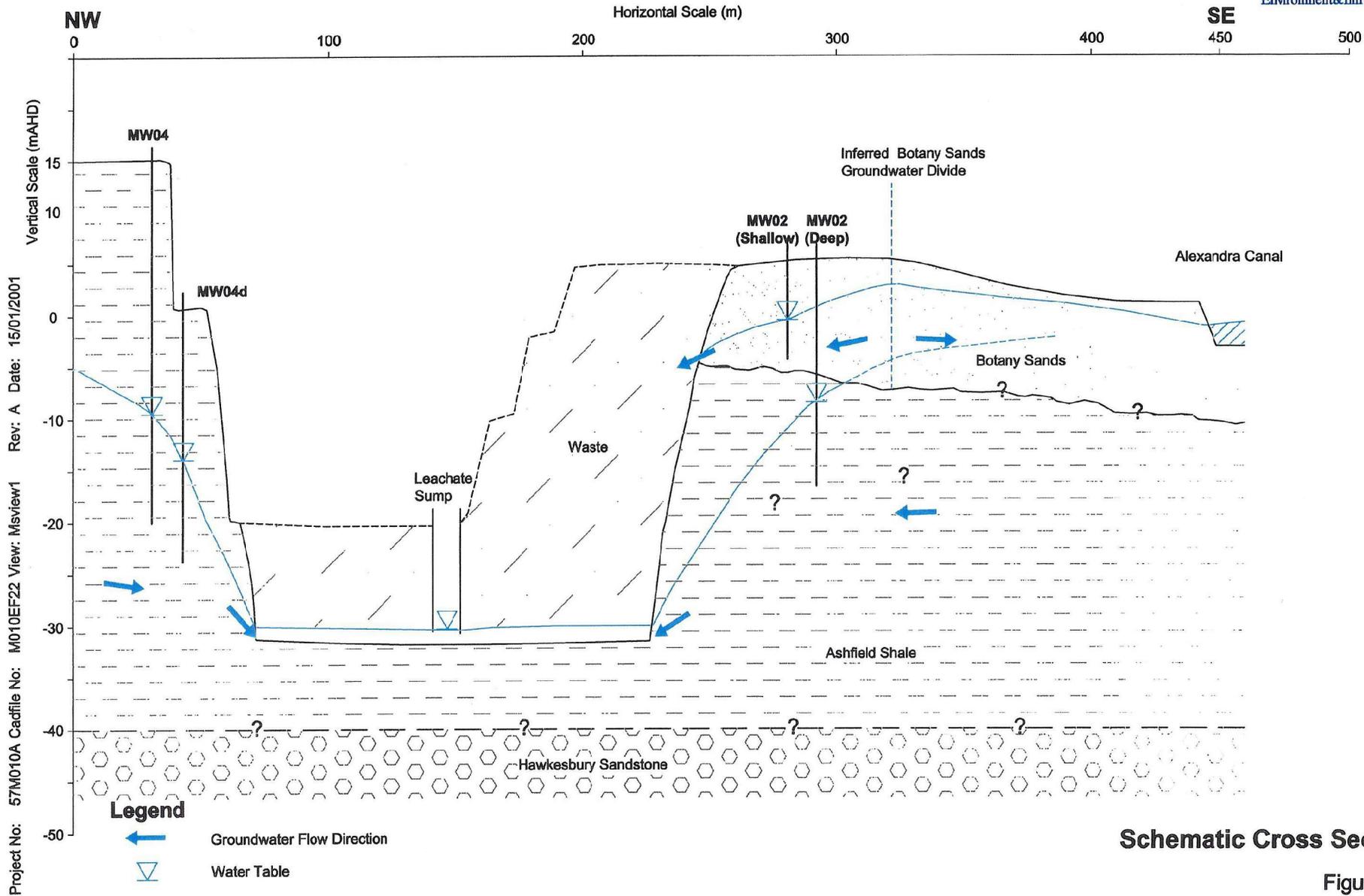
36495/CP6
CONCEPT

COMPLETION OF THE QUALITY CHECK IS EVIDENCE THAT THE DESIGN AND DRAWING HAVE BEEN REVIEWED IN ACCORDANCE WITH THE REQUIREMENTS OF THE CLIENT'S SPECIFICATION.



 Douglas Partners Geotechnics, Environmental, Groundwater		Sydney, Newcastle, Brisbane, Melbourne, Perth, Darwin, Wyoong, Singleton, Campbelltown, Townsville, Cairns, Wollongong	
		<small>Liability is limited by the Professional Engineers Scheme</small> 	
TITLE: Schematic Representation of Leachate Collection Landfill Environmental Management Plan ST PETERS WASTE MANAGEMENT FACILITY			
CLIENT: City of Sydney Council			
DRAWN BY: PSCH	SCALE: N.T.S.	PROJECT No: 28233A	OFFICE: SYDNEY
APPROVED BY: 	DATE: 22.3.2000	DRAWING No: 4	

Client: Council of the City of Sydney
 Project: St Peters Waste Management Facility Environmental Monitoring
 Location: St Peters, Sydney



Schematic Cross Section

Figure 2.2

Appendix D

Stormwater/Surface Water Plans

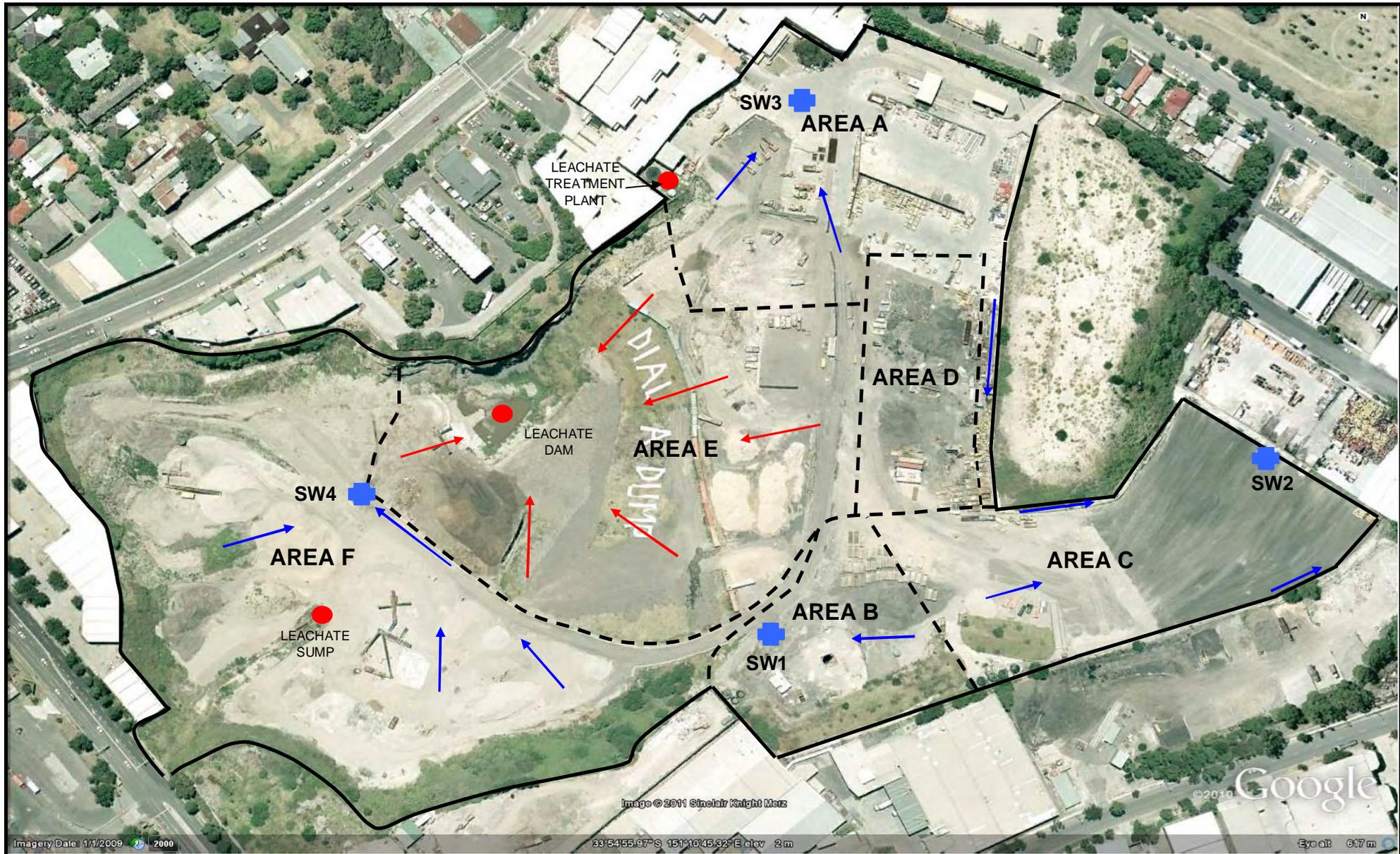


FIGURE 3 (REVISED): SITE WATER MANAGEMENT FEATURES REVISED MARCH 2012

Project: Alexandria Landfill Site Revised SWLMP, March 2012
 Location: Albert Street, St Peters, Sydney
 Client: DADI
 Project No: AJ01



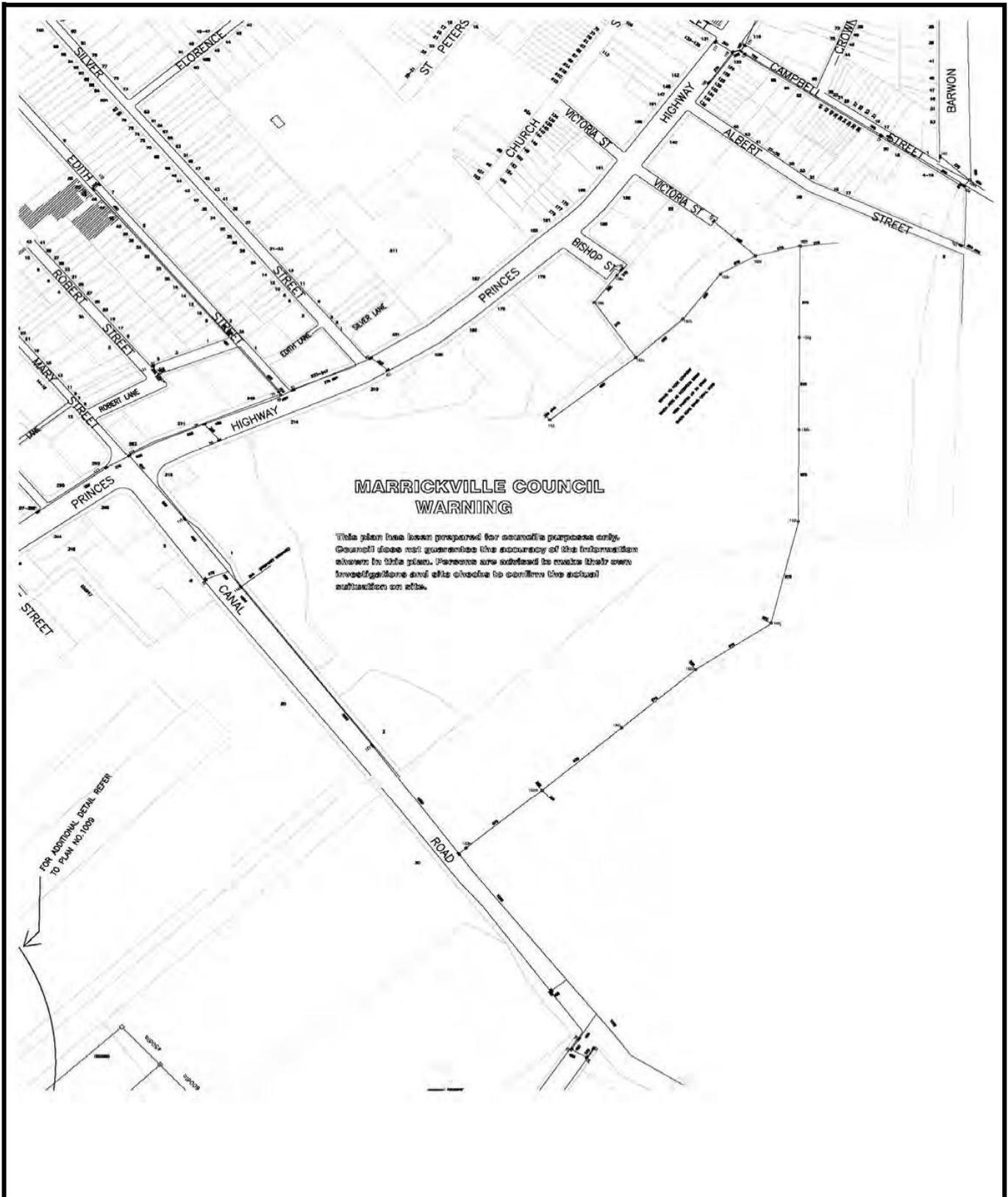


FIGURE 4: MARRICKVILLE COUNCIL STORMWATER NETWORK

Project: Alexandria Landfill Site, Revised SWLMP, March 2012
 Location: Albert Street, St Peters, Sydney
 Client: DADI
 Project No: AJ01



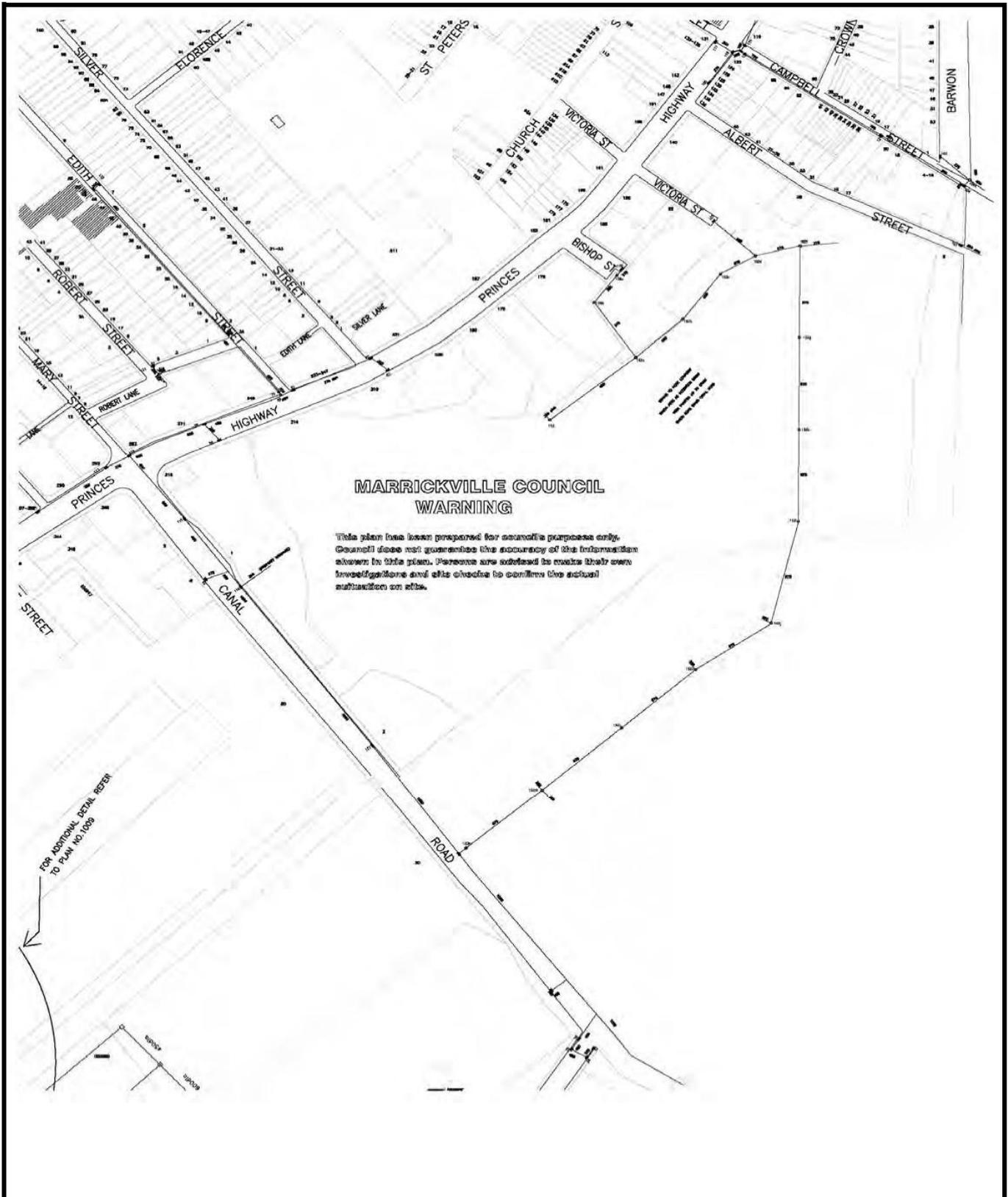


FIGURE 4: MARRICKVILLE COUNCIL STORMWATER NETWORK

Project: Alexandria Landfill Site, Revised SWLMP, March 2012
 Location: Albert Street, St Peters, Sydney
 Client: DADI
 Project No: AJ01



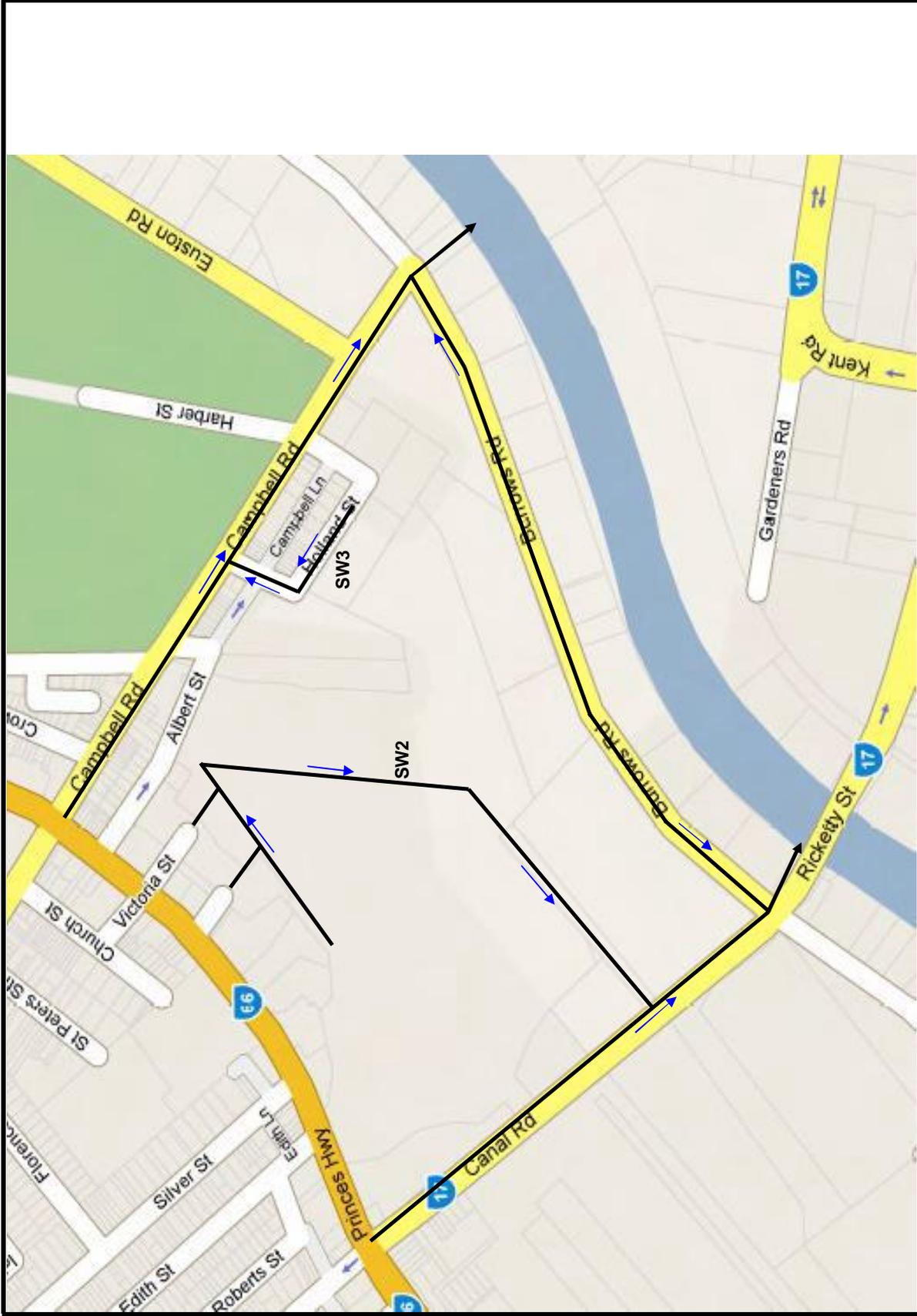


FIGURE 5: OFF-SITE STORMWATER NETWORK

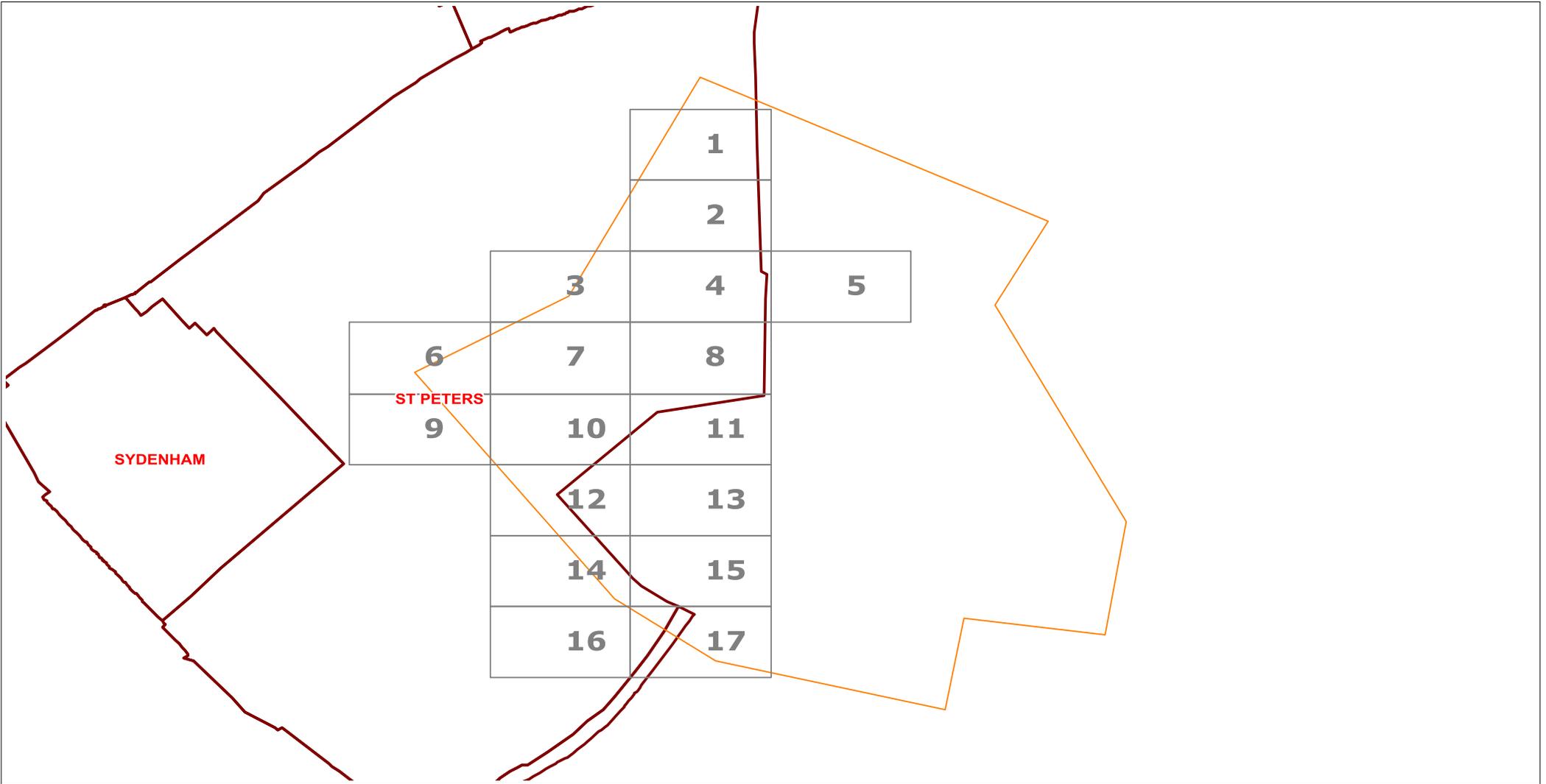
Project: Alexandria Landfill Site, Revised SWLMP, March 2012

Location: Albert Street, St Peters, Sydney

Client: DADI

Project No: AJ01



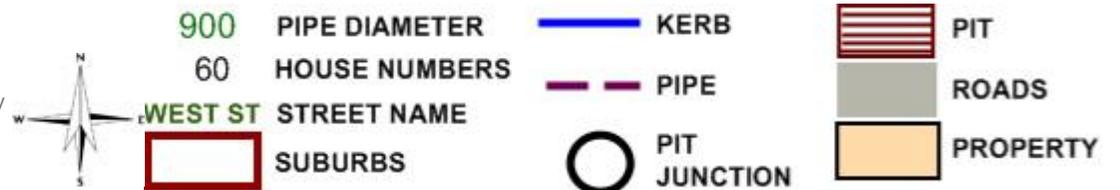


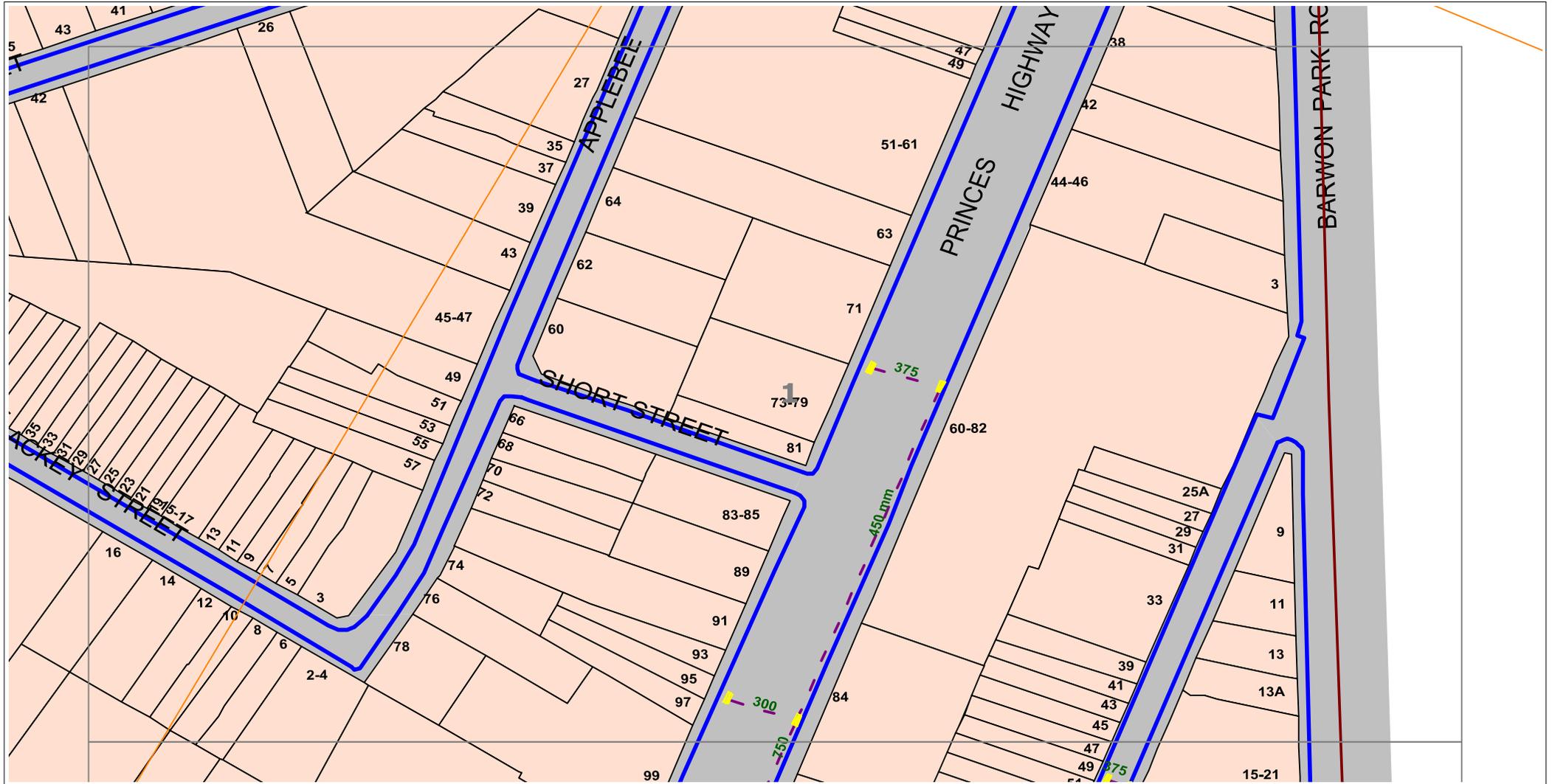
Create Date: 15/07/2014

Scale: 1:1000

DISCLAIMER: This map has been prepared from various sources and the publisher and/or contributors accept no responsibility for any injury, loss or damage arising from its use or errors or omissions therein.

WARNING: This plan has been prepared for Council's Purposes only. Council does not guarantee the accuracy of the information shown in this plan. Persons are advised to make their own investigations and site checks to confirm the actual situation on site.



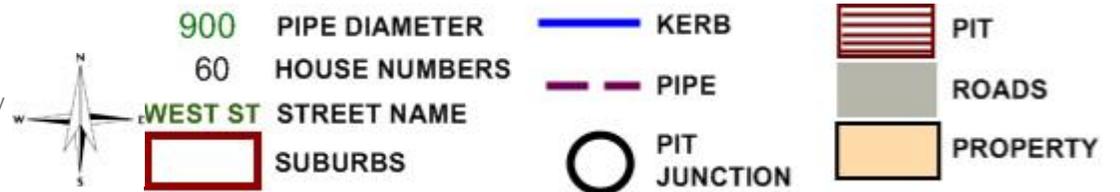


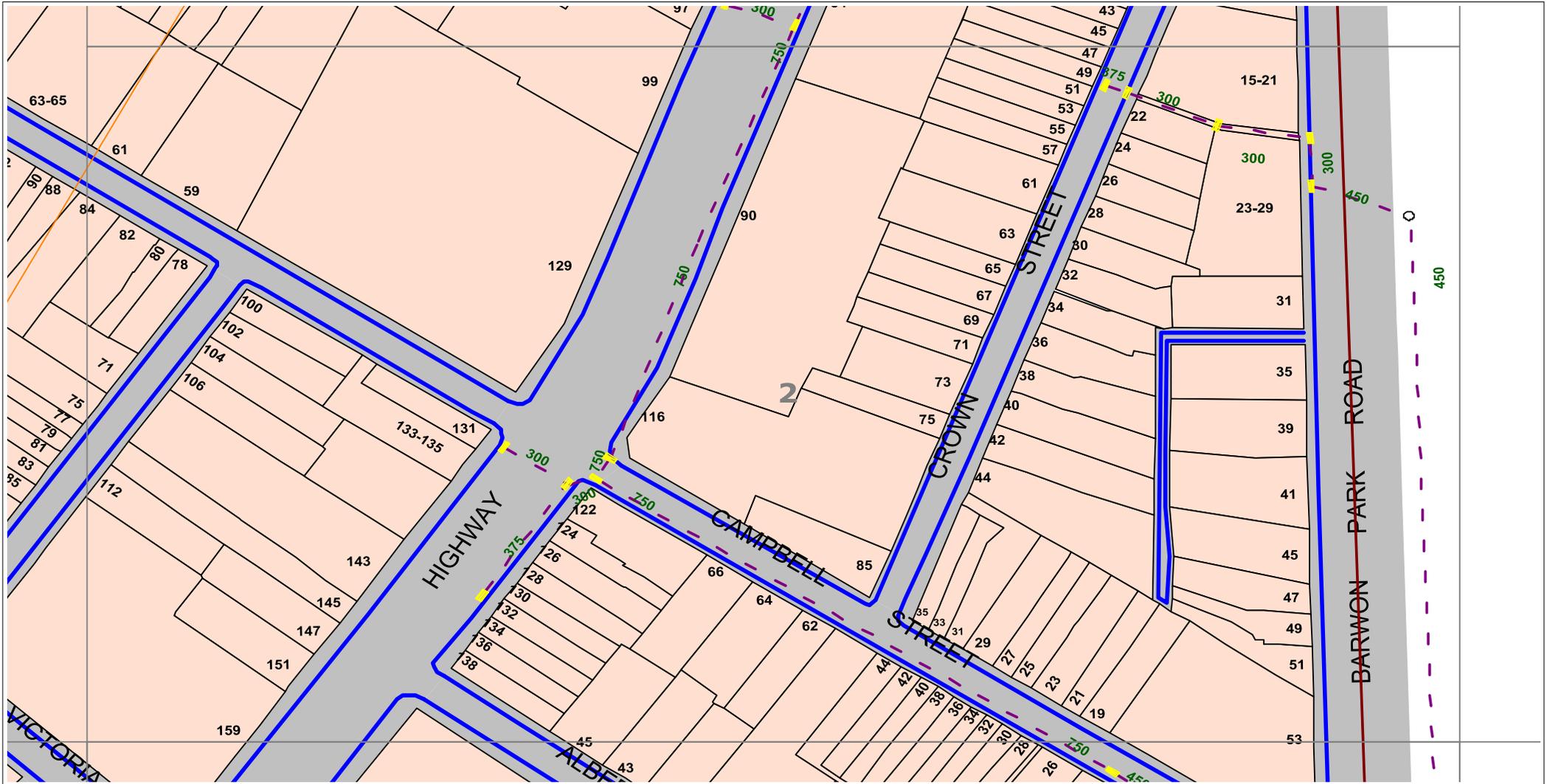
Create Date: 15/07/2014

Scale 1:1000

DISCLAIMER: This map has been prepared from various sources and the publisher and/or contributors accept no responsibility for any injury, loss or damage arising from its use or errors or omissions therein.

WARNING: This plan has been prepared for Council's Purposes only. Council does not guarantee the accuracy of the information shown in this plan. Persons are advised to make their own investigations and site checks to confirm the actual situation on site.



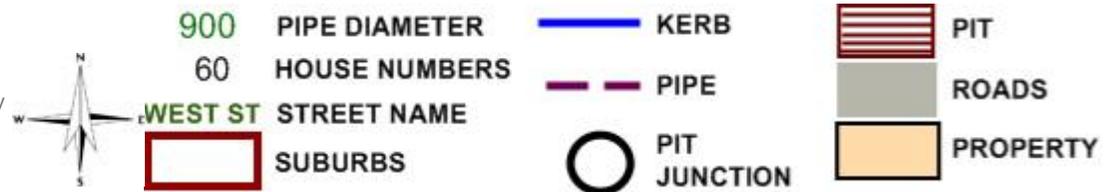


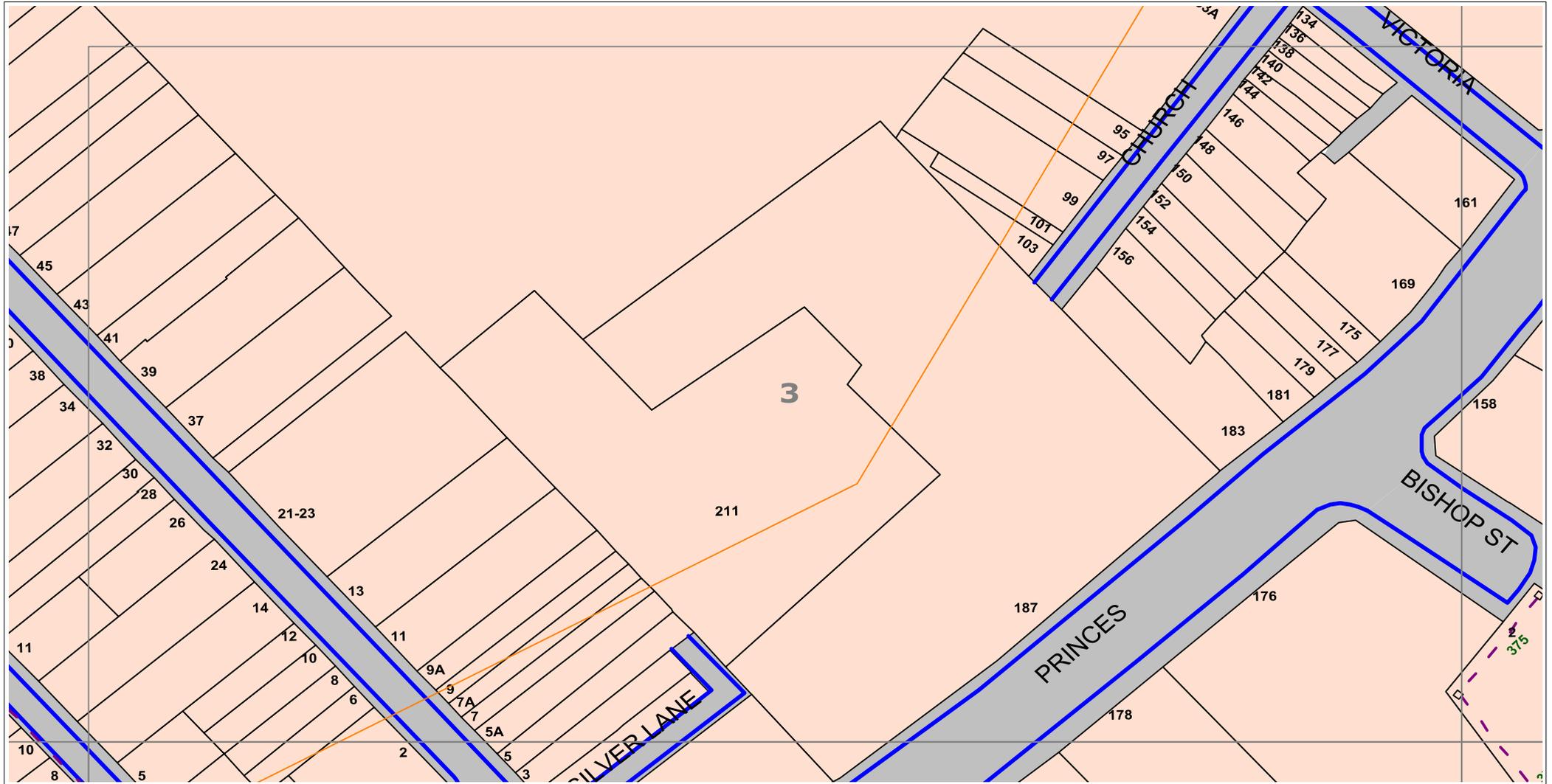
Create Date: 15/07/2014

Scale 1:1000

DISCLAIMER: This map has been prepared from various sources and the publisher and/or contributors accept no responsibility for any injury, loss or damage arising from its use or errors or omissions therein.

WARNING: This plan has been prepared for Council's Purposes only. Council does not guarantee the accuracy of the information shown in this plan. Persons are advised to make their own investigations and site checks to confirm the actual situation on site.





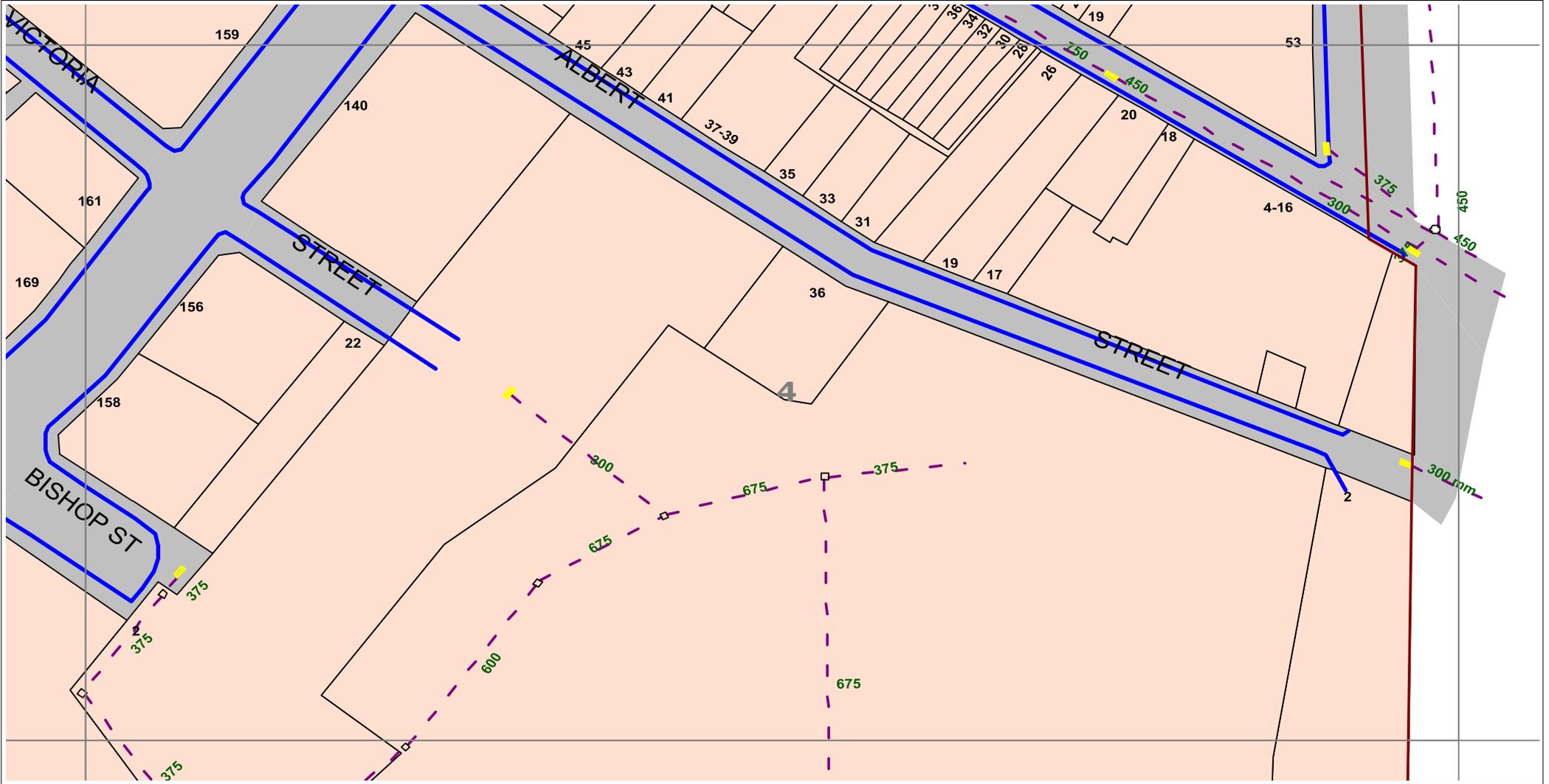
Create Date: 15/07/2014

Scale: 1:1000

DISCLAIMER: This map has been prepared from various sources and the publisher and/or contributors accept no responsibility for any injury, loss or damage arising from its use or errors or omissions therein.

WARNING: This plan has been prepared for Council's Purposes only. Council does not guarantee the accuracy of the information shown in this plan. Persons are advised to make their own investigations and site checks to confirm the actual situation on site.

	<p>900 PIPE DIAMETER</p> <p>60 HOUSE NUMBERS</p> <p>WEST ST STREET NAME</p> <p> SUBURBS</p>	<p> KERB</p> <p> PIPE</p> <p> PIT JUNCTION</p>	<p> PIT</p> <p> ROADS</p> <p> PROPERTY</p>
---	---	---	---



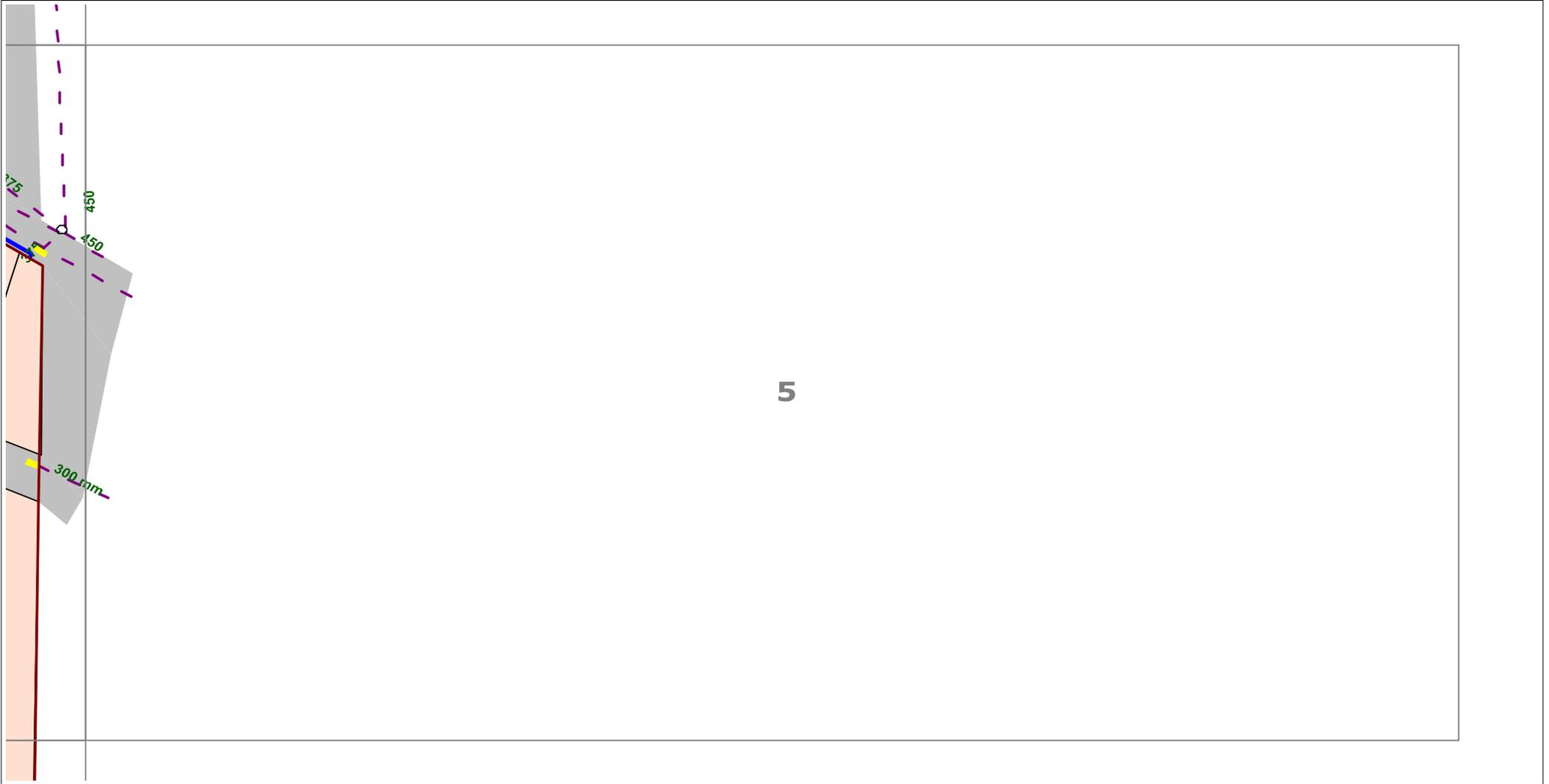
Create Date: 15/07/2014

Scale: 1:1000

DISCLAIMER: This map has been prepared from various sources and the publisher and/or contributors accept no responsibility for any injury, loss or damage arising from its use or errors or omissions therein.

WARNING: This plan has been prepared for Council's Purposes only. Council does not guarantee the accuracy of the information shown in this plan. Persons are advised to make their own investigations and site checks to confirm the actual situation on site.

	<p>900 PIPE DIAMETER</p> <p>60 HOUSE NUMBERS</p> <p>WEST ST STREET NAME</p> <p> SUBURBS</p>	<p> KERB</p> <p> PIPE</p> <p> PIT JUNCTION</p>	<p> PIT</p> <p> ROADS</p> <p> PROPERTY</p>
---	---	---	---



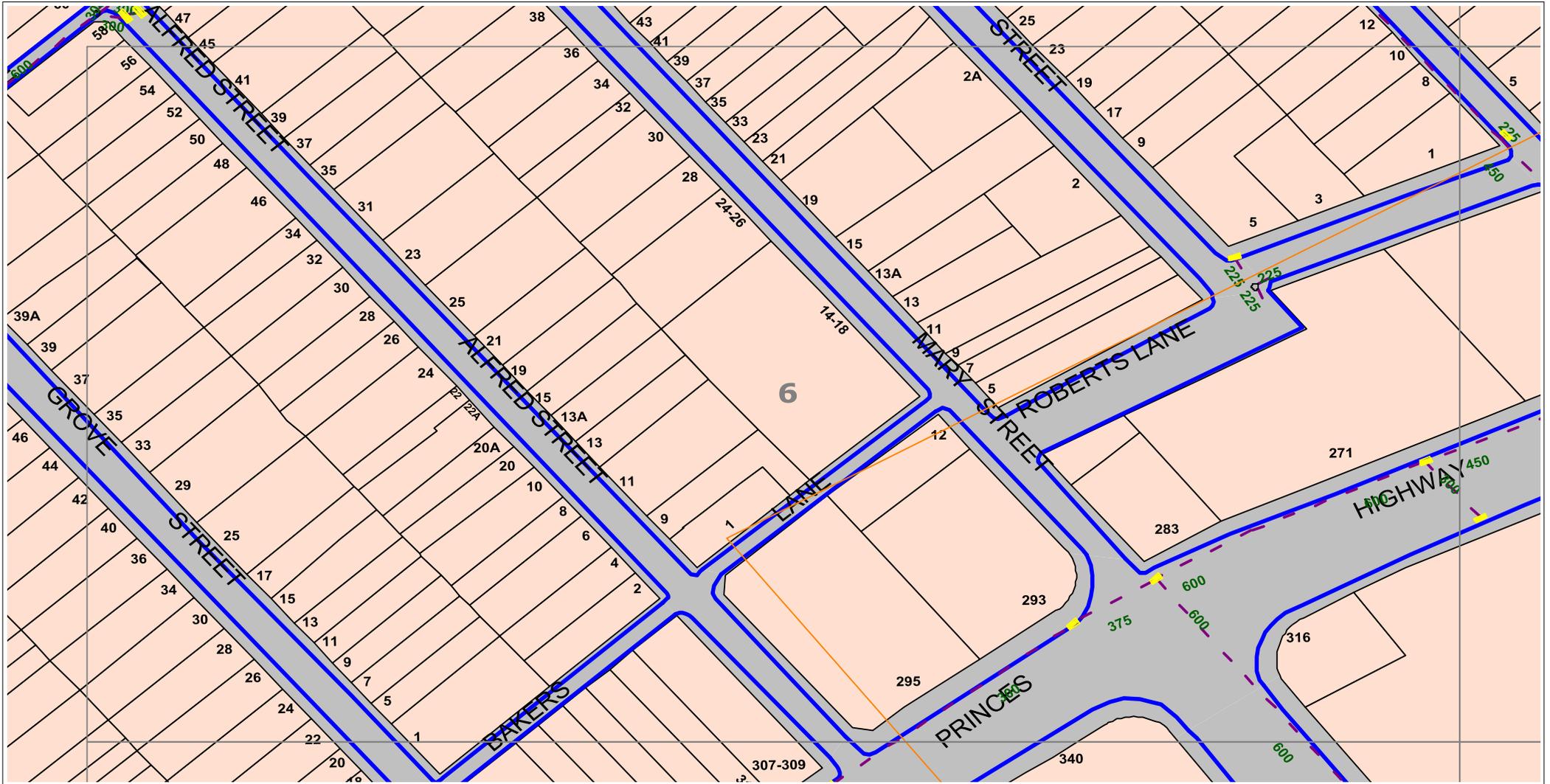
Create Date: 15/07/2014

Scale: 1:1000

DISCLAIMER: This map has been prepared from various sources and the publisher and/or contributors accept no responsibility for any injury, loss or damage arising from its use or errors or omissions therein.

WARNING: This plan has been prepared for Council's Purposes only. Council does not guarantee the accuracy of the information shown in this plan. Persons are advised to make their own investigations and site checks to confirm the actual situation on site.

	900	PIPE DIAMETER	—	KERB	 PIT	
	60	HOUSE NUMBERS	---	PIPE		 ROADS  PROPERTY
	WEST ST	STREET NAME	○	PIT JUNCTION		
	SUBURBS					



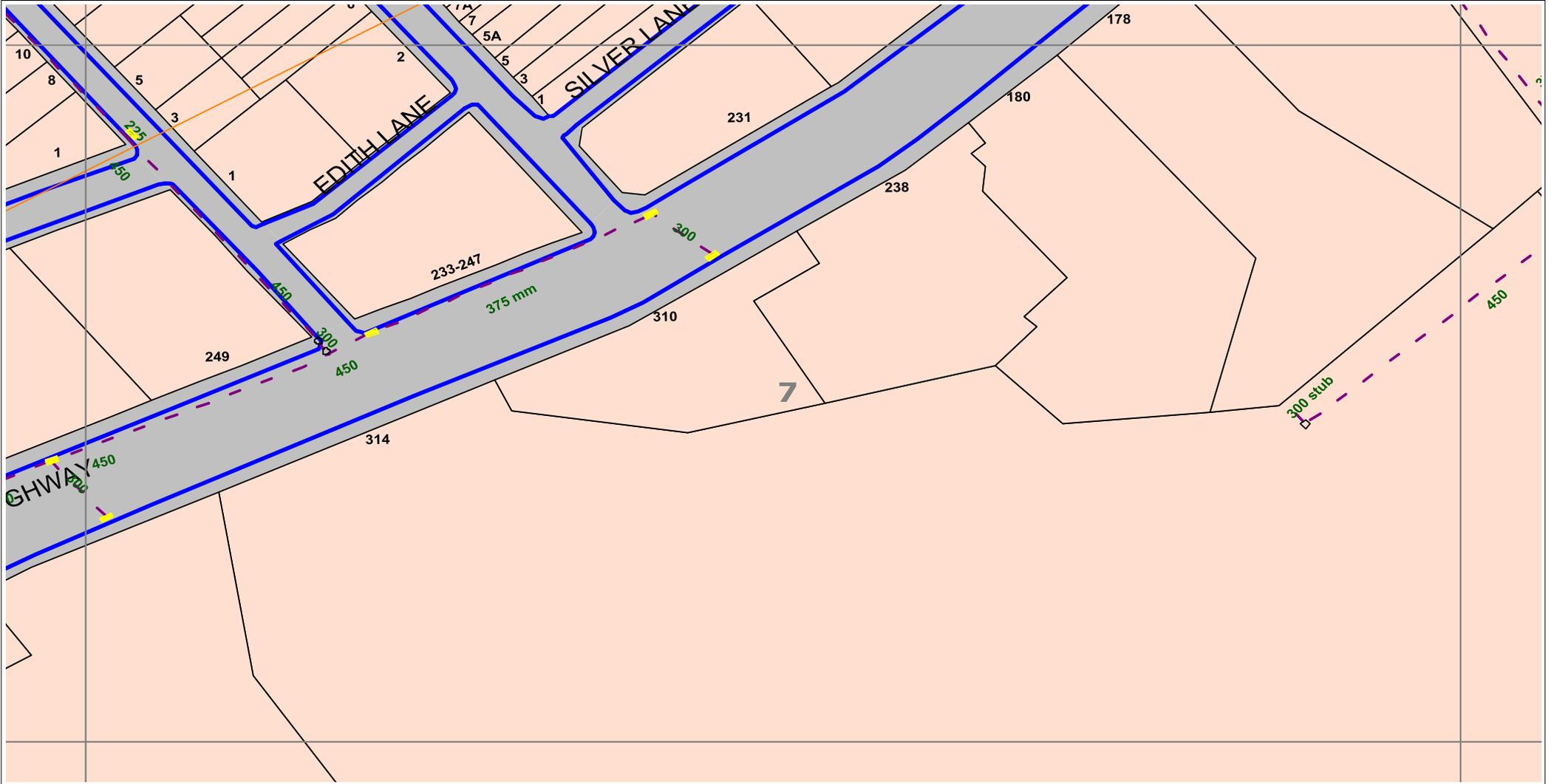
Create Date: 15/07/2014

Scale: 1:1000

DISCLAIMER: This map has been prepared from various sources and the publisher and/or contributors accept no responsibility for any injury, loss or damage arising from its use or errors or omissions therein.

WARNING: This plan has been prepared for Council's Purposes only. Council does not guarantee the accuracy of the information shown in this plan. Persons are advised to make their own investigations and site checks to confirm the actual situation on site.

	<p>900 PIPE DIAMETER</p> <p>60 HOUSE NUMBERS</p> <p>WEST ST STREET NAME</p> <p>SUBURBS</p>	<p> KERB</p> <p> PIPE</p> <p> PIT JUNCTION</p>	<p> PIT</p> <p> ROADS</p> <p> PROPERTY</p>
---	--	---	---



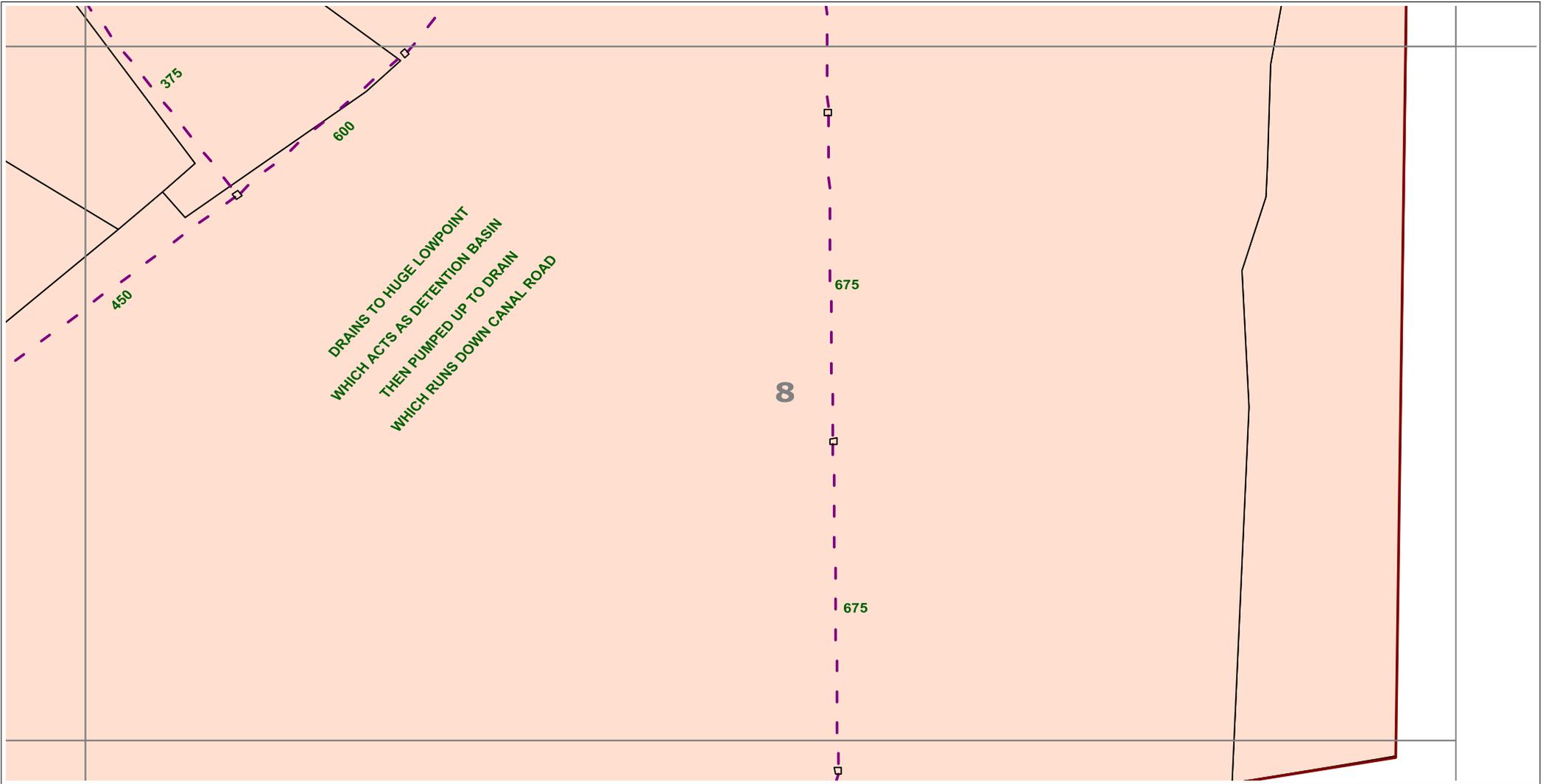
Create Date: 15/07/2014

Scale: 1:1000

DISCLAIMER: This map has been prepared from various sources and the publisher and/or contributors accept no responsibility for any injury, loss or damage arising from its use or errors or omissions therein.

WARNING: This plan has been prepared for Council's Purposes only. Council does not guarantee the accuracy of the information shown in this plan. Persons are advised to make their own investigations and site checks to confirm the actual situation on site.

	<p>900 PIPE DIAMETER</p> <p>60 HOUSE NUMBERS</p> <p>WEST ST STREET NAME</p> <p> SUBURBS</p>	<p> KERB</p> <p> PIPE</p> <p> PIT JUNCTION</p>	<p> PIT</p> <p> ROADS</p> <p> PROPERTY</p>
---	---	---	---



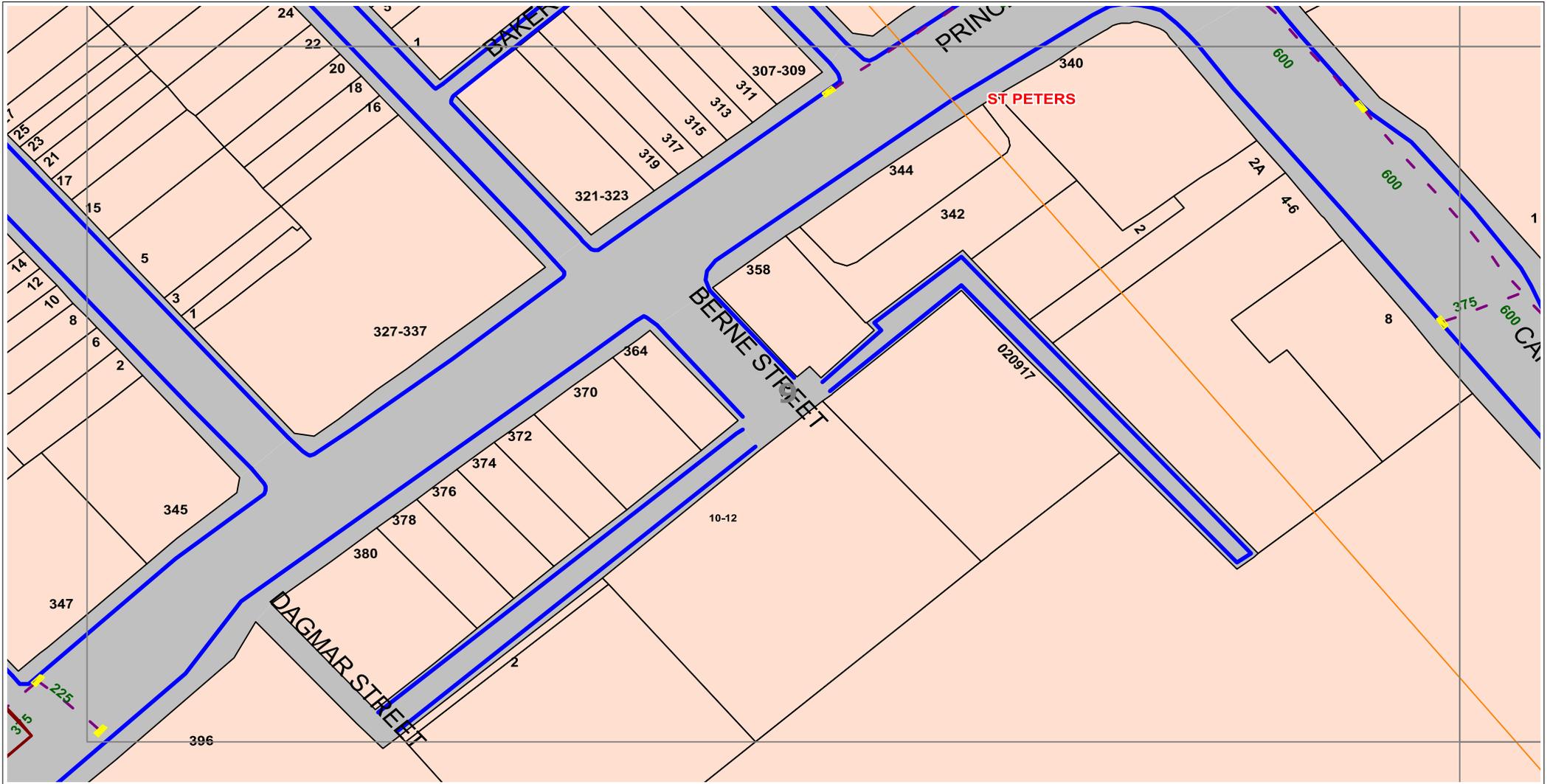
Create Date: 15/07/2014

Scale: 1:1000

DISCLAIMER: This map has been prepared from various sources and the publisher and/or contributors accept no responsibility for any injury, loss or damage arising from its use or errors or omissions therein.

WARNING: This plan has been prepared for Council's Purposes only. Council does not guarantee the accuracy of the information shown in this plan. Persons are advised to make their own investigations and site checks to confirm the actual situation on site.

	<p>900 PIPE DIAMETER</p> <p>60 HOUSE NUMBERS</p> <p>WEST ST STREET NAME</p> <p> SUBURBS</p>	<p> KERB</p> <p> PIPE</p> <p> PIT JUNCTION</p>	<p> PIT</p> <p> ROADS</p> <p> PROPERTY</p>
---	---	---	---

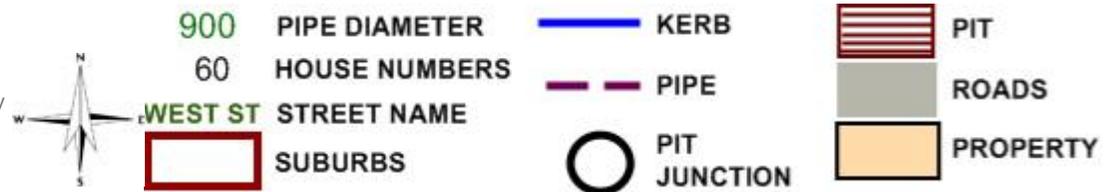


Create Date: 15/07/2014

Scale: 1:1000

DISCLAIMER: This map has been prepared from various sources and the publisher and/or contributors accept no responsibility for any injury, loss or damage arising from its use or errors or omissions therein.

WARNING: This plan has been prepared for Council's Purposes only. Council does not guarantee the accuracy of the information shown in this plan. Persons are advised to make their own investigations and site checks to confirm the actual situation on site.



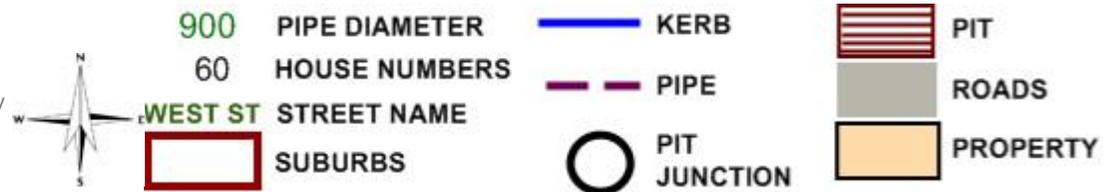


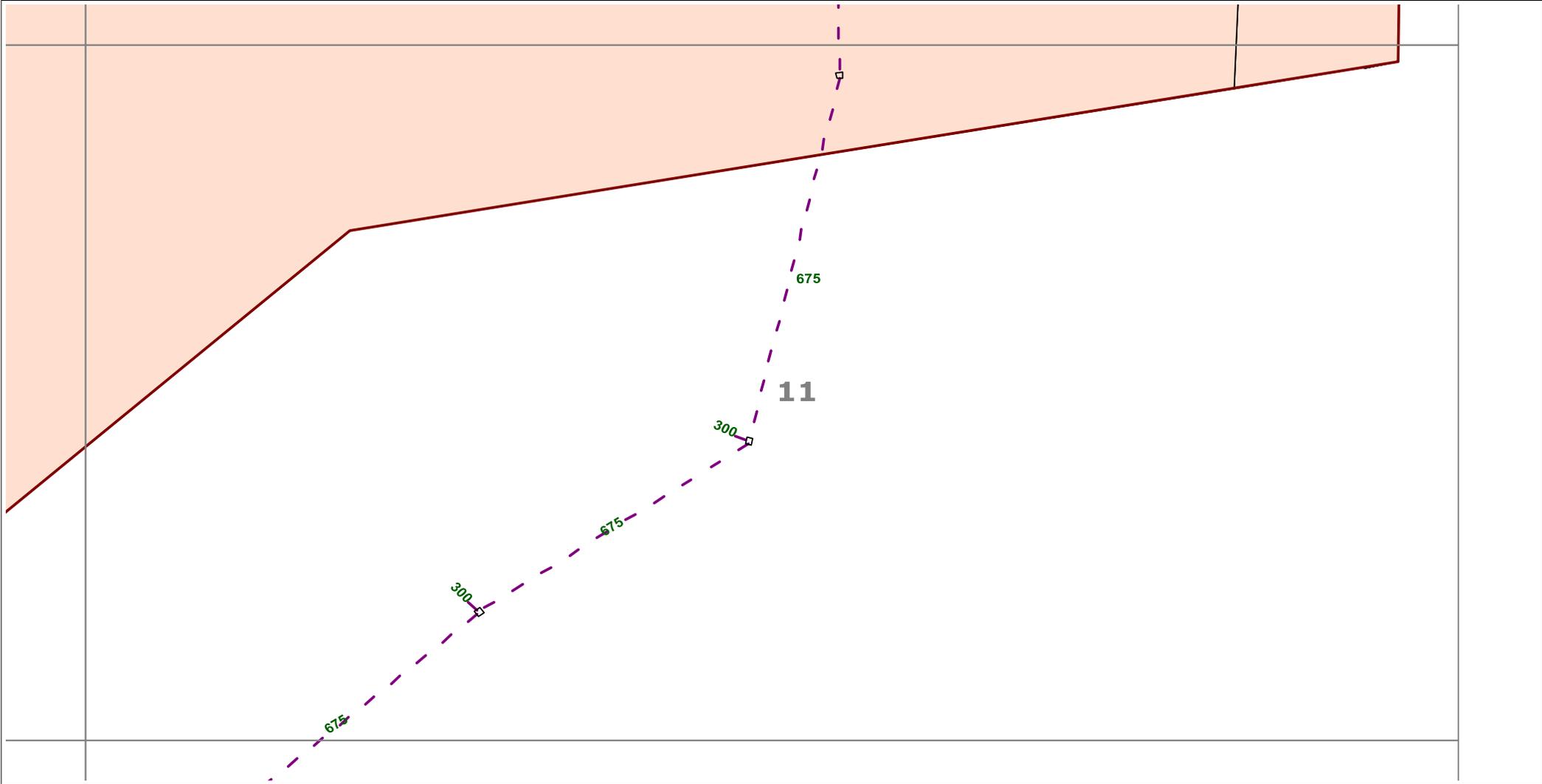
Create Date: 15/07/2014

Scale: 1:1000

DISCLAIMER: This map has been prepared from various sources and the publisher and/or contributors accept no responsibility for any injury, loss or damage arising from its use or errors or omissions therein.

WARNING: This plan has been prepared for Council's Purposes only. Council does not guarantee the accuracy of the information shown in this plan. Persons are advised to make their own investigations and site checks to confirm the actual situation on site.





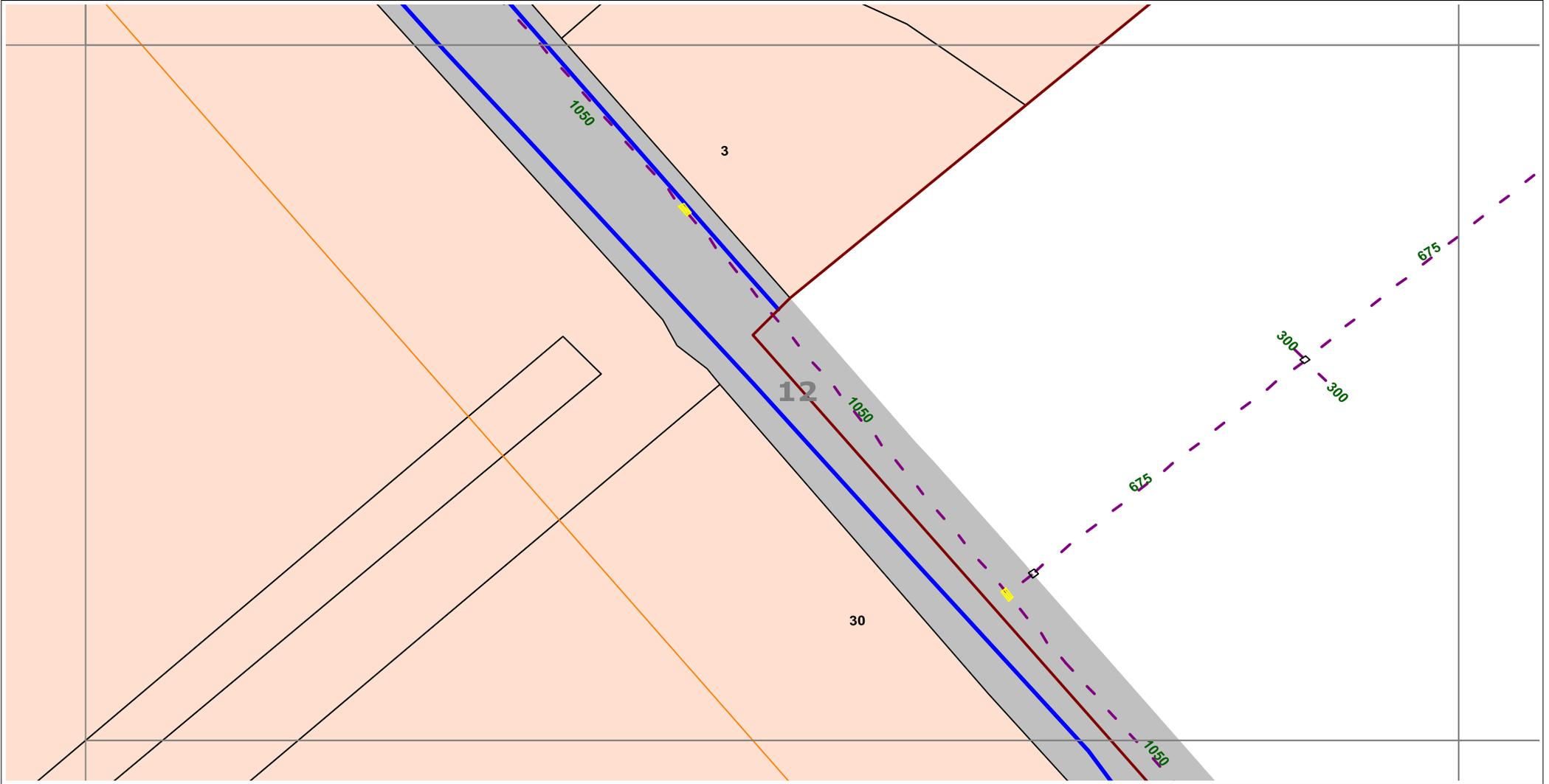
Create Date: 15/07/2014

Scale: 1:1000

DISCLAIMER: This map has been prepared from various sources and the publisher and/or contributors accept no responsibility for any injury, loss or damage arising from its use or errors or omissions therein.

WARNING: This plan has been prepared for Council's Purposes only. Council does not guarantee the accuracy of the information shown in this plan. Persons are advised to make their own investigations and site checks to confirm the actual situation on site.

	<p>900 PIPE DIAMETER</p> <p>60 HOUSE NUMBERS</p> <p>WEST ST STREET NAME</p> <p> SUBURBS</p>	<p> KERB</p> <p> PIPE</p> <p> PIT JUNCTION</p>	<p> PIT</p> <p> ROADS</p> <p> PROPERTY</p>
---	---	---	--



Create Date: 15/07/2014

Scale: 1:1000

DISCLAIMER: This map has been prepared from various sources and the publisher and/or contributors accept no responsibility for any injury, loss or damage arising from its use or errors or omissions therein.

WARNING: This plan has been prepared for Council's Purposes only. Council does not guarantee the accuracy of the information shown in this plan. Persons are advised to make their own investigations and site checks to confirm the actual situation on site.

	<p>900 PIPE DIAMETER</p> <p>60 HOUSE NUMBERS</p> <p>WEST ST STREET NAME</p> <p> SUBURBS</p>	<p> KERB</p> <p> PIPE</p> <p> PIT JUNCTION</p>	<p> PIT</p> <p> ROADS</p> <p> PROPERTY</p>
---	---	--	---



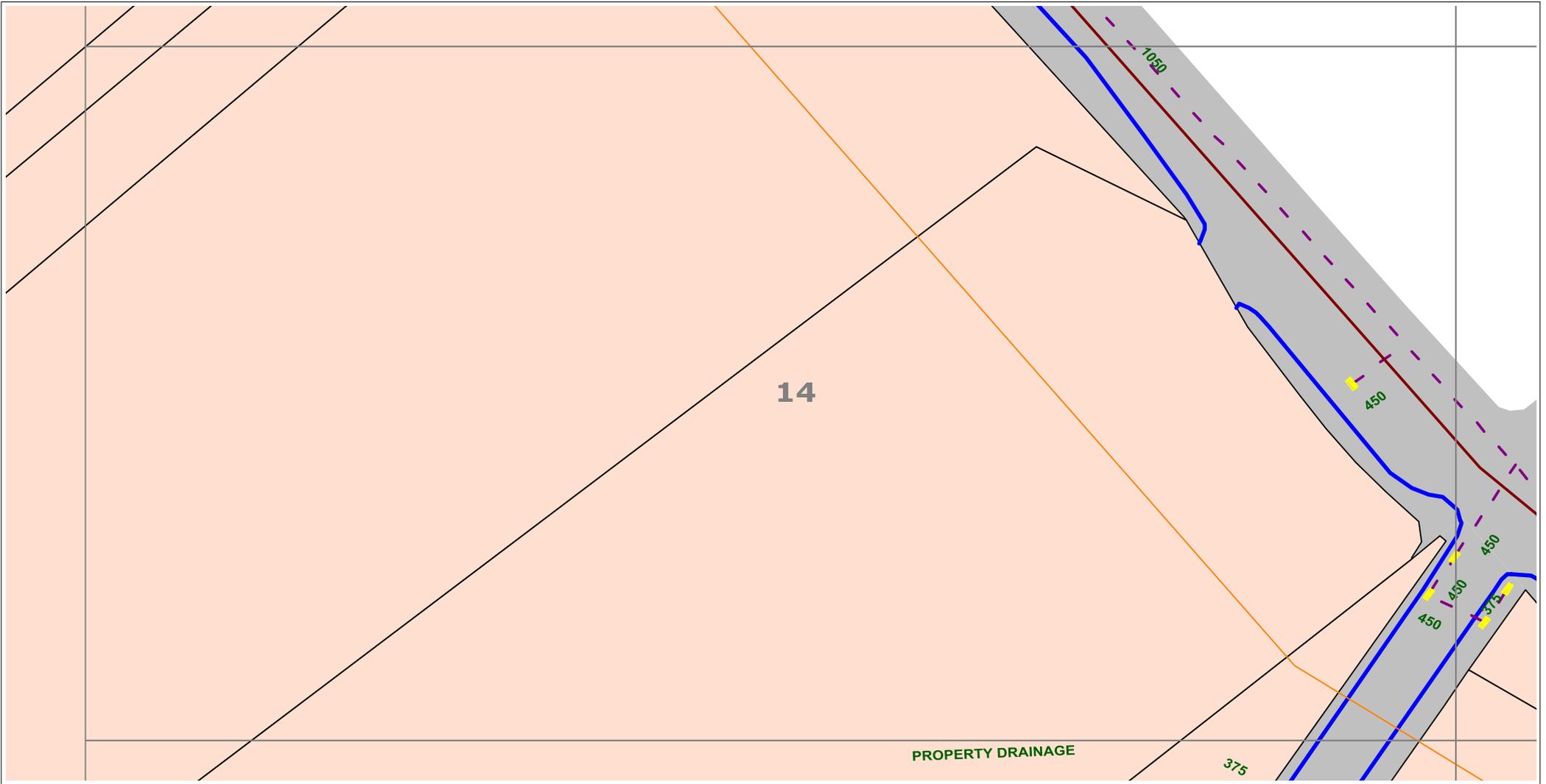
Create Date: 15/07/2014

Scale: 1:1000

DISCLAIMER: This map has been prepared from various sources and the publisher and/or contributors accept no responsibility for any injury, loss or damage arising from its use or errors or omissions therein.

WARNING: This plan has been prepared for Council's Purposes only. Council does not guarantee the accuracy of the information shown in this plan. Persons are advised to make their own investigations and site checks to confirm the actual situation on site.

	<p style="margin: 0;">900 PIPE DIAMETER</p> <p style="margin: 0;">60 HOUSE NUMBERS</p> <p style="margin: 0;">WEST ST STREET NAME</p> <p style="margin: 0;"> SUBURBS</p>	<p style="margin: 0;"> KERB</p> <p style="margin: 0;"> PIPE</p> <p style="margin: 0;"> PIT JUNCTION</p>	<p style="margin: 0;"> PIT</p> <p style="margin: 0;"> ROADS</p> <p style="margin: 0;"> PROPERTY</p>
---	---	--	---

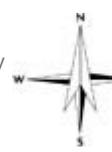


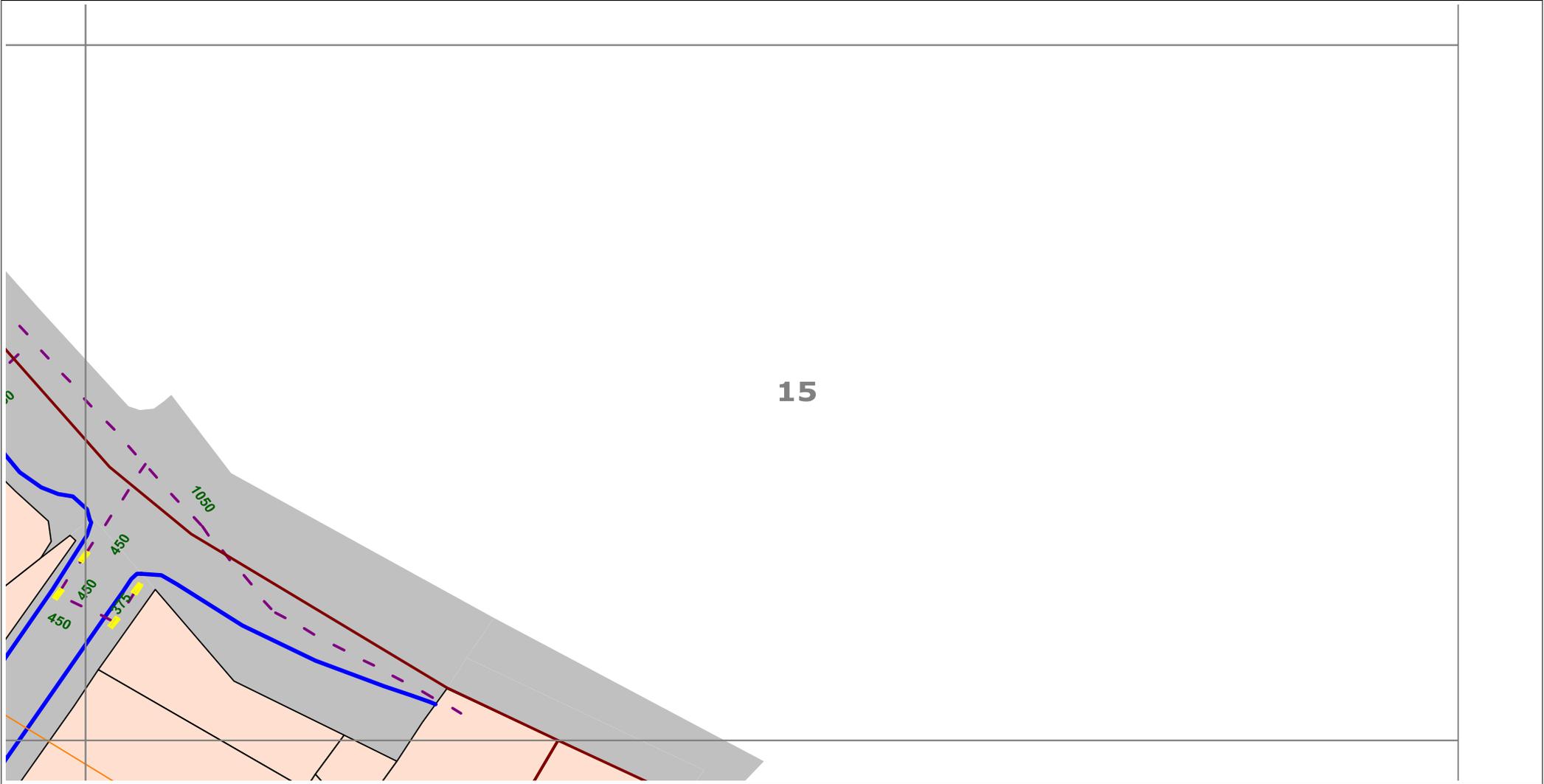
Create Date: 15/07/2014

Scale: 1:1000

DISCLAIMER: This map has been prepared from various sources and the publisher and/or contributors accept no responsibility for any injury, loss or damage arising from its use or errors or omissions therein.

WARNING: This plan has been prepared for Council's Purposes only. Council does not guarantee the accuracy of the information shown in this plan. Persons are advised to make their own investigations and site checks to confirm the actual situation on site.

	<p>900 PIPE DIAMETER</p> <p>60 HOUSE NUMBERS</p> <p>WEST ST STREET NAME</p> <p> SUBURBS</p>	<p> KERB</p> <p> PIPE</p> <p> PIT JUNCTION</p>	<p> PIT</p> <p> ROADS</p> <p> PROPERTY</p>
---	---	---	---



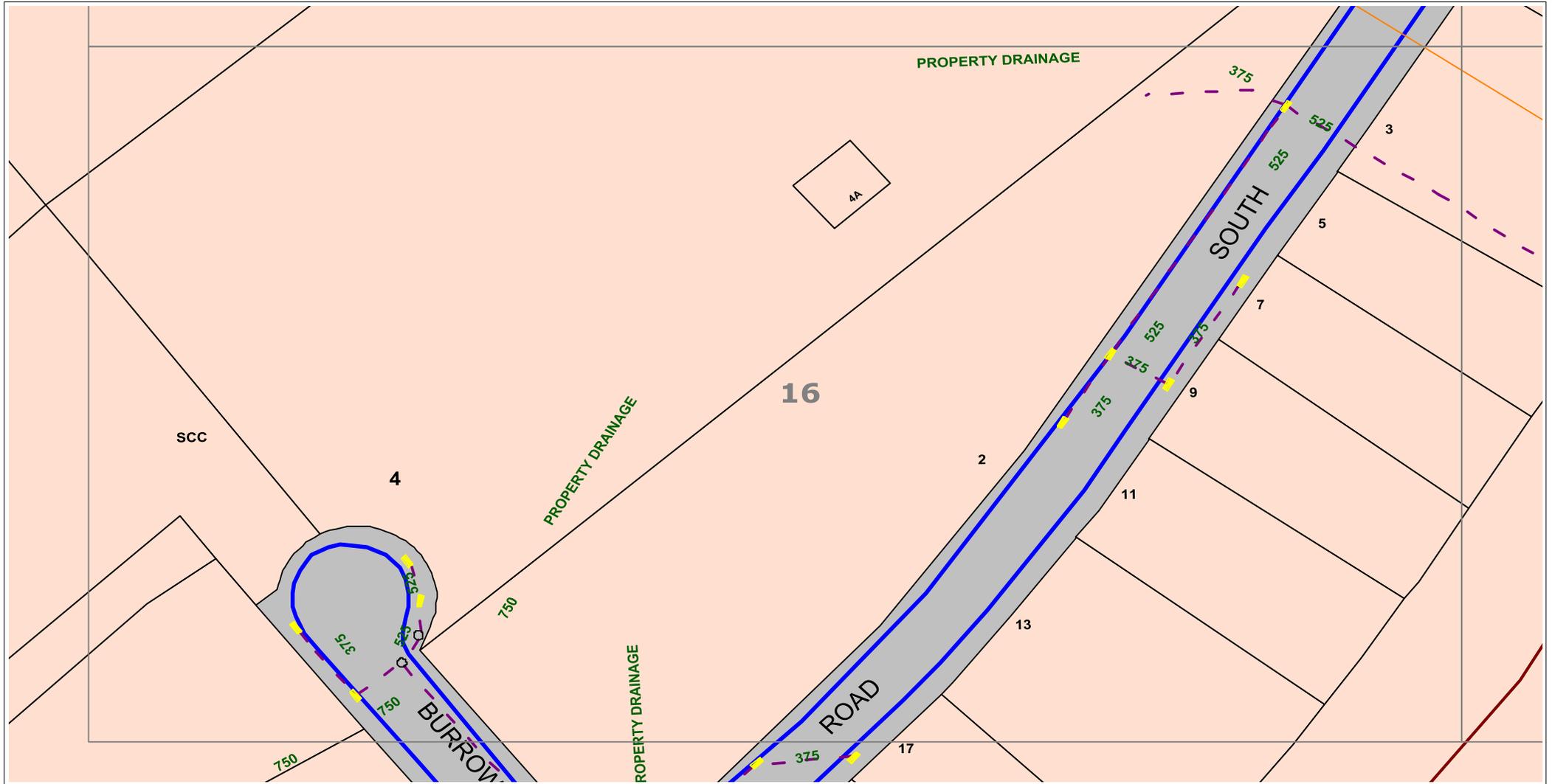
Create Date: 15/07/2014

Scale: 1:1000

DISCLAIMER: This map has been prepared from various sources and the publisher and/or contributors accept no responsibility for any injury, loss or damage arising from its use or errors or omissions therein.

WARNING: This plan has been prepared for Council's Purposes only. Council does not guarantee the accuracy of the information shown in this plan. Persons are advised to make their own investigations and site checks to confirm the actual situation on site.

	<p>900 PIPE DIAMETER</p> <p>60 HOUSE NUMBERS</p> <p>WEST ST STREET NAME</p> <p> SUBURBS</p>	<p>— KERB</p> <p>- - - PIPE</p> <p> PIT JUNCTION</p>	<p> PIT</p> <p> ROADS</p> <p> PROPERTY</p>
---	---	---	---



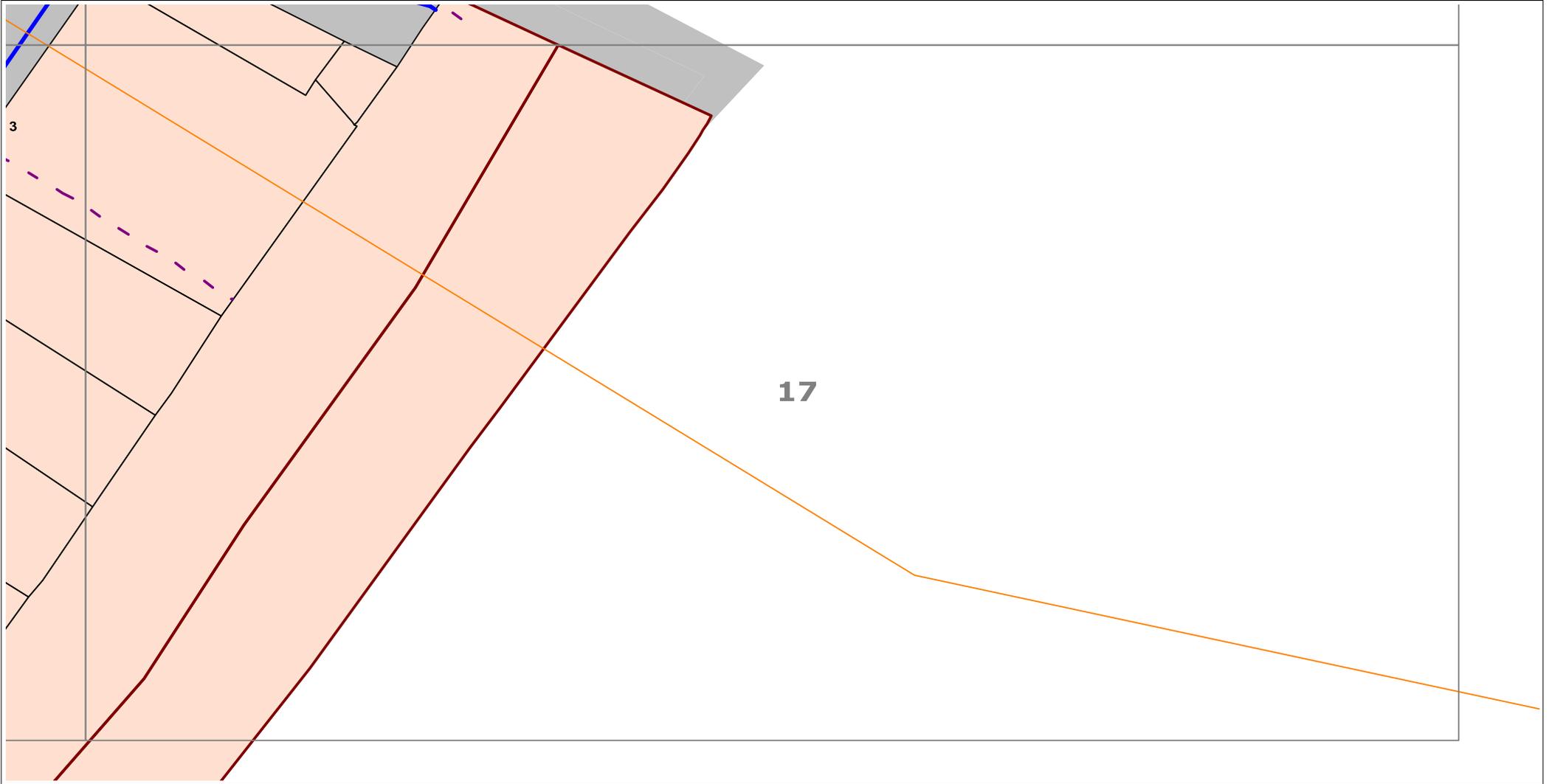
Create Date: 15/07/2014

Scale: 1:1000

DISCLAIMER: This map has been prepared from various sources and the publisher and/or contributors accept no responsibility for any injury, loss or damage arising from its use or errors or omissions therein.

WARNING: This plan has been prepared for Council's Purposes only. Council does not guarantee the accuracy of the information shown in this plan. Persons are advised to make their own investigations and site checks to confirm the actual situation on site.

	<p>900 PIPE DIAMETER</p> <p>60 HOUSE NUMBERS</p> <p>WEST ST STREET NAME</p> <p> SUBURBS</p>	<p> KERB</p> <p> PIPE</p> <p> PIT JUNCTION</p>	<p> PIT</p> <p> ROADS</p> <p> PROPERTY</p>
---	---	---	---



Create Date: 15/07/2014

Scale: 1:1000

DISCLAIMER: This map has been prepared from various sources and the publisher and/or contributors accept no responsibility for any injury, loss or damage arising from its use or errors or omissions therein.

WARNING: This plan has been prepared for Council's Purposes only. Council does not guarantee the accuracy of the information shown in this plan. Persons are advised to make their own investigations and site checks to confirm the actual situation on site.

	900	PIPE DIAMETER	 KERB	 PIT
	60	HOUSE NUMBERS	 PIPE	 ROADS
	WEST ST	STREET NAME	 PIT JUNCTION	 PROPERTY
		SUBURBS		

Appendix E

Former Sydney Water Corporation Trade Waste Agreement (TWA)

Consent to Discharge Industrial Trade Wastewater

SYDNEY WATER CORPORATION

and

ALEXANDRIA LANDFILL PTY LTD

A.C.N. 098 849 971

Trading as

ALEXANDRIA LANDFILL PTY LTD

A.B.N. 26 098 849 971

ACTIVITY: GARBAGE TIP (GE06)

RISK INDEX: 05

CONSENT NO: 29304

CONNECTION NO: 2

PROPERTY NUMBER: 4059264

This CONSENT is made on
Executed for and on behalf of
Sydney Water Corporation

day: month: year:

By

.....
(Signature)
Sally Armstrong
Manager, Business Customer Services

In the presence of:

Witness

.....
(Signature)

Executed for and on behalf of
the Customer:

.....
(Print name of witness)

.....
(Signature)

By

.....
IAN MALOUF SOLE DIRECTOR/SECRETARY
(Print name and position of person signing)
who warrants s/he has sufficient authority to execute this consent.

In the presence of:

Witness

.....
(Signature)

.....
JACQUELINE BRAUMAN
(Print name of witness)

This consent must be executed by the Customer prior to execution by Sydney Water and submitted by the Customer to Sydney Water for its consideration. Submission of a consent executed by the Customer under no circumstances obliges Sydney Water to enter into or complete the consent. Submission of an executed consent by the Customer constitutes an application for a consent which Sydney Water may in its reasonable discretion reject, or with the consent of the Customer modify any of the proposed terms thereto.

SCHEDULE 1
(SUBJECT TO PUBLIC DISCLOSURE)

TRADE WASTEWATER WHICH MAY BE DISCHARGED

1. Trade wastewater substances

- (a) The Customer may discharge trade wastewater into the Sewer in a manner whereby the substance characteristics of the trade wastewater are of a type and discharged at a rate, level or concentration equal to or less than that described in this schedule.
- (b) The Customer must not discharge trade wastewater into the Sewer in a manner whereby the trade wastewater discharged;
 - (i) contains, possesses or produces a substance characteristic not provided in, or which may be determined as being contrary to that described in this schedule.
 - (ii) is at or of a rate, level, or concentration not provided in, or which may be determined as being contrary to, that described in this schedule.

SUBSTANCE	LTADM (kg/day)	MDM (kg/day)	Standard (mg/L)
AMMONIA (AS N)	1.50000	25.00000	100.000
SUSPENDED SOLIDS	5.00000	20.00000	600.000
TOTAL DISSOLVED SOLIDS	450.00000	674.00000	10000.000
BARIUM	0.21000	1.00000	5.000
IRON	0.70000	4.00000	50.000

RECONCILIATION PROCEDURES:

LONG TERM AVERAGE DAILY MASS:

The Long Term Average Daily Mass is a twelve month arithmetic average of ALL daily mass discharges as calculated for each composite sample. The Daily Mass discharged is to be calculated for each of the above substances, and checked against the above Long Term Average Daily Mass (kg/day) on the basis of average concentrations of substances discharged (mg/L) over any 24 hour period as determined from composite samples, obtained by either the Customer (in accordance with Schedule 2) or Sydney Water, or a combination of sample results by both.

This average concentration (mg/L) is to be multiplied by the total discharge (kL) as recorded by the Customer's discharge flow meter over the 24 hour period in order to calculate the Daily Mass of substances discharged (kg). Exceeding the Long Term Average Daily Mass does not constitute a Breach, but may incur a Critical Mass Charge as detailed in Schedule 3.

ACCEPTANCE STANDARD:

The Composite Sample Concentration is to be determined for each of the above substances, and checked against the above Acceptance Standard (mg/L) for each sample obtained. Exceeding the Acceptance Standard constitutes a Breach and will also incur an increased Quality Charge as detailed in Schedule 3.

The Discrete Sample Concentration is to be determined for each of the substances identified at Schedule 2, 2 (b) and checked against the above Acceptance Standard (mg/L) for each sample obtained. Exceeding the Acceptance Standard constitutes a Breach.

MAXIMUM DAILY MASS:

The Daily Mass discharged is to be calculated for each of the above substances, and checked against the above Maximum Daily Mass (kg/day) on the basis of average concentrations of substances discharged (mg/L) over any 24 hour period as determined from composite samples, obtained by either the Customer (in accordance with Schedule 2) or Sydney Water, or a combination of sample results by both.

This average concentration (mg/L) is to be multiplied by the total discharge (kL) as recorded by the Customer's discharge flow meter over the 24hour period in order to calculate the Daily Mass of substances discharged (kg). Exceeding the Maximum Daily Mass constitutes a Breach.

2. The trade wastewater discharged must at all times have the following properties:

- Temperature - Not to exceed 38 degrees Celsius.
- Colour - Determined on a system specific basis
- pH - Within the range 7.0 to 10.0.
- Fibrous material - None which could cause an obstruction to Sydney Water's sewerage system.
- Gross solids (other than faecal) - A maximum linear dimension of less than 20 mm, a maximum cross section dimension of 6 mm, and a quiescent settling velocity of less than 3 m/h.
- Flammability - Where flammable and/or explosive substances may be present, the Customer must demonstrate to the satisfaction of Sydney Water that there is no possibility of explosions or fires occurring in the sewerage system. The flammability of the discharge must never exceed 5% of the Lower Explosive Limit (LEL) at 25° Celsius.

3. Rate of discharge of waste to sewer:

- (a) Instantaneous maximum rate of gravitated discharge 6.0 litres per second
- (b) Maximum daily discharge 620.0 kilolitres
- (c) Average daily discharge 121.0 kilolitres

RECONCILIATION PROCEDURE:

The data obtained from applying these procedures is to be checked by the interface of a chart recorder to the Customer's flow metering equipment, or by the installation of flow metering equipment by Sydney Water, for a minimum of 7 days.

SCHEDULE 2
(SUBJECT TO PUBLIC DISCLOSURE)

SAMPLING, ANALYSIS, FLOW RATES AND VOLUME DETERMINATION

1. The Customer must provide and make available for the purpose of sampling and analysis;
 - (a) Sampling point located at the pretreatment discharge excluding domestic sewage prior to the point of connection to the Sewer.
 - (b) Equipment necessary to allow collection of composite automatic samples on either a flow proportional or a time basis.
2. The Customer is to undertake collection and analysis of samples in accordance with the schedule detailed below:
 - (a) Composite samples are to be obtained:
 - (i) over one full production day by combining equal volumes taken at 5 kilolitre intervals. The volumes are to be such that at least 5,000 millilitres are obtained over the full day. The reading of the flowmeter meter is to be obtained at the commencement and conclusion of the sampling day.
 - (ii) on 12 July 2011 and every 22 days thereafter. If trade wastewater is not discharged on this day, then the sample is to be taken on the next day that trade wastewater is discharged. Trade wastewater includes all non-domestic wastewater discharged to sewer from the premises, including cleaning waste.
 - (b) Discrete samples are to be obtained as detailed below, and analysed according to the procedures and methods specified in Sydney Water's published analytical methods, to determine the concentrations or levels of the following substance characteristics:

pH	at the start and finish of each sample day
AMMONIA (AS N)	at the finish of each sample day
 - (c) Composite samples are to be analysed according to the procedures and methods specified in Sydney Water's published analytical methods, or methods otherwise agreed to and detailed hereunder, to determine the concentrations or levels of the following substance characteristics:

AMMONIA (AS N)
SUSPENDED SOLIDS
TOTAL DISSOLVED SOLIDS
BARIUM
IRON
 - (d) The Customer, or the laboratory contracted by the customer, is to submit results of analyses to Sydney Water within 21 days from the date the sample was taken. All analysis results are to be submitted on the sample analysis report provided as appendices 1 and 2 to this Consent OR in such format as may be specified from time to time by Sydney Water.
 - (e) All data requested on the sample analysis report must be provided.
 - (f) Sydney Water must be notified in writing within 7 days of;
 - (i) any failure to obtain samples in accordance with the provisions of Schedule 2; or
 - (ii) any loss of any analytical data.Where data is unavailable, lost or not provided, the Quality Charge and Critical Substance Charge, as detailed in Schedule 3, will be assessed on the basis of the highest Composite Sample concentration recorded in the 12 months prior to the date of the missing sample data.
3. The volume of wastewater discharged must be obtained from the reading of the total flow on the Customer's flowmetering system.

The rate of waste discharged is to be obtained by the reading of the instantaneous flow rate indicator on

the Customer's flowmetering system, or from any chart recorder interfaced to the Customer's flowmetering system.

The flowmetering system is to be calibrated at least annually at the Customer's expense, by a person or company approved by Sydney Water and a copy of the calibration certificate supplied to Sydney Water within one month of the certificate being received by the Customer.

If the Customer's flowmetering system fails to record data for any period, Sydney Water is to be advised in writing by the Customer within 7 days of any such failure becoming known by the Customer. An estimate of any data not recorded is to be made as follows:

Average of the waste discharged, registered for the four weeks before and/or after the failure to record.

SCHEDULE 3

(SUBJECT TO PUBLIC DISCLOSURE)

PAYMENTS

The charges are effective from 1 July 2011 and will continue until otherwise advised by Sydney Water.

All trade waste fees and charges are subject to CPI adjustments from 1 July each year in accordance with Determination No 1, 2008 made by the Independent Pricing and Regulatory Tribunal (IPART).

1. CHARGES FOR TRADE WASTEWATER DISCHARGE

Sydney Water will conduct a reading of the Customer's discharge meter at approximately 90 day intervals. The volume of trade wastewater discharged for the period since the previous reading will be calculated.

Charges are based on the Daily Mass calculated from composite samples and corresponding meter readings for each sampling day in the billing period, and calculated in accord with (c), (d), (e), and (f) below. The charge for each sampling day is then multiplied by a flow weighting factor to give a flow weighted charge. The total charge for each substance for the billing period is equal to the sum of the flow weighted charges for the billing period.

Total Charge = the sum of the flow weighted charges for the billing period

Flow Weighted Charge = (charge for all sample days) x (flow weighting factor) and:

$$\text{Flow Weighting Factor} = \frac{\text{(total volume discharged during billing period)}}{\text{(sum of volumes discharged during all sample days during billing period)}}$$

In this formula volume discharged refers to the volume of trade wastewater discharged.

(a) Mass Discharged:

For each substance, the Mass Discharged is calculated by multiplying the Composite Sample concentration by the Trade Wastewater discharge for that sample day.

(b) Chargeable Tradewaste Mass:

(i) For the following substances, the Chargeable Tradewaste Mass is equal to the Mass Discharged:

SUBSTANCE
BARIUM
IRON

(ii) For the following substances, the Chargeable Tradewaste Mass is calculated by subtracting the Equivalent Domestic Mass from the Mass Discharged. The Equivalent Domestic Mass is defined as the Domestic Concentration multiplied by the Trade Wastewater discharge.

SUBSTANCE	DOMESTIC CONCENTRATION mg/L
AMMONIA (AS N)	35.000
SUSPENDED SOLIDS	200.000
TOTAL DISSOLVED SOLIDS	450.000

If the resulting Chargeable Tradewaste Mass is zero or negative, then no Quality or Critical Mass charges will apply for that substance for that sample day.

(iii) Where a Critical Mass Charge applies, the Chargeable Tradewaste Mass will be reduced in accord with paragraph (d) (iv), below.

(c) Quality Charge:

- (i) For the following substances, the Quality Charge is determined by multiplying the Chargeable Tradewaste Mass by the Rate for that substance:

SUBSTANCE	STANDARD MASS CHARGING RATE \$ per kg
AMMONIA (AS N)	2.0730
SUSPENDED SOLIDS	0.8870
TOTAL DISSOLVED SOLIDS	0.0059
BARIUM	13.8970
IRON	1.3840

- (ii) For the following substances, the Quality Charge is determined by multiplying the Chargeable Tradewaste Mass by the Rate, where the Rate is a function of the composite sample concentration recorded for that sample day:

SUBSTANCE	STANDARD MASS CHARGING RATE \$ per kg
N/A	N/A

(d) Critical Mass Charge:

- (i) Where the customer has been notified that a given substance is Critical or Over Capacity and the Mass Discharged is greater than the 1.5 times the Long Term Average Daily Mass (LTADM) for that substance, then the Chargeable Critical Mass is calculated by subtracting 1.5 times LTADM from the Mass Discharged, except where (ii), below, applies.
- (ii) Where the customer has been notified that a given substance is Critical or Over Capacity and the Equivalent Domestic Mass is greater than 1.5 times the LTADM the Chargeable Critical Mass is calculated by subtracting the Equivalent Domestic Mass from the Mass Discharged.
- (iii) Where the customer has been notified that a given substance is Critical or Over Capacity and paragraph (i) or (ii) above applies, the Chargeable Tradewaste Mass calculated in (b), above, will be reduced by the Chargeable Critical Mass.
- (iv) The Critical Mass Charge Rate is a function of the Rate and Mass Discharged and LTADM for that substance:

SUBSTANCE STATUS	CHARGING RATE MULTIPLIER	MASS AFFECTED BY CHARGING RATE MULTIPLIER
Critical	2.00	Mass discharged >1.50 LTADM
Over Capacity	3.00	Mass discharged >1.50 LTADM

- (v) The Critical Mass Charge is the product of the Chargeable Critical Mass, the rate for that substance and the charging rate multiplier.

(e) Concentration Breach Charge:

Where the Composite Sample concentration is greater than the Acceptance Standards specified in Schedule 1 (with the exception of sulphate), any charges calculated in (c) or (d) above will be doubled for that sampling day.

(f) Failure to collect required samples:

Where the Customer fails to collect and analyse samples in accord with this consent the above charges will be assessed on the basis of the highest composite concentrations recorded for any billing period within the previous 12 months and the average daily discharge for the current billing period.

2. CHARGES FOR INSPECTIONS

- (a) If, in the opinion of Sydney Water, it is necessary for a Customer Service Representative to exercise rights under clause 6.1, the Customer will incur no liability for payment for any such exercise unless Customer Service Representative has already exercised rights under clause 6.1 on 5 occasions within a period of one year.
- (b) If it is necessary, in the opinion of Sydney Water, to carry out more than 5 inspections within a period of one year, the additional inspections will be charged. The rate for additional inspections is \$78.50 per

hour per Sydney Water employee attending, up to a maximum of two employees, with a minimum charge of \$39.55.

- (c) Any inspection required following up an alleged breach or a default notice will result in a fee payable even if the number of inspections nominated in paragraph 2 (a) has not been exceeded.
- (d) For the purposes of 2 (a) and 2 (b), above, one year is defined as the period from 1 July to 30 June the following year.

3. CHARGES FOR ADMINISTRATION OF TRADEWASTE CONSENT

A consent fee of \$591.25 per quarter is payable from 1 July 2011.

4. CHARGES FOR VARIATION OR RENEWAL OF TRADEWASTE CONSENT

Where a Variation is made to the Consent a fee of \$343.35 will be payable. There will be no charge for renewal.

5. CHARGES FOR PROCESSING GREASE TRAP WASTE

Charges for processing grease trap waste under the 'Wastesafe' Management System are as follows:
(Not Applicable)

6. PAYMENT OF FEES AND CHARGES

An account will be issued for all fees and charges. Any fees or charges payable by the Customer must be paid by the Customer within 30 days of the receipt by the Customer of the account detailing those fees and charges.

**SCHEDULE 4
ADDITIONAL REQUIREMENTS**

1. EFFLUENT IMPROVEMENT PROGRAM

N/A

2. WASTE MANAGEMENT PLAN

The existing pre-treatment will result in the generation of 0.1 tonne per annum of waste substances in the form of a sludge containing generally solids. The waste substances are, and will continue to be disposed of, in compliance with the requirements of the Department of Environment and Climate Change.

3. OTHER REQUIREMENTS

1) Tipping Bucket Rain Gauge

The tipping bucket rain gauge is to be maintained in a clean and working manner at all times.

The rain gauge is to be set at a 203 mm rainfall catch and after 2 tips the controller will set the pump timer to a 4 hour time delay for discharge of the first flush.

The rain gauge is to be calibrated at least annually at the Customer's expense, by a person or company approved by Sydney Water and a copy of the calibration certificate supplied to Sydney Water within one month of the certificate being received by the Customer.

4. BACKFLOW REQUIREMENTS

a) A Backflow Containment Device must be installed and maintained at the water meter outlet/property boundary in accordance with Sydney Waters Backflow Containment Policy.

b) Individual Backflow and Zone protection is required on any tap located within 5 metres of any Trade Waste Apparatus

SCHEDULE 5
APPARATUS, PLANT AND EQUIPMENT

EXISTING: COLLECTION WELL 30 kL
1 X 80 KL BIOLOGICAL TREATMENT PLANT (BATCH DISCHARGE)
1 X 100 KL biological treatment plant (batch discharge)
1 X RAINFALL SENTINEL MEA 2211
1 X ABB MAGMASTER ELECTROMAGNETIC FLOW METER

PROPOSED: n/a

**SCHEDULE 6
SPECIAL CONDITIONS**

1. DANGEROUS DISCHARGES

In this Schedule, the term "may pose a danger to the environment, the Sewer or workers at a sewage treatment plant";

- (a) means an occurrence whereby matter is discharged to the Sewer which either alone or in conjunction with other matter discharged cannot be adequately treated or may cause corrosion or a blockage, explosion or the production of dangerous gases in the Sewer or may adversely affect the operation of a sewer or sewage treatment plant; and
- (b) includes, but not so as to restrict the generality of paragraph (a), matter or substances, which is or are
 - (i) toxic or corrosive;
 - (ii) petroleum hydrocarbons;
 - (iii) heavy metals;
 - (iv) volatile solvents;
 - (v) phenolic compounds;
 - (vi) organic compounds.

2. UNINTENDED DISCHARGES

- (a) For purposes of avoiding unintended discharges to the Sewer or the stormwater drainage system, all matter and substances on the Premises must be processed, handled, moved and stored in a proper and efficient manner.
- (b) Any substance on the Premises which, if discharged to the Sewer, may pose a danger to the environment, the Sewer or workers at a sewage treatment plant or may harm any sewage treatment process must be handled, moved and stored in areas where leaks, spillages or overflows cannot drain by gravity or by automated or other mechanical means to the Sewer or the stormwater drainage system.

3. NOTIFICATION

In the event of a discharge of matter to the sewer that poses or may pose a danger to the environment, the Sewer or workers at a sewage treatment plant the Customer must immediately notify:

(a) MALABAR STP CONTROL ROOM TEL: (02) 9931 8319 FAX: (02) 9931 8366

(b) BUSINESS CUSTOMER SERVICES
DACEYVILLE OFFICE: TEL: (02) 9694 6500 FAX: (02) 9662 0419

(c) BUSINESS CUSTOMER SERVICES EMERGENCY CONTACT
CITY & EAST TEL: 0408 256 470

(d) BUSINESS CUSTOMER SERVICES EMERGENCY CONTACT
ALTERNATE CONTACT TEL: 0418 221 516

4. PROVISION OF SAFE ACCESS

The Customer shall provide safe access to Sydney Water employees visiting the site. In the event that unsafe conditions are identified the Customer must take reasonable steps to correct unsafe conditions and create safe access.

5. ELECTRONIC REPORTING OF SAMPLE ANALYSIS RESULTS

Sydney Water reserves the right to vary this consent to specify the option of reporting by electronic mail as outlined in Schedule 2, 2 (d).

SCHEDULE 7

1. Premises for which Consent is granted
10-34 ALBERT ST, ST PETERS NSW 2044
2. Industrial or other commercial activities for which Consent granted
GARBAGE TIP (GE06)
3. Discharge point for which Consent granted
BOUNDARY TRAP
4. The date for purposes of clause 3.1 is 1 July 2011
5. The period for purposes of clause 3.2 is 24 months.
6. The receiving Treatment Plant is MALABAR Sewage Treatment Plant

**SCHEDULE 8
NOTICES AND COMMUNICATION ADDRESSES**

SYDNEY WATER: CUSTOMER SERVICE REPRESENTATIVE
BUSINESS CUSTOMER SERVICES
71 GARDENERS RD,
DACEYVILLE 2032
TEL: (02) 9694 6500
FAX: 1300 364 403
A.H: 132 092

CUSTOMER: GENERAL MANAGER
ALEXANDRIA LANDFILL PTY LTD
PO BOX 1040
MASCOT NSW 1460
TEL: 9519 9999
FAX: 9516 5559

**SCHEDULE 9
AUTHORISED OFFICERS**

SYDNEY WATER: MANAGER
BUSINESS CUSTOMER SERVICES
71 GARDENERS RD,
DACEYVILLE 2032
TEL: (02) 9694 6500
FAX: 1300 364 403
A.H: 132 092

Postal Address: PO BOX 399
PARRAMATTA NSW 2124

Email: Sally.armstrong@sydneywater.com.au

CUSTOMER: GENERAL MANAGER
ALEXANDRIA LANDFILL PTY LTD
10-36 ALBERT STREET
ST PETERS NSW 2044
TEL: 9519 9999
FAX: 9516 5559

Email:

**SCHEDULE 10
NOMINATED REPRESENTATIVES**

SYDNEY WATER: BUSINESS MANAGER - SALES & SERVICE
BUSINESS CUSTOMER SERVICES
71 GARDENERS RD,
DACEYVILLE 2032
TEL: (02) 9694 6500
FAX: 1300 364 403
A.H: 132 092

CUSTOMER: CHRISTOPHER BIGGS
ALEXANDRIA LANDFILL PTY LTD
10-36 ALBERT STREET
ST PETERS NSW 2044
TEL: 9519 9999
FAX: 9516 5559

**APPENDIX 1
SAMPLE ANALYSIS REPORT (COMPOSITE) DISCHARGE METER**

Consent Number: 29304	
Company Name: ALEXANDRIA LANDFILL PTY LTD	
Company Address: 10-34 ALBERT ST, ST PETERS NSW 2044	
Sample Type:	
<input type="checkbox"/> 6 (composite, manual time based)	Start date: ___/___/___
<input type="checkbox"/> 7 (composite, manual flow proportional)	Finish date: ___/___/___
<input type="checkbox"/> 8 (composite, automatic time based)	Start time: ___:___ am/pm
<input type="checkbox"/> 9 (composite, automatic flow proportional)	Finish time: ___:___ am/pm
grabs taken in sample period: _____	Initial meter reading: _____ kL
sample intervals min/kL: _____	Final Meter reading: _____ kL
mL per grab: _____	Volume discharged: _____ kL

Laboratory:		
	Acceptance Standard	Measured Units
Substance	Acceptance Standard (mg/L)	Measured Concentration(mg/L)
AMMONIA (AS N)	100.000	
SUSPENDED SOLIDS	600.000	
TOTAL DISSOLVED SOLIDS	10 000.000	
BARIUM	5.000	
IRON	50.000	

COPY OF ORIGINAL ANALYTICAL LABORATORY REPORT TO BE ATTACHED
NOTE: LABORATORY REPORT MUST CERTIFY NATA REGISTRATION FOR EACH ANALYSIS

Comments: _____

Customer Signature: _____ Date: ___/___/___

Designation: _____

OFFICE USE ONLY

TERRITORY: D7

Sample No:

--	--	--	--	--	--

PLEASE RETURN TO:
 businesscustomers.labdata@sydneywater.com.au

**APPENDIX 2
SAMPLE ANALYSIS REPORT (DISCRETE SAMPLE)**

Consent Number:	29304
Company Name:	ALEXANDRIA LANDFILL PTY LTD
Company Address:	10-34 ALBERT ST, ST PETERS NSW 2044

Sample Type: DISCRETE

Date

Time

Laboratory:

Substance	Acceptance Standard (units or mg/L)	Measured Units or Concentration.
pH at start	7 - 10	
pH at finish	7 - 10	
NH3 at finish	100.000	

COPY OF ORIGINAL ANALYTICAL LABORATORY REPORT TO BE ATTACHED

NOTE: LABORATORY REPORT MUST CERTIFY NATA REGISTRATION FOR EACH ANALYSIS

Comments: _____

Customer Signature: _____ Date: ___/___/___

Designation: _____

OFFICE USE ONLY

TERRITORY: D7

Sample No:

--	--	--	--	--

PLEASE RETURN TO
businesscustomers.labdata@sydneywater.com.au

Sewerage System Plans

Guide to reading Sydney Water DBYD Plans



Legend

Sewer

Sewer Main (with flow arrow & size type text)	
Disused Main	
Rising Main	
Maintenance Hole (with upstream depth to invert)	
Maintenance Hole with Overflow	
Ventshaft EDUCT	
Ventshaft INDUCT	
Property Connection Point (with chainage to downstream MH)	
Concrete Encased Section	
Terminal Maintenance Shaft	
Maintenance Shaft	
Rodding Point	
Lamphole	
Vertical	
Pumping Station	

Pressure Sewer

Pressure Sewer Main	
Pump Unit (Alarm, Electrical Cable, Pump Unit)	
Property Valve Boundary Assembly	
Stop Valve	
Reducer / Taper	
Flushing Point	

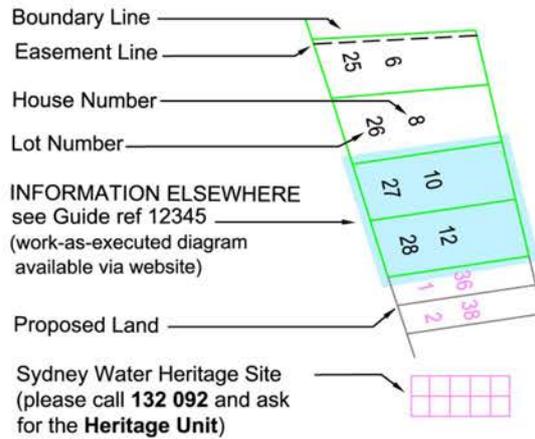
Vacuum Sewer

Pressure Sewer Main	
Division Valve	
Vacuum Chamber	
Clean Out Point	

Stormwater

Stormwater Pipe	
Stormwater Channel	
Stormwater Gully	
Stormwater Maintenance Hole	

Property Details



Water

WaterMain - Potable (with size type text)	
Disconnected Main - Potable	
Proposed Main - Potable	
Water Main - Recycled	
Special Supply Conditions - Potable	
Special Supply Conditions - Recycled	
Restrained Joints - Potable	
Restrained Joints - Recycled	
Hydrant	
Maintenance Hole	
Stop Valve	
Stop Vale with By-pass	
Stop Valve with Tapers	
Closed Stop Valve	
Air Valve	
Valve	
Scour	
Reducer / Taper	
Vertical Bends	
Reservoir	
Recycled Water is shown as per Potable above. Colour as indicated	

Private Mains

Potable Water Main	
Recycled Water Main	
Sewer Main	
Symbols for Private Mains shown grey	

Pipe Types

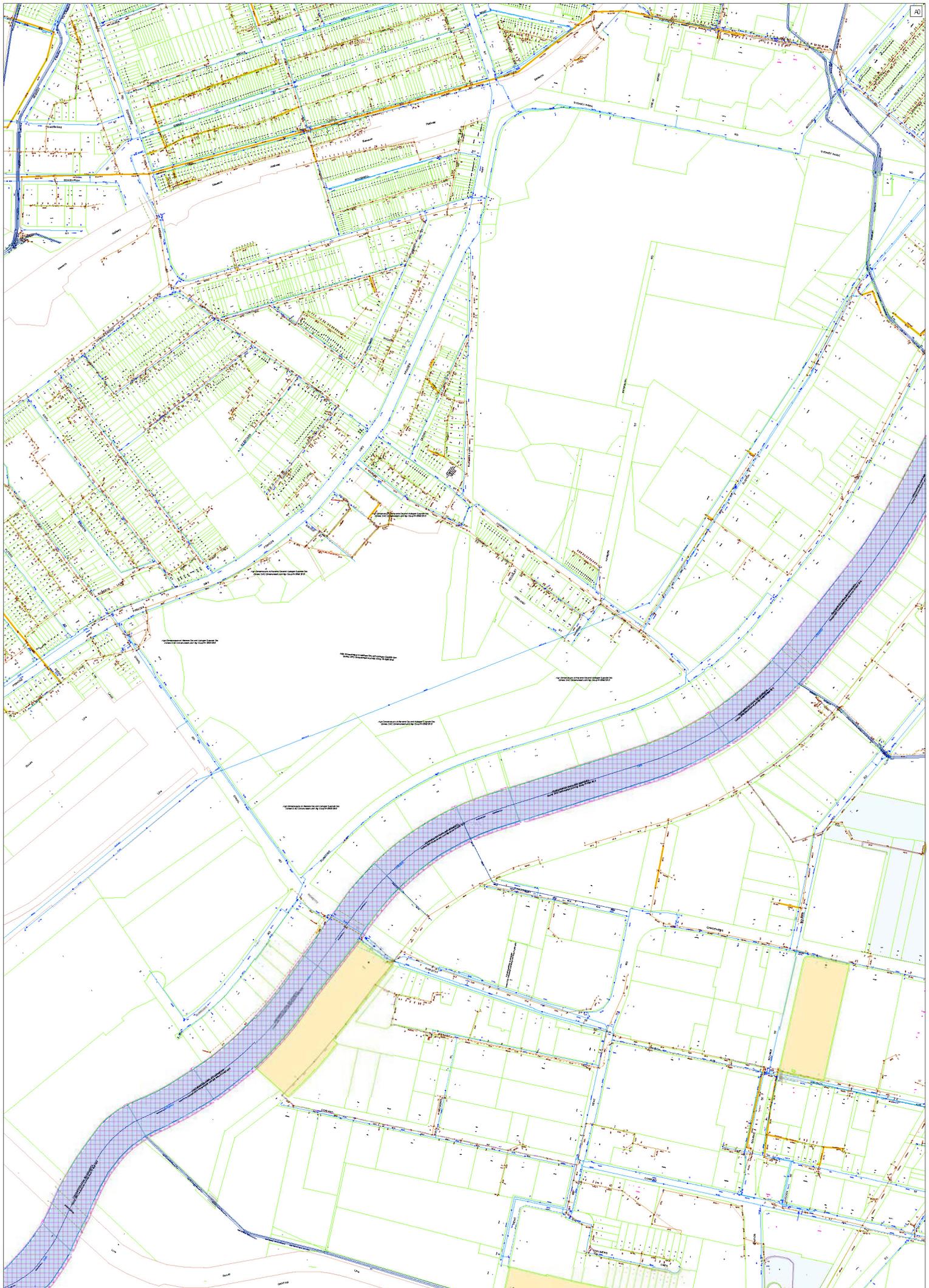
ABS	Acrylonitrile Butadiene Styrene	AC	Asbestos Cement
BRICK	Brick	CI	Cast Iron
CICL	Cast Iron Cement Lined	CONC	Concrete
COPPER	Copper	DI	Ductile Iron
DICL	Ductile Iron Cement (mortar) Lined	DIPL	Ductile Iron Polymeric Lined
EW	Earthenware	FIBG	Fibreglass
FL BAR	Forged Locking Bar	GI	Galvanised Iron
GRP	Glass Reinforced Plastics	HDPE	High Density Polyethylene
IBL	Internal Bitumen Lined	MS	Mild Steel
MSCL	Mild Steel Cement Lined	PE	Polyethylene
PC	Polymer Concrete	PP	Polypropylene
PVC	Polyvinylchloride	PVC - M	Polyvinylchloride, Modified
PVC - O	Polyvinylchloride, Oriented	PVC - U	Polyvinylchloride, Unplasticised
RC	Reinforced Concrete	RC-PL	Reinforced Concrete Plastics Lined
S	Steel	SCL	Steel Cement (mortar) Lined
SGW	Salt Glazed Ware	SPL	Steel Polymeric Lined
SS	Stainless Steel	STONE	Stone
VC	Vitrified Clay	WI	Wrought Iron
WS	Woodstave		

Further Information

Please consult the [Dial Before You Dig enquiries](#) page on the Sydney Water website

For general enquiries please call the Customer Contact Centre on **132 092**

In an emergency, or to notify Sydney Water of damage or threats to its structures, call 13 20 90 (24 hours, 7 days)



Appendix G

Development Consent Documents

City of Sydney

ABN 22 636 550 790
GPO Box 1591 Sydney NSW 2001 Australia
Town Hall House 456 Kent Street Sydney NSW 2000 Australia
Phone +61 2 9265 9333 Fax +61 2 9265 9222
council@cityofsydney.nsw.gov.au www.cityofsydney.nsw.gov.au



2 April, 2013

ALEXANDRIA LANDFILL PTY LTD
32 Burrows Road
ALEXANDRIA NSW 2015

**SECTION 96 MODIFICATION APPROVAL FOR 9 CANAL ROAD , ST PETERS
APPLICATION NO: DU/2003/635/C**

Dear Sir/Madam

I refer to your application, dated 27 May 2011, to modify the consent for Development Application No. DU/2003/635/C in the following manner:

- Amend Condition 1.2 to allow the continued operation of the site for a further 5 year period;
- Add new Condition 4.4, 10.18, 17.15, 17.16 and 18.4 to reflect the requirements of the Environment Protection Authority;
- Amend Condition 13.7 to reflect the requirements of the Environmental Protection Authority; and
- Delete Conditions 18.1 and 18.2 to reflect the subdivision of the site and removal of the property known as 1 Holland Street for the site.

You are advised that your application for modification has been **approved** under Section 96AA of the Environmental Planning and Assessment Act 1979. A copy of the Notice of Determination of the original development application is attached with the amendments resulting from the modification shown in **bold italics**.

This approval is limited to only those amendments requested in your Section 96 application, dated 27 May 2011. Approval is not granted for any other items which may have been amended on the submitted drawings and for which approval has not been specifically sought.

This approved modification will require an amended Construction Certificate which must be obtained from your Certifying Authority (Council or private accredited certifier). Building work must not commence until an amended Construction Certificate has been approved.

The Council officer dealing with this application is **Nicola Reeve** ph. 9265 9961, email **nreeve@cityofsydney.nsw.gov.au**.

Please contact this officer if further information is required.

Yours faithfully



GRAHAM JAHN

Director - City Planning, Development & Transport

Notes:

Modification of development consent in accordance with Section 96 of the Act shall not be construed as the granting of development consent, but reference to a development consent, is a reference to the development consent so modified.

Section 96(6) of the Act confers on an applicant who is dissatisfied with this determination a right of appeal to the Land and Environment Court and the Court may determine the appeal.

For the reasons for imposing conditions, refer to the Notice of Determination for the original development consent.

Modification of a development consent does not remove the need to obtain any other statutory consent necessary under the Environmental Planning and Assessment Act 1979, or any other Act.

The conditions of consent of the development application have been modified with the consent of the applicant.

City of Sydney

ABN 22 636 550 790
GPO Box 1591 Sydney NSW 2001 Australia
Town Hall House 456 Kent Street Sydney NSW 2000 Australia
Phone +61 2 9265 9333 Fax +61 2 9265 9222
council@cityofsydney.nsw.gov.au www.cityofsydney.nsw.gov.au



NOTICE OF DETERMINATION - APPROVAL issued under Section 80(1)(a) of the Environmental Planning and Assessment Act 1979

Development Application No.	DU/2003/635/C
Applicant	ALEXANDRIA LANDFILL PTY LTD 32 Burrows Road ALEXANDRIA NSW 2015
Land to be developed	9 Canal Road, ST PETERS NSW 2044 Lot 2 DP 1168612
Approved development	Use of the premises as a waste transfer, recycling and resource recovery, involving sorting, crushing, shredding, screening, stockpiling and on-selling recyclables and associated plant and vehicle maintenance all in conjunction with the continued use of the premises as a solid waste landfill depot
Cost of development	\$0
Determination	The application was determined by the Land and Environment Court and was granted consent subject to the attached conditions. This Section 96 modification application was determined under delegation of Council and was granted consent subject to the attached conditions.
Consent is to operate from	28 September 2006
Consent will lapse on	28 September 2011
Date of Section 96(AA) Modification	2 April 2013

Reasons for conditions

Unrestricted consent may affect the environmental amenity of the area and would not be in the public interest.

Right of Appeal

If you are dissatisfied with this decision, Section 96(6) of the Environmental Planning and Assessment Act 1979 gives you the right to appeal to the Land and Environmental Court within 6 months after the date of this Notice of Determination.

Alternatively, you may request a review under Section 96AB of the Act within 28 days of the date of this notice (NB section 96AB is not applicable to integrated or designated development).



GRAHAM JAHN

Director - City Planning, Development & Transport

CONDITIONS OF CONSENT

CHAPTER 1 – LICENSES

- 1.1 That the development shall be carried out substantially in accordance with Drawing Nos. A2152001-2005, Environmental Impact Statement prepared by Patrick James received by Council on 13 August 2003 and detail submitted to Council on 12 August 2003 and the Alexandria Landfill Site Water & Leachate Management Plan (September 2004) and additional information submitted to Council on 20 October 2003 and 7 April 2004 and drawings No. 05F and 06A, marked Plan 1 and Plan 2 respectively, given to the Land and Environment Court forming part of this Consent Condition and as amended by conditions of this consent.
- 1.2 The development the subject of this consent is limited to a period of 5 years from the date ~~of this consent being the date Consent is granted by the Court of determination of Section 96 application DU/2003/635/C by Council~~. However, if an application for an extension of time under this condition is lodged with the consent authority at least 3 months before the required date for cessation of the development under this condition, the development can continue to be carried out until such time as that modification application is finally determined. Any such modification application must include details of possible additional ingress and egress points to the site.
- (As modified by DU/2003/635/C, dated 2 April 2013)***
- 1.3 That the use shall cease within 6 months of the cessation of the current solid waste landfill operation if such use ceases prior to the 5 year limit contained in condition 1.2 above.
- 1.4 The person operating under this consent shall submit a geo-technical report on the stability of the cliff face and undertake any necessary work to prevent failure of the cliff face. The report shall also recommend and put in place regular inspections of the cliff face to ensure the ongoing safety of the site and adjacent properties. A copy of future inspection reports shall be submitted to Council.
- 1.8 The licensee must operate the proposed recycling facility in accordance with the SWLMP (or any updated version reference) that was negotiated and agreed to by the DEC and the licensee.
- 1.9 The environmental protection measures as detailed in Section 8 of the Environmental Impact Statement, dated 7 August 2003 submitted with the application shall, except if inconsistent with any other conditions of the consent, be implemented and carried out.
- 1.10 A separate application being submitted to, and approved by, Council prior to the erection of any advertisements or advertising structures.
- 1.11 Hazardous and/or industrial waste arising from the operational activities being removed (generated) and/or transported in accordance with the requirements of the DEC and the NSW WorkCover Authority pursuant to the provisions of the following:-
- Protection of the Environment Operations Act 1997;
 - Protection of the Environment Operations (Waste) Regulation 2005;
 - Waste Minimisation & Management Act 1995;

- NSW Occupational Health & Safety Act 2000;
- NSW Construction Safety Act 1983 (Regulation 84A-J Construction Work involving Asbestos or Asbestos Cement 1983);
- The Occupational Health and Safety (Hazardous Substances) Regulation 1996; and
- The Occupational Health and Safety (Asbestos Removal Work) Regulation 1996.

CHAPTER 2 - BUNDS

- 2.1 The person operating under this consent shall,
- (a) increase the volume and height of the existing bund shown edged yellow on Plan 1 ("Existing Bund") to a height and to the approximate dimensions shown in Plan 1 and in the cross section on Plan 2; and
 - (b) vegetate the Existing Bund. This must include growing vegetation or putting a crusting agent on all sides of the Existing Bund and keeping it vegetated or covered with a crusting agent thereafter; and
 - (c) build a new bund of the approximate dimensions shown in Plan 1, of inert solid material on the area shown edged blue on Plan 1 and in the cross section on Plan 2 ("New Bund"); and
 - (d) vegetate the New Bund. This must include growing vegetation or putting a crusting agent on all sides of the New Bund and keeping it vegetated or covered with a crusting agent thereafter.

CHAPTER 3 - PANEL WALL

- 3.1 Subject to obtaining a Construction Certificate (if required) the person operating under this consent shall by 31 March 2006 install a Panel between points marked "X" and "Y" on plan 1 to prevent dust migration onto the neighbouring property at 1-3 Burrows Road Alexandria.
- 3.2 The Panel must be of the same or similar material to the material of the acoustic boundary already installed by Tip Fast.
- 3.3 Thereafter the person operating under this consent must maintain that Panel in a good state of repair and condition.

CHAPTER 4 - DESIGNATED OPERATIONS AREAS

- 4.1 The person operating under this consent will ensure that stockpiles of materials the particle size of which is less than 20mm (being soil or fines or sand) shall only be located in the area shown on Plan 1 as hatched pink ("the Pit Area") and the stockpiles of materials so placed will be either:
- (a) within range of an operational sprinkler and kept damp to prevent dust migration; or
 - (b) covered with a fabric cover to ensure that no dust is able to escape from the stockpile; or

- (c) hardened with a crusting agent; or
 - (d) protected to ensure that no dust is able to escape from the stockpile.
- 4.2 The person operating under this consent must ensure that any land or materials in:
- (a) the Pit Area must not exceed a height of RL 10 and any processing which occurs in the Pit Area must be done below a height of RL 8;
 - (b) the Hatched Area (save for the Existing Bund and the New Bund) must not be used for the processing, crushing or grinding of any materials and must not exceed a height of RL 10 and must not be used for the stockpiling of materials unless the material has at least one dimension which is greater than 100mm, such stockpiles not to exceed the height of the higher of the Existing Bund and New Bund;
 - (c) The area shown hatched blue on Plan 1 must:
 - (i) Not include any stockpiles of materials unless the relevant material has at least one dimension which is greater than or equal to 30mm except that bitumen of any dimension may be stockpiled in that area; and
 - (ii) not exceed the height of the higher of the Existing Bund and the New Bund; and
 - (iii) not be used for processing, crushing or grinding other than within a waste processing and transfer facility that is within a permanent or temporary building or structure (except that bitumen may be processed in that area). If no such structure or building currently exists, the person operating under this consent must apply for development consent for such a structure or building in order to carry out those activities; and
 - (d) the area shown hatched green on Plan 1 may include "show piles" that are contained within concrete walls and wetted but they must not exceed the height of the higher of the Existing Bund and the New Bund; and
 - (e) the area shown hatched red on Plan 1 must:
 - 1. not include any stockpiles of materials unless the relevant material has at least one dimension which is greater than or equal to 30mm; and
 - 2. not exceed the height of the higher of the Existing Bund and the New Bund; and
 - 3. not be used for processing, crushing or grinding at any time.
- 4.3 The sizes of the materials in the show piles do not have dimension restrictions. The show piles will be limited to the size of show bays.
- 4.4 ***Within 6 months of the approval date, the person acting on this consent must provide to Council and the EPA a map showing the areas of the premises, known to have been landfilled, where intermediate cover or capping has been applied and provide information that demonstrates that intermediate capped areas are covered with material having hydraulic conductivity of less than 1×10^{-5} m/s to a depth of at least 300mm.***

If the intermediate covered areas do not have a hydraulic connectivity of less than 1×10^{-5} m/s and/or have not had cover applied to a depth of 300mm, the proponent must install an intermediate cap to the satisfaction of the EPA within a timeframe specified by the EPA.

(As modified by DU/2003/635/C, dated 2 April 2013)

CHAPTER 5 – STOCKPILES

- 5.1 The operator must ensure that all stockpiles are wetted prior to material being removed from them for processing, and that during processing, they are kept wet and high-pressure water sprays are utilized to prevent the migration of dust.
- 5.2 Crushing, grinding and screening of the stockpiles shall be subject to stringent dust mitigation measures utilizing water sprays on the processing equipment at all times without a break during processing so that the materials being processed or moved are sufficiently wetted so as to prevent fugitive dust emissions.

CHAPTER 6 - LOADS

- 6.1 All vehicles carrying materials to or from the site must have their loads covered with tarpaulins or similar covers. The operator must advertise on its website, all advertising brochures and all advertisements that it is only able to receive covered loads.

CHAPTER 7 - WHEEL WASH

- 7.1 All vehicles leaving the site must be first put through a wheel wash except those that have not been in a landfilling or processing area.
- 7.2 The roadway between the wheel wash and the exit of the site is to be kept clean by satisfactory methods employed within the site addressing tracking of mud and sediments.

CHAPTER 8 - WASTER SPRAY

- 8.1 All haul roads and stockpile areas must be regularly watered to prevent dust emissions from the site migrating onto neighbouring land.
- 8.2 The vehicle routes in use around the site, except for concreted hardstand, are to be kept damp from 7.00am to 5.00pm Monday to Friday and 7.00am to 4.00pm Saturday.
- 8.3 Dust emissions from the stockpiles and other areas of the site shall be suppressed at all times by a permanently installed irrigation system and by a water truck.
- 8.4 The installed suppression system shall be designed such that it will automatically operate to spray a sufficient amount of water to suppress dust and to prevent fugitive emissions whenever wind speeds as measured by the anemometer installed on the site exceed 30 km/hour and when it is not raining, even when the site is not open. If the water sprays create a nuisance to neighbouring sites located between 282 degrees from the North West through to 45 degrees from the North East (measured clockwise) of the Premises, such water spraying operations within that area are to be suspended until further notice from council. For the purposes of this

clause, water spraying operations at the southern end of the site along the boundary of the Tip Fast premises (location indicated on plan 1 as "Water spray installation" for the benefit of the property known as 1-3 Burrows Road must not be suspended unless the owner of 1-3 Burrows Road requires suspension, in which case the person operating under this consent must suspend forthwith until further notice by that owner.

- 8.5 Dust sprays and/or dust collection systems must be installed and operating on a crushing, grinding and screening equipment at the site.
- 8.6 The site operator must install sprinkler or spray systems along points marked "water spray installation" on Plan 1. Person operating under this consent must maintain all sprinklers or spray systems in good condition.
- 8.7 The person operating on this consent must install sprinkler or spray systems along the perimeter escarpment of the pit area of the site. Person operating under this consent must maintain all sprinklers or spray systems in good condition.

CHAPTER 9 - WATER QUALITY

- 9.1 Any water (other than any water directly from Sydney Water's mains supply) that is used for dust control, firefighting or the like on the site shall be:
 - (a) of a quality that would be acceptable to Sydney Water as trade waste; and
 - (b) of primary human contact quality such that it will cause no harm to the health of persons who may come into contact with such water.
- 9.2 If any water is used on the site (other than any water directly from Sydney Water's mains supply) then it shall be tested as required by DEC NSW by an independent water expert.
- 9.3 If the water quality shown by the tests fails to meet the specified criteria, the processing of materials shall cease unless the water used for dust suppression and the like is replaced with water that is compliant with DEC NSW requirements.
- 9.4 If the required water in such a case is not available the processing of material shall cease forthwith.

CHAPTER 10 - STORMWATER AND GROUNDWATER

- 10.1 The person operating under this consent shall be responsible for the future maintenance, upgrade, improvements and/or renewal of the stormwater drainage line approved by Marrickville Council Determination No. 199901506. Details of the proposed future maintenance/inspections of the existing stormwater pipeline including a schedule of regular inspections shall be submitted to and accepted by Marrickville Council. A copy of all future inspection reports shall also be submitted to Council.
- 10.2 The stormwater drainage line within the property shall be inspected by Closed Circuit Television (CCTV) and a video copy provided to Council so as to determine the condition of the existing drainage line through the site. Any defects in the drainage line shall be repaired at no cost to Council. The stormwater line shall again be inspected upon completion of any necessary repairs and a video copy provided to Council.

- 10.3 The Terms of Approval for Integrated Development relating to Water Licence (Part V of Water Act, 1912). Under the provisions of Part V (s116) of the Water Act 1912), this licence shall be valid for the period of the development consent.
- 10.4 That the licensee shall allow the NSW Department of natural Resources, or its authorised representative, subject to appropriate occupational health and site safety provisions, full and free access to the works (ie groundwater interception works and groundwater investigation/monitoring bores), for the purpose of undertaking inspection or test of works and its fittings, and shall carry out any work or alterations deemed necessary by the Department of Natural Resources to ensure the protection and maintenance of the works, or the control of the water extracted and for the protection of the quality and the prevention from pollution/contamination of surface and subsurface water.
- 10.5 The licensee shall notify the NSW Department of Natural Resources, if the works (ie groundwater interception works, investigation/monitoring bores) are to be abandoned and, contingent with site safety requirements, seal off the works by:
- backfilling the work to ground level with clay or cement, or
 - other methods agreed to or directed by the NSW Department of Natural Resources.
- 10.6 Any groundwater interception works for purposes of leachate control, groundwater investigation and/or groundwater monitoring are required to be licensed and a bore licence application shall be submitted and a licence obtained from the NSW Department of Natural Resources. Completion details (Form A. - Particulars of groundwater interception works are required to be forward to the NSW Department of Natural Resources within three (3) months of the date of this Determination.
- 10.7 Any licence granted authorises groundwater interception to address leachate control and dust suppression use on-site only and no entitlement to the groundwater intercepted for any other water supply purpose is authorised.
- 10.8 The licensee will ensure that operational site plans promote the sustainable use and management of local natural resources.
- 10.9 The licensee shall not allow any discharge of intercepted waters into or onto:
- Any adjoining public or crown land
 - Any other persons land without written permission
 - Any creek, river, water course or aquifer without approval determining authority
 - Any native vegetation as defined under the Native Vegetation Conservation Act (1997); or
 - Any wetlands of environmental significance
- 10.10 An efficient monitoring system must be installed to the satisfaction of the NSW Department of Natural Resources to measure the groundwater interception

(dewatering) activity, both quality and quantity. Any variation with the requirements given in this Condition must be approved by the NSW Department of Planning .

- 10.11 The proponent is to prepare an annual environmental management report and forward a copy to the NSW Department of Natural Resources. The environmental report should include the following:-
- (a) volume of groundwater intercepted and pumped off-site for each of the two Botany Sands interception systems (weekly volumes);
 - (b) groundwater levels in the four shale boreholes and in the Botany Sands monitoring bore (monthly measurements); and
 - (c) the results of bi-annual water quality samples from monitored groundwater and surface water systems including groundwater from the interception works and stormwater discharge. The list of analyses should include those given in the Department's 'Recommended Bore Licence Minimum Analytical Suite' for the Botany Sands Aquifer (see attached information sheet).
- 10.12 After receipt of the licence, the proponent shall provide NSW Department of natural Resources on an annual basis with the interpreted report on monitoring, detailing the quantity of water pumped from the facility in the previous 12 months as per condition 10.11(a), the water level data described in condition 10.11(b), water quality data described in condition 10.11(c) and detailing any changes to the environment that may trigger the need for remedial action.
- 10.13 Tabulated hydrologic and hydraulic calculations that demonstrate the adequacy of the existing site stormwater drainage system being submitted to and accepted by Council before the issue of a Construction Certificate. Such calculations shall include any remedial measures necessary to rectify defects in the existing system. Where the existing system is to be interfaced with proposed site drainage, the calculations shall clearly demonstrate the adequacy of the existing drainage network to accept the additional stormwater flows.
- 10.14 The operation of the premises being conducted in a manner which does not pollute waters as defined by the Protection of the Environment Operations Act 1997.
- 10.16 Only clean and unpolluted water shall be permitted to discharge from the subject premises into Council's stormwater drainage system.
- 10.17 Sign(s) being displayed and maintained adjacent to all stormwater drains premises, clearly indicating 'clean water only - no wastewater or rubbish'.
- 10.18 *A Trade Waste Agreement with Sydney Water for discharge of leachate to sewer is to be maintained.***

(As modified by DU/2003/635/C, dated 2 April 2013)

CHAPTER 11 - WIND MEASUREMENT

- 11.1 An anemometer shall be maintained on the Site at all times and shall be installed and operated in accordance with its manufacturer's instructions.
- 11.2 The anemometer shall be linked to a device that issues a warning and which activates mist sprays along the perimeter escarpment of the Pit Area in the south

east of the site and appropriate sprays in areas where processing is carried out in the open air when wind speeds exceed 30 km/h and it is not raining. If the water sprays create a nuisance to neighbouring sites located between 292 degrees from the North West through to 45 degrees from the North East (measured clockwise) of the Premises, such water spraying operations within that area are to be suspended until further notice from council. For the purposes of this clause, water spraying operations at the southern end of the site along the boundary of the Tip Fast premises (location indicated on plan 1 as "Water spray installation") for the benefit of the property known as 1-3 Burrows Road must not be suspended unless the owner of 1-3 Burrows Road requires suspension, in which case the person operating under this consent must not be suspended forthwith until further notice by that owner.

- 11.3 The anemometer shall be maintained and checked regularly to ensure it is in good working order during the hours of operation on the Site.

CHAPTER 12 - HIGH WIND

- 12.1 When the wind speed is measured above 30 kms per hour and when it is not raining those parts of the Site with a potential for dust generation must be continuously kept damp or high pressure mist sprays shall be activated along the perimeter of the Pit Area or any area used for processing. If the water sprays create a nuisance to neighbouring sites located between 292 degrees from the North West through to 45 degrees from the North East (measured clockwise) of the Premises, such water spraying operations within that area are to be suspended until further notice from council. For the purposes of this clause, water spraying operations at the southern end of the site along the boundary of the Tip Fast premises (location indicated on plan 1 as "Water spray installation") for the benefit of the property known as 1-3 Burrows Road must not be suspended unless the owner of 1-3 Burrows Road suspension, in which case the person operating under this consent must, suspend forthwith until further notice by that owner.

CHAPTER 13 - DUST MANAGEMENT

- 13.1 Prior to the use commencing a plan of management detailing treatment techniques to eliminate the tracking of sediment onto the egress road and onto public streets by vehicles exiting the site shall be submitted to Council's satisfaction; such plan shall include daily cleaning of the roadway between the entry and the weighbridge and details of a truck wheel wash and other exit treatment techniques in order to stabilize the area so as to eliminate the tracking of sediments onto the egress road and public streets by vehicles exiting the site.
- 13.2 Appropriate measures shall be adopted to prevent run off or liquids or mud onto neighbouring land.
- 13.3 An employee of the business shall regularly inspect the roadways within 100 metres of the site entrance to check for any material deposited thereon by vehicles entering or leaving the site and if such is observed the deposits shall be promptly and completely cleaned up (not washed or swept into Council's gutters and drains).
- 13.4 The results of the air sampling tests to be recorded, assessed and reviewed by an Independent Consultant practicing in air quality assessments and submitted to Council within twelve (12) months of the operation of the premises, with any

NOTICE OF DETERMINATION – APPROVAL DU/2003/635/C

recommendations of the Independent Consultant being incorporated into the operation of the premises.

- 13.5 All mechanical, degreasing and pressure cleaning operations being conducted within the workshop/maintenance building. In this regard, a Trade Waste Permit is to be obtained from Sydney Water prior to the commencement of the use.
- 13.6 The operation of the premises being carried out in accordance with the requirements of the WorkCover Authority and the DEC at all times. In this regard it may be necessary to obtain licences under the Waste Minimisation and Management Regulations 1997 and the Protection of the Environment (operations) Act 1997.
- 13.7 (a) That existing and future vehicle routes forming part of the lower level roads to the pit area at the site shall be covered with dust suppressing material, such as wetted wood chips in accordance with the Site's Dust Management Plan (DMP).
- ~~(b) That existing and future vehicle route on the upper level of the site be paved in concrete or asphalt or other dust suppressing material within three months of this consent being granted.~~
- (b) Within 3 months of the approval date, the roads marked purple on the document attached to the Marrickville Council consent and marked "Plan 3" shall be paved in concrete or asphalt or other dust suppressing material. Such road, together with the roads marked green on Plan 3, shall be maintained in their paved state whenever development is carried out pursuant to this consent.**
- (c) That existing and future vehicle routes are to be kept as free of dust as practicable at all times.

(As modified by DU/2003/635/C, dated 2 April 2013)

- 13.8 The Hatched Area on Plan 1 must be leveled to a height of no more than RL 10 and paved, concreted or covered with compacted bitumen. The person operating under this consent must maintain that area at that level and must maintain the paved, concreted or compacted bitumen so as to minimise the escape of dust. This is subject to condition 4.2(b).
- 13.9 When moving materials for the purpose of carrying out condition 13.8 materials must be kept wetted at all times and the site operator must also use its best endeavors not to cause a dust nuisance.
- 13.10 Any future filling, from the date of this consent, in the road proposal affected area shall be clean fill and fully compacted.
- 13.11 Any filling on the Site must be done with materials permitted by the DEC site licence and must be fully compacted.
- 13.12 Tipping drop heights being minimised to prevent fugitive dust emissions.
- 13.14 The DMP should include but should not be limited to:
- Controlling dust emissions from processed waste stockpiles

- Controlling dust emissions from unprocessed waste stockpiles
- Controlling dust emissions from processing waste materials; and
- Preventing dust, waste or waste water from the wheel wash being tracked from the premises by vehicles on the premises.

The DMP is to be prepared by an appropriately qualified and independent person.

CHAPTER 14 – ROADS

- 14.1 All deliveries to and from the site using trucks of 2 tonne or greater capacity, being restricted to using Canal Road, Burrows Road, Campbell Road, Barwon park Road and the Princes Highway. Vehicles of 2 tonne or greater capacity shall not use Euston Road, north of Huntley Street nor Sydney Park Road. Signs to facilitate this route being erected at the weighbridge and front gate and company drivers shall being so instructed and regular customers/suppliers shall be advised in writing.
- 14.2 Access to the site shall be as follows:
- (a) Outside the hours of 7.00am to 6.00pm Mondays to Fridays and 7.30am to 5.00pm Saturdays, all trucks of greater than 2 tonne capacity arriving or departing the site shall not use Campbell Street or Campbell road east of Barwon Park Road. To facilitate this signs shall be erected at the weighbridge and front gate, company drivers shall be so instructed and regular customers/suppliers shall be advised in writing.
- (b) Access hours to the site through 1 Holland Street and Access hours to 1 Holland Street is dealt with in condition 18.3.
- 14.3 At no time shall nay truck arrive or depart the site via Albert Street or Campbell Lane.
- 14.4 All vehicles entering and leaving the site in a forward direction.
- 14.5 No semi-trailers or trucks with dog trailers accessing the site on Sundays.
- 14.6 A 15km/h speed limit shall apply on the site and shall be signposted accordingly.
- 14.7 No access to and from the site shall be via Albert Street from the Princes Highway.
- 14.8 A road opening permit shall be obtained for all works carried out in public roads or Council controlled lands. Restorations shall be in accordance with Marrickville Council's Restorations Code. Failure to obtain a road opening permit will incur an additional charge for unauthorised openings in the amount of \$1,321.30, as provided for in Council's adopted fees and charges.
- 14.9 The owner or builder shall sign a written undertaking that they shall be responsible for the full cost of repairs to footpath, kerb and gutter, or other Council property damaged as a result of construction of the proposed development. Council may utilize part or all of any Building security deposit (BSD) or recover in any court of competent jurisdiction, any costs to Council for such repairs.

CHAPTER 15 – PARKING

- 15.1 Twenty five (25) off-street car parking spaces being provided, paved, line marked and maintained at all times in accordance with the standards contained within Marrickville Development Control Plan No. 19 - Parking Strategy prior to the commencement of the use.
- 15.2 All parking spaces and turning area thereto being provided in accordance with the design requirements set out within Marrickville Council's Development Control Plan No. 19 Parking Strategy, and being used exclusively for parking and not for storage or any other purpose.
- 15.3 All parking spaces and access thereto shall be used exclusively for parking and access and shall not be used for storage or any other purpose.
- 15.4 If at any time during this consent more than twenty (20) persons are employed on a full-time permanent basis by the person operating under this consent and are present at the premises at any one time the Site Operator shall provide one additional (1) parking spot for every additional three (3) full time permanently employed persons.
- 15.5 All vehicles used by employees must be parked within the premises.
- 15.6 No vehicles associated with the use shall park or queue on surrounding streets.
- 15.7 No vehicles arriving or departing the site or standing on street awaiting the site's opening contrary to the hours of operation restrictions contained in Condition 17.1.
- 15.8 No bins or trucks or trailers being parked or left on the street should they arrive outside the hours set out in Condition 17.1 and appropriate procedures to ensure this shall be prepared and communicated regularly to all company, contract or other drivers who would bring bins/trucks to the site.
- 15.9 The person operating under this consent shall take steps to encourage 'back loading' of recovered materials - that is the removal of processed materials in trucks used to bring raw waste to the site.

CHAPTER 16 – UTILITIES

- 16.1 That the person operating under this consent shall liaise with the Sydney Water Corporation, Energy Australia, AGL and a telecommunications provider concerning the provision of utility services to the site and any works to such services resulting from the development shall be at no cost to Council.
- 16.2 That, if required by the electricity supply authority, an area of land for a substation to be established shall be dedicated to such authority in accordance with their size and locational requirements provided these are not in the required landscaped setback areas.
- 16.3 That all materials and equipment associated with the use shall be stored on the premises in a neat and tidy manner behind the existing fence and not visible external to the site.

CHAPTER 17 – OPERATIONS

- 17.1 The hours of operation being restricted to:
- (a) For landfill, processing of materials and arrival and departure of trucks 7.00am to 6.00pm Mondays to Fridays, and 7.30am to 4.00pm Saturdays.
 - (b) For inward movement of goods only (no processing or outwards goods movement) 9.00am to 3.00pm Sundays (in addition to the above hours); and
 - (c) For inward movements of goods only (no processing or outwards goods movement) 9.00am to 3.00pm on public holidays for trucks of not more than 2 tonnes.
 - (d) For maintenance and office activities 7.00am to 7.00pm Mondays to Fridays, 7.30am to 5.00pm Saturdays and 9.00am to 3.00pm Sundays and public holidays.
- 17.2 No putrescible, medical or hazardous waste shall be received at the recycling facility or processed at any time and all loads shall be checked upon arrival to ensure such.
- 17.3 paper or plastic received at the site shall be stored in a contained environment to prevent them being windblown off the site until such time as they can be disposed of or removed from the site.
- 17.4 Any liquid waste, medical waste, toxic, contaminated or hazardous wastes received at the site shall be turned away and if any such waste is discovered in other loads it shall be stored and disposed of in accordance with the requirements of the DEC as expeditiously as possible. Only waste of a type permitted by the DEC Environment Protection Authority's Environment Protection Licence shall be accepted for disposal at the site.
- 17.5 All incoming loads shall be inspected to ensure compliance with Condition 17.4 above.
- 17.6 No dangerous goods being stored on the site other than fuels and lubricants required for the operation of plant and equipment on the site.
- 17.7 That no controlled composting of green wastes (general garden vegetation), involving the use of offal, animal products or food waste or similar putrescible materials, shall occur on the site.
- 17.8 The development shall be undertaken in accordance with the proposal contained in Development Application DA2000300514 and supporting documentation. The proponent is limited to processing 240,000 tonnes per annum of waste through the recovery facility.
- 17.9 Only the following range of materials may be separated for recycling and reprocessing at the facility:
- Wood and green waste
 - Metals
 - Glass
 - Plastics; and

- Inert aggregate and inert construction and demolition materials
- 17.10 The stockpiles of recovered materials must not exceed the following limits:
- Timber for reuse - 2000 tonnes
 - Shredded timber and green waste - 2000 tonnes
 - Metal scrap - 500 tonnes
 - Glass - 500 tonnes
 - Plastic - 500 tonnes
- 17.11 The use of the premises shall not give rise to:
- (a) Transmission of offensive noise to any place of different occupancy, and
 - (b) a sound pressure level at any affected premises that exceeds the background (LA90) noise level in the absence of the noise under consideration by more than 5dB(A). The source noise level shall be assessed as an LA eg. 15min and adjusted in accordance with EKPA guidelines for tonality, frequency weighting, impulsive characteristics, fluctuations and temporal content, and
 - (c) A sound pressure level at any affected premises that exceeds the recommended planning levels outlined in the EPA Industrial Noise guidelines.
- 17.12 Noise and vibration from the use and operation of any plant and equipment and/or building services associated with the premises shall not give rise to "offensive noise" as defined under the Protection of the Environment (Operations) Act 1997.
- 17.13 That the use of the premises shall not give rise to the emission into the surrounding environment of gases, vapours, dusts or other impurities at levels or concentrations which are injurious or prejudicial to health.
- 17.4 Any site works or the like necessary for the carrying out of this development (landscaping, installation of irrigation pipes etc) being carried out between the hours of 7.00am and 6.00pm Mondays to Fridays.
- 17.15 *The person acting on this consent must engage a suitably qualified expert to conduct assessments and prepare a report identifying the extent of any potentially offensive odour emissions that may be generated beyond the boundary of the premises.***
- The scope of the report must be developed in consultation with the EPA and may include revised air dispersion modelling based on actual site emissions data, field investigations according to German standards, and/or use of field olfactometers, and analysis of detailed complaints records and on-site meteorological data.***
- 17.16 ***The person acting on this consent shall:***
- (a) Implement suitable measures to prevent unnecessary proliferation of litter both on and off the site; and***
 - (b) Inspect and, using best endeavours, clear the site and surrounding area of litter on a daily basis.***

(As modified by DU/2003/635/C, dated 2 April 2013)

18 ADDITIONAL CONDITION

~~18.1 That the nature strip in front of 1 Holland Street shall be kept in a clean, tidy and weed free condition at all times.~~

~~18.2 That 1 Holland Street shall be used only for bin storage, metal scaffolding and equipment storage, office use and showroom, truck, bus, vehicle, plant and equipment parking, mechanical repairs to trucks, vehicles, plant and equipment, sorting, transfer, stacking of glass, metals, plastics, brick and concrete tiles and pavers. 1 Holland Street should not involve oil changing, vehicle washing or like activities that generate a potential for water pollution.~~

(As modified by DU/2003/635/C, dated 2 April 2013)

18.3 Access shall be permitted to the site via 1 Holland Street and access to 1 Holland Street shall be subject to the following conditions applicable to the site and subject also to:

- (a) Hours of access and egress as follows:
 - a. 7.00am to 7.00am Mon to Friday
 - b. 7.30am to 5.00pm Saturday
 - c. 9.00am to 3.00pm Sundays and public holidays

(b) All trucks and vehicles (including cars) shall travel via Burrows Road or Euston Road and then via Campbell road and Harber Street to enter or leave the site.

18.4 That mining or gas exploration or extraction activities be prohibited on the site due to the proximity to residences, the safety and health risks associated with gas extraction, and the uncertainty over the effect of coal seam gas extraction on the local environment and aquifers, and the potential to further contaminate the land.

(As modified by DU/2003/635/C, dated 2 April 2013)

**In the Land and
Environment Court
of New South Wales**

No. 10079 of 2005

Tallina Pty Limited
ACN 090 716 895
Applicant

**Alexandria Landfill Pty
Limited**
First Respondent

City of Sydney Council
Second Respondent

Order

By consent the Court orders that:

1. The appeal be upheld.
2. Development Consent be granted for Alexandria Landfill Pty Limited to use the premises at 10-16 Albert Street St Peters (aka 314 Princes Highway St Peters) and otherwise known as Alexandria Landfill for the purposes set out in, and subject to, the Conditions of Consent annexed hereto and marked "Annexure A".
3. Each party bear its own costs.

Ordered: 28 September 2006



"ANNEXURE A"

CONDITIONS OF CONSENT

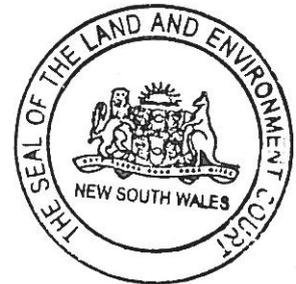
Development Consent to use the premises for waste transfer, recycling and resource recovery involving sorting, crushing, shredding, screening, stockpiling and on-selling recyclables and associated plant and vehicle maintenance all in conjunction with the continued use of the premises as a solid waste landfill depot relating to the property situated at:

1 HOLLAND STREET ST PETERS NSW 2044 AND 314 PRINCES HIGHWAY
AKA 10 - 16 ALBERT STREET (LOT 11/1013168 & LOT 100/845651)

The Development Consent is subject to the following conditions:

Index:

- Chapter 1 – Licenses
- Chapter 2 – Bunds
- Chapter 3 – Panel Wall
- Chapter 4 – Designated Operations Area
- Chapter 5 – Stockpiles
- Chapter 6 – Loads
- Chapter 7 – Wheel Wash
- Chapter 8 – Water Spray
- Chapter 9 – Water Quality
- Chapter 10 – Stormwater and Groundwater
- Chapter 11 – Wind Measurement
- Chapter 12 – High Wind
- Chapter 13 – Dust Management
- Chapter 14 – Roads
- Chapter 15 – Parking
- Chapter 16 – Utilities
- Chapter 17 – Operations
- Chapter 18 – Additional Conditions



CHAPTER 1 – LICENSES

- 1.1 That the development shall be carried out substantially in accordance with Drawing Nos. A2152001-2005, Environmental Impact Statement prepared by Patrick James received by Council on 13 August 2003 and detail submitted to Council on 12 August 2003 and the Alexandria Landfill Site Water & Leachate Management Plan (September 2004) and additional information submitted to Council on 20 October 2003 and 7 April 2004 and drawings No. 05F and 06A, marked Plan 1 and Plan 2 respectively, given to

the Land and Environment Court forming part of this Consent Condition and as amended by conditions of this consent.

- 1.2 The development the subject of this consent is limited to a period of 5 years from the date of this consent, being the date Consent is granted by the Court. However, if an application for an extension of time under this condition is lodged with the consent authority at least 3 months before the required date for cessation of the development under this condition, the development can continue to be carried out until such time as that modification application is finally determined. Any such modification application must include details of possible additional ingress and egress points to the site.
- 1.3 That the use shall cease within 6 months of the cessation of the current solid waste landfill operation if such use ceases prior to the 5 year limit contained in condition 1.2 above.
- 1.4 The person operating under this consent shall submit a geo-technical report on the stability of the cliff face and undertake any necessary work to prevent failure of the cliff face. The report shall also recommend and put in place regular inspections of the cliff face to ensure the ongoing safety of the site and adjacent properties. A copy of future inspection reports shall be submitted to Council.
- 1.6 All site works complying with the occupational health and safety requirements of WorkCover NSW.
- 1.7 Any pollution reduction programs which the NSW Department of Environment and Conservation ("DEC") may attach to their licence for the proposal to address environmental management of the premises shall be complied with.
- 1.8 The licensee must operate the proposed recycling facility in accordance with the SWLMP (or any updated version reference) that was negotiated and agreed to by the DEC and the licensee.
- 1.9 The environmental protection measures as detailed in Section 8 of the Environmental Impact Statement, dated 7 August 2003 submitted with the application shall, except if inconsistent with any other conditions of the consent, be implemented and carried out.
- 1.10 A separate application being submitted to, and approved by, Council prior to the erection of any advertisements or advertising structures.
- 1.11 Hazardous and/or industrial waste arising from the operational activities being removed (generated) and/or transported in accordance with the requirements of the DEC and the NSW WorkCover Authority pursuant to the provisions of the following:-
 - Protection of the Environment Operations Act 1997;
 - Protection of the Environment Operations (Waste) Regulation 2005;



- Waste Minimisation & Management Act 1995;
- NSW Occupational Health & Safety Act 2000;
- NSW Construction Safety Act 1912 (Regulation 84A-J Construction Work involving Asbestos or Asbestos Cement 1983);
- The Occupational Health and Safety (Hazardous Substances) Regulation 1996;
and
- The Occupational Health and Safety (Asbestos Removal Work) Regulation 1996.

CHAPTER 2 – BUNDS

- 2.1 The person operating under this consent shall,
- (a) increase the volume and height of the existing bund shown edged yellow on Plan 1 ("Existing Bund") to a height and to the approximate dimensions shown in Plan 1 and in the cross section on Plan 2; and
 - (b) vegetate the Existing Bund. This must include growing vegetation or putting a crusting agent on all sides of the Existing Bund and keeping it vegetated or covered with a crusting agent thereafter; and
 - (c) build a new bund of the approximate dimensions shown in Plan 1, of inert solid material on the area shown edged blue on Plan 1 and in the cross section on Plan 2 ("New Bund"); and
 - (d) vegetate the New Bund. This must include growing vegetation or putting a crusting agent on all sides of the New Bund and keeping it vegetated or covered with a crusting agent thereafter.

CHAPTER 3 – PANEL WALL

- 3.1 Subject to obtaining a Construction Certificate (if required) the person operating under this consent shall by 31 March 2006 install a Panel between points marked "X" and "Y" on plan 1 to prevent dust migration onto the neighbouring property at 1-3 Burrows Road Alexandria.
- 3.2 The Panel must be of the same or a similar material to the material of the acoustic boundary wall already installed by Tip Fast.
- 3.3 Thereafter the person operating under this consent must maintain that Panel in state of repair and condition.



CHAPTER 4 - DESIGNATED OPERATIONS AREAS

- 4.1 The person operating under this consent will ensure that stockpiles of materials the particle size of which is less than 20mm (being soil or fines or sand) shall only be

located in the area shown on Plan 1 as hatched pink ("the Pit Area") and the stockpiles of materials so placed will be either:

- (a) within range of an operational sprinkler and kept damp to prevent dust migration; or
- (b) covered with a fabric cover to ensure that no dust is able to escape from the stockpile; or
- (c) hardened with a crusting agent; or
- (d) protected to ensure that no dust is able to escape from the stockpile.

4.2 The person operating under this consent must ensure that any land or materials in:

- (a) the Pit Area must not exceed a height of RL 10 and any processing which occurs in the Pit Area must be done below a height of RL 8;
- (b) the Hatched Area (save for the Existing Bund and the New Bund) must not be used for the processing, crushing or grinding of any materials and must not exceed a height of RL 10 and must not be used for the stockpiling of materials unless the material has at least one dimension which is greater than 100mm, such stockpiles not to exceed the height of the higher of the Existing Bund and the New Bund;
- (c) The area shown hatched blue on Plan 1 must:
 - (i) not include any stockpiles of materials unless the relevant material has at least one dimension which is greater than or equal to 30mm except that bitumen of any dimension may be stockpiled in that area; and
 - (ii) not exceed the height of the higher of the Existing Bund and the New Bund; and
 - (iii) not be used for processing, crushing or grinding other than within a waste processing and transfer facility that is within a permanent or temporary building or structure (except that bitumen may be processed in that area). If no such structure or building currently exists, the person operating under this consent must apply for development consent for such a structure or building in order to carry out those activities; and
- (d) the area shown hatched green on Plan 1 may include "show piles" that are contained within concrete walls and wetted but they must not exceed the height of the higher of the Existing Bund and the New Bund; and



(e) the area shown hatched red on Plan 1 must:

1. not include any stockpiles of materials unless the relevant material has at least one dimension which is greater than or equal to 30mm; and
2. not exceed the height of the higher of the Existing Bund and the New Bund; and
3. not be used for processing, crushing or grinding at any time.

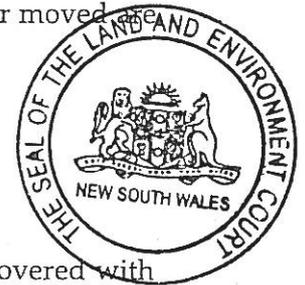
4.3 The sizes of the materials in the show piles do not have dimension restrictions. The show piles will be limited to the size of show bays.

CHAPTER 5 – STOCKPILES

- 5.1 The operator must ensure that all stockpiles are wetted prior to material being removed from them for processing, and that during processing, they are kept wet and high-pressure water sprays are utilized to prevent the migration of dust.
- 5.2 Crushing, grinding and screening of the stockpiles shall be subject to stringent dust mitigation measures utilising water sprays on the processing equipment at all times without a break during processing so that the materials being processed or moved sufficiently wetted so as to prevent fugitive dust emissions.

CHAPTER 6 – LOADS

- 6.1 All vehicles carrying materials to or from the site must have their loads covered with tarpaulins or similar covers. The operator must advertise on its website, all advertising brochures and all advertisements that it is only able to receive covered loads.



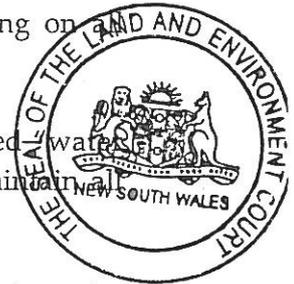
CHAPTER 7 – WHEEL WASH

- 7.1 All vehicles leaving the Site must be first put through a wheel wash except those that have not been in a landfilling or processing area.
- 7.2 The roadway between the wheel wash and the exit of the site is to be kept clean by satisfactory methods employed within the site addressing tracking of mud and sediments.

CHAPTER 8 – WATER SPRAY

- 8.1 All haul roads and stockpile areas must be regularly watered to prevent dust emissions from the Site migrating onto neighbouring land.

- 8.2 The vehicle routes in use around the site, except for concreted hardstand, are to be kept damp from 7am to 5 pm Monday to Friday and 7am to 4pm Saturday.
- 8.3 Dust emissions from the stockpiles and other areas of the Site shall be suppressed at all times by a permanently installed irrigation system and by a water truck.
- 8.4 The installed suppression system shall be designed such that it will automatically operate to spray a sufficient amount of water to suppress dust and to prevent fugitive emissions whenever wind speeds as measured by the anemometer installed on the Site exceed 30 km/hour and when it is not raining, even when the Site is not open. If the water sprays create a nuisance to neighbouring sites located between 292 degrees from the North West through to 45 degrees from the North East (measured clockwise) of the Premises, such water spraying operations within that area are to be suspended until further notice from council. For the purposes of this clause, water spraying operations at the southern end of the site along the boundary of the Tip Fast premises (location indicated on plan 1 as "Water spray installation") for the benefit of the property known as 1 – 3 Burrows Road must not be suspended unless the owner of 1 – 3 Burrows Road requires suspension, in which case the person operating under this consent must suspend forthwith until further notice by that owner.
- 8.5 Dust sprays and/or dust collection systems must be installed and operating on crushing, grinding and screening equipment at the Site.
- 8.6 The site operator must install sprinkler or spray systems along points marked "water spray installation" on Plan 1. Person operating under this consent must maintain all sprinklers or spray systems in good condition.
- 8.7 The person operating on this consent must install sprinkler or spray systems along the perimeter escarpment of the pit area of the site. Person operating under this consent must maintain all sprinklers or spray systems in good condition.



CHAPTER 9 – WATER QUALITY

- 9.1 Any water (other than any water directly from Sydney Water's mains supply) that is used for dust control, fire fighting or the like on the Site shall be:
- (a) of a quality that would be acceptable to Sydney Water as trade waste; and
 - (b) of primary human contact quality such that it will cause no harm to the health of persons who may come into contact with such water.
- 9.2 If any water is used on the Site (other than any water directly from Sydney Water's mains supply) then it shall be tested as required by DEC NSW by an independent water expert.

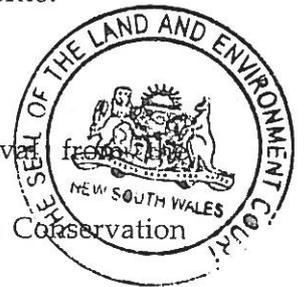
- 9.3 If the water quality shown by the tests fails to meet the specified criteria, the processing of materials shall cease unless the water used for dust suppression and the like is replaced with water that is compliant with DEC NSW requirements.
- 9.4 If the required water in such a case is not available the processing of material shall cease forthwith.

CHAPTER 10 – STORMWATER AND GROUNDWATER

- 10.1 The person operating under this consent shall be responsible for the future maintenance, upgrade, improvements and/or renewal of the stormwater drainage line approved by Marrickville Council Determination No.199901506. Details of the proposed future maintenance/inspections of the existing stormwater pipeline including a schedule of regular inspections shall be submitted to and accepted by Marrickville Council. A copy of all future inspection reports shall also be submitted to Council.
- 10.2 The stormwater drainage line within the property shall be inspected by Closed Circuit Television (CCTV) and a video copy provided to Council so as to determine the condition of the existing drainage line through the site. Any defects in the drainage line shall be repaired at no cost to Council. The stormwater line shall again be inspected upon completion of any necessary repairs and a video copy provided to Council.
- 10.3 The terms of Approval for Integrated development relating to Water Licence (Water Act, 1912). Under the provisions of Part V (s116) of the Water Act (2012), this licence shall be valid for the period of the development consent.
- 10.4 That the licensee shall allow the NSW Department of Natural Resources, or its authorised representatives, subject to appropriate occupational health and site safety provisions, full and free access to the works (i.e groundwater interception works and groundwater investigation/monitoring bores), for the purpose of undertaking inspection or test of works and its fittings, and shall carry out any work or alterations deemed necessary by the Department of Natural Resources to ensure the protection and maintenance of the works, or the control of the water extracted and for the protection of the quality and the prevention from pollution/contamination of surface and subsurface water.
- 10.5 The licensee shall notify the NSW Department of Natural Resources, if the works (ie groundwater interception works, investigation/monitoring bores) are to be abandoned and, contingent with site safety requirements, seal off the works by:
- backfilling the work to ground level with clay or cement, or
 - other methods agreed to or directed by the NSW Department of Natural Resources.



- 10.6 Any groundwater interception works for purposes of leachate control, groundwater investigation and/or groundwater monitoring are required to be licensed and a bore licence application shall be submitted and a licence obtained from the NSW Department of Natural Resources. Completion details (Form A - Particulars of completed bore) of all bores and/or detailed construction information for the groundwater interception works are required to be forwarded to the NSW Department of Natural Resources within three (3) months of the date of this Determination.
- 10.7 Any licence granted authorises groundwater interception to address leachate control and dust suppression use on-site only and no entitlement to the groundwater intercepted for any other water supply purpose is authorised.
- 10.8 The licensee will ensure that operational site plans promote the sustainable use and management of local natural resources.
- 10.9 The licensee shall not allow any discharge of intercepted waters into or onto:
- any adjoining public or crown land;
 - any other persons land without written permission;
 - any creek, river, water course or aquifer without approval from the determining authority;
 - any native vegetation as defined under the Native Vegetation Conservation Act (1997); or
 - any wetlands of environmental significance.
- 10.10 An efficient monitoring system must be installed to the satisfaction of the NSW Department of Natural Resources to measure the groundwater interception (dewatering) activity, both quality and quantity. Any variation with the requirements given in this Condition must be approved by the NSW Department of Planning .
- 10.11 The proponent is to prepare an annual environmental management report and forward a copy to the NSW Department of Natural Resources. The environmental report should include the following:-
- (a) volume of groundwater intercepted and pumped off-site for each of the two Botany Sands interception systems (weekly volumes);
 - (b) groundwater levels in the four shale boreholes and in the Botany Sands monitoring bore (monthly measurements); and
 - (c) the results of bi-annual water quality samples from monitored groundwater and surface water systems including groundwater from the interception works and stormwater discharge. The list of analytes should include those given in the Department's 'Recommended Bore Licence Minimum Analytical Suite' for the Botany Sands Aquifer (see attached information sheet).



- 10.12 After receipt of the licence, the proponent shall provide NSW Department of Natural Resources on an annual basis with the interpreted report on monitoring, detailing the quantity of water pumped from the facility in the previous 12 months as per condition 10.11 (a), the water level data described in condition 10.11(b), water quality data described in condition 10.11 (c) and detailing any changes to the environment that may trigger the need for remedial action.
- 10.13 Tabulated hydrologic and hydraulic calculations that demonstrate the adequacy of the existing site stormwater drainage system being submitted to and accepted by Council before the issue of a Construction Certificate. Such calculations shall include any remedial measures necessary to rectify defects in the existing system. Where the existing system is to be interfaced with proposed site drainage, the calculations shall clearly demonstrate the adequacy of the existing drainage network to accept the additional stormwater flows.
- 10.14 The operation of the premises being conducted in a manner which does not pollute waters as defined by the Protection of the Environment Operations Act 1997.
- 10.15 All wastewater and stormwater treatment devices (including drainage systems, sumps and traps) being regularly maintained in order to remain effective. All solid and liquid wastes collected from the device must be disposed of in accordance with the Protection of the Environment Operations Act, 1997.
- 10.16 Only clean and unpolluted water shall be permitted to discharge from the subject premises into Council's stormwater drainage system.
- 10.17 Sign(s) being displayed and maintained adjacent to all stormwater drains on the premises, clearly indicating 'Clean water only - No wastewater or rubbish'.



CHAPTER 11 - WIND MEASUREMENT

- 11.1 An anemometer shall be maintained on the Site at all times and shall be installed and operated in accordance with its manufacturer's instructions.
- 11.2 The anemometer shall be linked to a device that issues a warning and which activates mist sprays along the perimeter escarpment of the Pit Area in the south east of the site and appropriate sprays in areas where processing is carried out in the open air when wind speeds exceed 30 km/h and it is not raining. If the water sprays create a nuisance to neighbouring sites located between 292 degrees from the North West through to 45 degrees from the North East (measured clockwise) of the Premises, such water spraying operations within that area are to be suspended until further notice from council. For the purposes of this clause, water spraying operations at the southern end of the site along the boundary of the Tip Fast premises (location indicated on plan 1 as "Water spray installation") for the benefit of the property known as 1 - 3 Burrows

Road must not be suspended unless the owner of 1 – 3 Burrows Road requires suspension, in which case the person operating under this consent must suspend forthwith until further notice by that owner.

- 11.3 The anemometer shall be maintained and checked regularly to ensure it is in good working order during the hours of operation of the Site.

CHAPTER 12 – HIGH WIND

- 12.1 When the wind speed is measured above 30 kms per hour and when it is not raining those parts of the Site with a potential for dust generation must be continuously kept damp or high pressure mist sprays shall be activated along the perimeter of the Pit Area or any area used for processing. If the water sprays create a nuisance to neighbouring sites located between 292 degrees from the North West through to 45 degrees from the North East (measured clockwise) of the Premises, such water spraying operations within that area are to be suspended until further notice from council. For the purposes of this clause, water spraying operations at the southern end of the site along the boundary of the Tip Fast premises (location indicated on plan 1 as "Water spray installation") for the benefit of the property known as 1 – 3 Burrows Road must not be suspended unless the owner of 1 – 3 Burrows Road requires suspension, in which case the person operating under this consent must suspend forthwith until further notice by that owner.

CHAPTER 13 – DUST MANAGEMENT

- 13.1 Prior to the use commencing a plan of management detailing treatment techniques to eliminate the tracking of sediment onto the egress road and onto public streets by vehicles exiting the site shall be submitted to Council's satisfaction; such plan shall include daily cleaning of the roadway between the entry and the weighbridge and details of a truck wheel wash and other exit treatment techniques in order to stabilise the area so as to eliminate the tracking of sediments onto the egress road and public streets by vehicles exiting the site.
- 13.2 Appropriate measures shall be adopted to prevent run off or liquids or mud onto neighbouring land.
- 13.3 An employee of the business shall regularly inspect the roadways within 100 metres of the site entrance to check for any material deposited thereon by vehicles entering or leaving the site and if such is observed the deposits shall be promptly and completely cleaned up (not washed or swept into Council's gutters and drains).
- 13.4 The results of the air sampling tests to be recorded, assessed and reviewed by an Independent Consultant practicing in air quality assessments and submitted to Council within twelve (12) months of the operation of the premises, with any



recommendations of the Independent Consultant being incorporated into the operation of the premises.

- 13.5 All mechanical, degreasing and pressure cleaning operations being conducted within the workshop/maintenance building. In this regard, a Trade Waste Permit is to be obtained from Sydney Water prior to the commencement of the use.
- 13.6 The operation of the premises being carried out in accordance with the requirements of the WorkCover Authority and the DEC at all times. In this regard it may be necessary to obtain licences under the Waste Minimisation and Management Regulations 1997 and the Protection of the Environment (operations) Act 1997.
- 13.7 (a) That existing and future vehicle routes forming part of the lower level roads to the pit area at the site shall be covered with dust suppressing material, such as wetted wood chips in accordance with the Site's Dust Management Plan (DMP).
- (b) That existing and future vehicle route on the upper level of the site be paved in concrete or asphalt or other dust suppressing material within three months of this consent being granted.
- (c) That existing and future vehicle routes are to be kept as free of dust as practicable at all times.
- 13.8 The Hatched Area on Plan 1 must be levelled to a height of no more than RL 10 and paved, concreted or covered with compacted bitumen. The person operating under this consent must maintain that area at that level and must maintain the paved, concreted or compacted bitumen so as to minimise the escape of dust. This is subject to condition 4.2(b).
- 13.9 When moving materials for the purpose of carrying out condition 13.8 materials must be kept wetted at all times and the site operator must also use its best endeavours not to cause a dust nuisance.
- 13.10 That any future filling, from the date of this consent, in the road proposal affected area shall be clean fill and fully compacted.
- 13.11 Any filling on the Site must be done with materials permitted by the DEC site licence and must be fully compacted.
- 13.12 Tipping drop heights being minimised to prevent fugitive dust emissions.
- 13.13 The person operating under this consent must submit to the DEC/EPA and implement a Dust Management Plan ("DMP") within 3 months from the date of this Determination.
- 13.14 The DMP should include but should not be limited to:



- Controlling dust emissions from processed waste stockpiles;
- Controlling dust emissions from unprocessed waste stockpiles;
- Controlling dust emissions from processing waste materials; and
- Preventing dust, waste or waste water from the wheel wash being tracked from the premises by vehicles on the premises.

The DMP is to be prepared by an appropriately qualified and independent person.

CHAPTER 14 – ROADS

- 14.1 All deliveries to and from the site using trucks of 2 tonne or greater capacity, being restricted to using Canal Road, Burrows Road, Campbell Road, Barwon Park Road and the Princes Highway. Vehicles of 2 tonne or greater capacity shall not use Euston Road, north of Huntley Street, nor Sydney Park Road. Signs to facilitate this route being erected at the weighbridge and front gate and company drivers shall being so instructed and regular customers/suppliers shall be advised in writing.
- 14.2 Access to the site shall be as follows:
- (a) Outside the hours of 7.00am to 6.00 pm Mondays to Fridays and 7.30am to 5.00pm Saturdays, all trucks of greater than 2 tonne capacity arriving or departing the site shall not use Campbell Street or Campbell Road east of Barwon Park Road. To facilitate this signs shall be erected at the weighbridge and front gate, company drivers shall be so instructed and regular customers/suppliers shall be advised in writing.
 - (b) Access Hours to the site through 1 Holland Street and Access Hours to 1 Holland Street is dealt with in Condition 18.3.
- 14.3 At no time shall any truck arrive or depart the site via Albert Street or Campbell Lane;
- 14.4 All vehicles entering and leaving the site in a forward direction.
- 14.5 No semi trailers or trucks with dog trailers accessing the site on Sundays.
- 14.6 A 15 km/h speed limit shall apply on the site and shall be signposted accordingly.
- 14.7 No access to and from the site shall be via Albert Street from the Princes Highway.
- 14.8 A road opening permit shall be obtained for all works carried out in public roads or Council controlled lands. Restorations shall be in accordance with Marrickville Council's Restorations Code. Failure to obtain a road opening permit will incur a fine.



additional charge for unauthorised openings in the amount of \$1,321.30, as provided for in Council's adopted fees and charges.

- 14.9 The owner or builder shall sign a written undertaking that they shall be responsible for the full cost of repairs to footpath, kerb and gutter, or other Council property damaged as a result of construction of the proposed development. Council may utilise part or all of any Building Security Deposit (B.S.D.) or recover in any court of competent jurisdiction, any costs to Council for such repairs.

CHAPTER 15 – PARKING

- 15.1 Twenty five (25) off-street car parking spaces being provided, paved, line marked and maintained at all times in accordance with the standards contained within Marrickville Development Control Plan No. 19 - Parking Strategy prior to the commencement of the use.
- 15.2 All parking spaces and turning area thereto being provided in accordance with the design requirements set out within Marrickville Council's Development Control Plan No. 19 - Parking Strategy, and being used exclusively for parking and not for storage or any other purpose.
- 15.3 All parking spaces and access thereto shall be used exclusively for parking and access and shall not be used for storage or any other purpose.
- 15.4 If at any time during this consent more than twenty (20) persons are employed on a full-time permanent basis by the person operating under this Consent and are present at the premises at any one time the Site Operator shall provide one additional (1) parking spot for every additional three (3) full time permanently employed persons
- 15.5 All vehicles used by employees must be parked within the premises.
- 15.6 No vehicles associated with the use shall park or queue on surrounding streets.
- 15.7 No vehicles arriving or departing the site or standing on street awaiting the site's opening contrary to the hours of operation restrictions contained in Condition 17.1.
- 15.8 No bins or trucks or trailers being parked or left on the street should they arrive outside the hours set out in Condition 17.1 and appropriate procedures to ensure this shall be prepared and communicated regularly to all company, contract or other drivers who would bring bins/ trucks to the site.
- 15.9 The person operating under this consent shall take steps to encourage 'back loading' of recovered materials - that is the removal of processed materials in trucks used to bring raw waste to the site.



CHAPTER 16 – UTILITIES

- 16.1 That the person operating under this Consent shall liaise with the Sydney Water Corporation, Energy Australia, AGL and a telecommunications provider concerning the provision of utility services to the site and any works to such services resulting from the development shall be at no cost to Council.
- 16.2 That, if required by the electricity supply authority, an area of land for a substation to be established shall be dedicated to such authority in accordance with their size and locational requirements provided these are not in the required landscaped setback areas.
- 16.3 That all materials and equipment associated with the use shall be stored on the premises in a neat and tidy manner behind the existing fence and not visible external to the site.

CHAPTER 17 – OPERATIONS

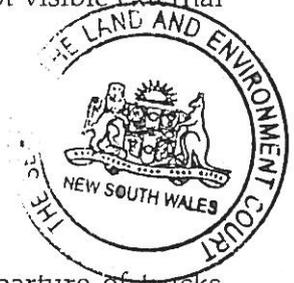
17.1 The hours of operation being restricted to:

- (a) For landfill, processing of materials and arrival and departure of trucks 7.00am to 6.00pm Mondays to Fridays, and 7.30am to 4.00pm Saturdays;
- (b) For inward movement of goods only (no processing or outwards goods movement) 9.00am to 3.00pm Sundays (in addition to the above hours); and
- (c) For inward movements of goods only (no processing or outwards goods movement) 9.00am to 3.00pm on public holidays for trucks of not more than 2 Tonnes.
- (d) For maintenance and office activities 7.00am to 7.00pm Mondays to Fridays, 7.30am to 5.00pm Saturdays and 9.00am to 3.00pm Sundays and public holidays.

17.2 No putrescible, medical or hazardous waste shall be received at the recycling facility or processed at any time and all loads shall be checked upon arrival to ensure such.

17.3 Paper or plastic received at the site shall be stored in a contained environment to prevent them being windblown off the site until such time as they can be disposed of or removed from the site.

17.4 Any liquid waste, medical waste, toxic, contaminated or hazardous wastes received at the site shall be turned away and if any such waste is discovered in other loads it shall be stored and disposed of in accordance with the requirements of the DEC as



expeditiously as possible. Only waste of a type permitted by the DEC Environment Protection Authority's Environment Protection Licence shall be accepted for disposal at the site.

- 17.5 All incoming loads shall be inspected to ensure compliance with Condition 17.4 above.
- 17.6 No dangerous goods being stored on the site other than fuels and lubricants required for the operation of plant and equipment on the site.
- 17.7 That no controlled composting of green wastes (general garden vegetation), involving the use of offal, animal products or food waste or similar putrescible materials, shall occur on the site.
- 17.8 The development shall be undertaken in accordance with the proposal contained in Development Application DA200300514 and supporting documentation. The proponent is limited to processing 240,000 tonnes per annum of waste through the recovery facility.
- 17.9 Only the following range of materials may be separated for recycling and reprocessing at the facility:-
- wood and green waste;
 - metals;
 - glass;
 - plastics; and
 - inert aggregate and inert construction and demolition materials.

17.10 The stockpiles of recovered materials must not exceed the following limits:

- Timber for reuse – 2000 Tonnes
- Shredded timber and green waste – 2000 Tonnes
- Metal scrap – 500 Tonnes
- Glass – 500 Tonnes
- Plastic – 500 Tonnes



17.11 The use of the premises shall not give rise to:

- (a) Transmission of offensive noise to any place of different occupancy, and
- (b) A sound pressure level at any affected premises that exceeds the background (LA90) noise level in the absence of the noise under consideration by more than 5dB(A). The source noise level shall be assessed as an LA eg, 15 min and adjusted in accordance with EPA guidelines for tonality, frequency weighting, impulsive characteristics, fluctuations and temporal content, and
- (c) A sound pressure level at any affected premises that exceeds the recommended planning levels outlined in the EPA Industrial Noise guidelines.

- 17.12 Noise and vibration from the use and operation of any plant and equipment and /or building services associated with the premises shall not give rise to "offensive noise" as defined under the Protection of the Environment (Operations) Act 1997.
- 17.13 That the use of the premises shall not give rise to the emission into the surrounding environment of gases, vapours, dusts or other impurities at levels or concentrations which are injurious or prejudicial to health.
- 17.14 Any site works or the like necessary for the carrying out of this development (landscaping, installation of irrigation pipes etc) being carried out between the hours of 7.00 am and 6.00pm Mondays to Fridays.

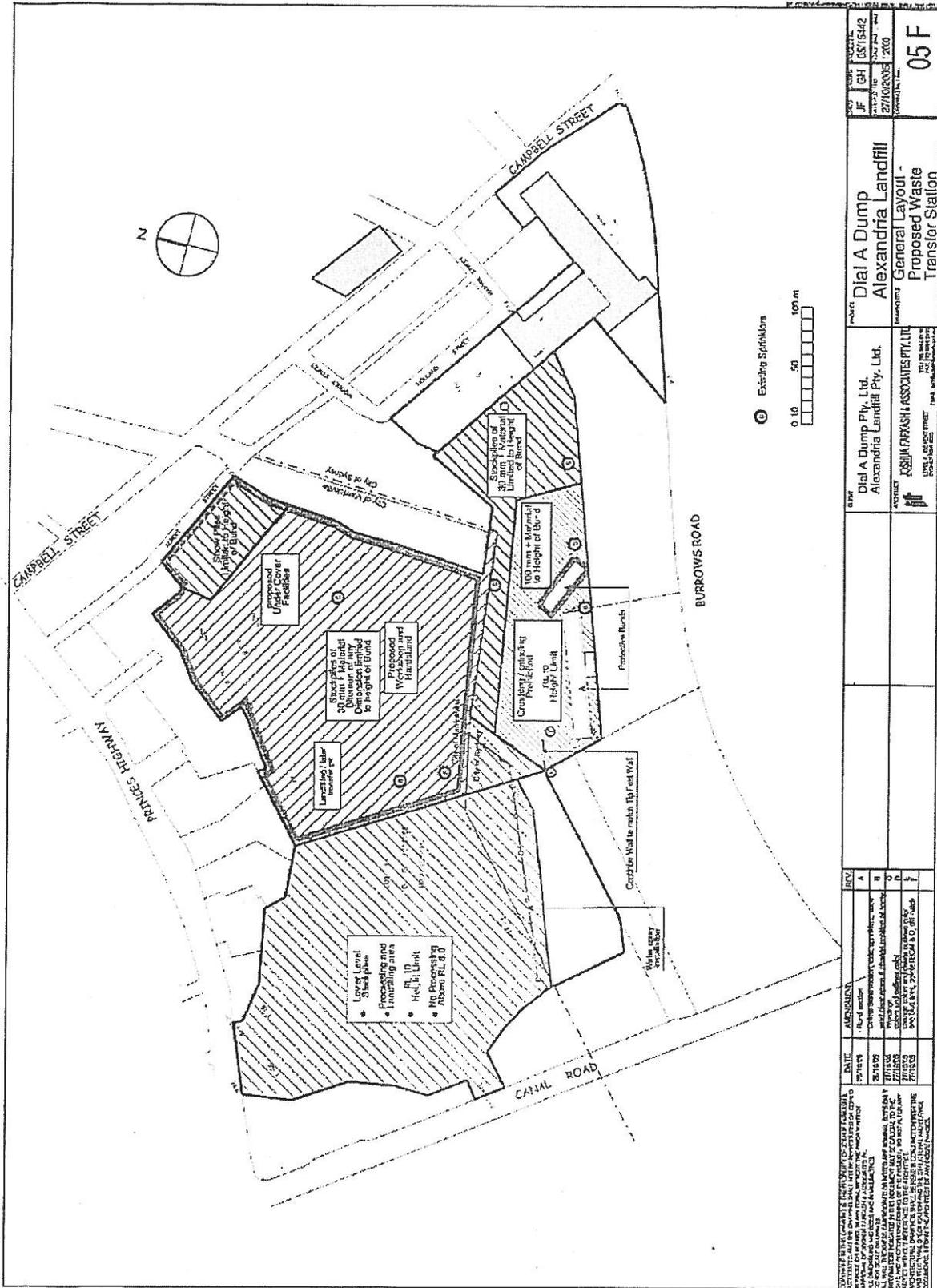
18 ADDITIONAL CONDITION

- 18.1 That the nature strip in front of 1 Holland Street shall be kept in a clean, tidy and weed free condition at all times.
- 18.2 That 1 Holland Street shall be used only for bin storage, metal scaffolding and equipment storage, office use and showroom, truck, bus, vehicle, plant and equipment parking, mechanical repairs to trucks, vehicles, plant and equipment, sorting, transfer, stacking of glass, metals, plastics, brick and concrete tiles and pavers. 1 Holland Street should not involve oil changing, vehicle washing or like activities that generate a potential for water pollution.
- 18.3 Access shall be permitted to the site via 1 Holland Street and access to 1 Holland Street shall be subject to the following conditions applicable to the site and subject also to:
- (a) Hours of access and egress as follows:
- a. 7.00am to 7.00am Mon to Friday
 - b. 7.30am to 5.00pm Saturday
 - c. 9.00am to 3.00pm Sundays and public holidays;
- (b) All trucks and vehicles (including cars) shall travel via Burrows Road or Euston Road and then via Campbell Rd and Harber Street to enter or leave the site.

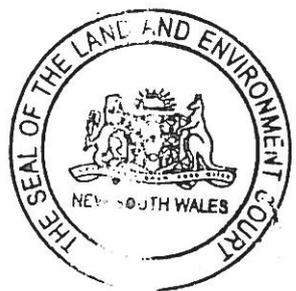
*** THE END ***

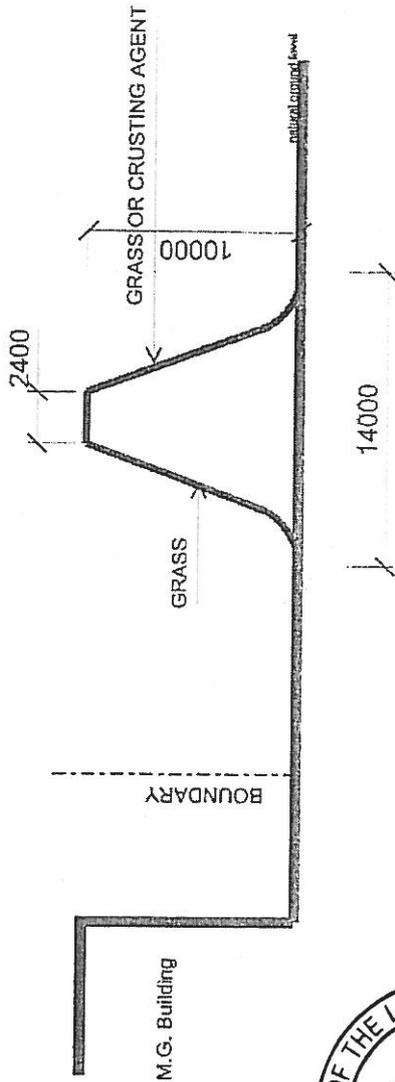


PLAN 1

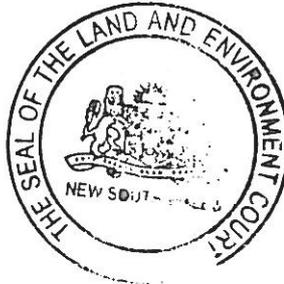


<p>STATE OF NEW SOUTH WALES DEPARTMENT OF ENVIRONMENT AND HERITAGE ACTIVITY AND THE ENVIRONMENTAL MANAGEMENT ACT 1994 ACTIVITY AND THE ENVIRONMENTAL MANAGEMENT ACT 1994 ACTIVITY AND THE ENVIRONMENTAL MANAGEMENT ACT 1994</p>		<p>DATE: 27/10/05 27/10/05 27/10/05 27/10/05</p>	<p>APPROVED: [Signature] [Signature] [Signature] [Signature]</p>	<p>REV: A B C D</p>	<p>PROJECT: Dial A Dump Alexandria Landfill CLIENT: Dial A Dump Pty. Ltd. Alexandria Landfill Pty. Ltd. CONSULTANT: ESH/INFRASTRUCTURE ASSOCIATES PTY. LTD. DRAWING NO: 27/10/05/05/001 DRAWING TITLE: General Layout - Proposed Waste Transfer Station SCALE: 1:500 SHEET NO: 05 F</p>
---	--	---	---	--	---





TYPICAL CROSS SECTION OF
 PROPOSED BOUNDARY BUND
 APPROXIMATE DIMENSIONS



<small> I HEREBY CERTIFY THAT THE INFORMATION CONTAINED IN THIS PLAN IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF AND THAT I AM A QUALIFIED PROFESSIONAL ENGINEER AND A MEMBER OF THE ENGINEERING BOARD OF NEW SOUTH WALES. </small>		DATE 27/10/05	AMENDMENT No. of binding A	PROJECT Dial A Dump Pty. Ltd. Alexandria Landfill Pty. Ltd. Proposed Waste Transfer Station Proposed Bund	DRAWN BY JF CHECKED BY GH DATE 27/10/05 SCALE 1:500	SHEET NO. 06 A
--	--	------------------	----------------------------------	---	--	-------------------

**In the Land and
Environment Court
of New South Wales**

No. 11646 of 2004

Tallina Pty Limited
ACN 090 716 895
Applicant

**Alexandria Landfill Pty
Limited**
First Respondent

Marrickville Council
Second Respondent

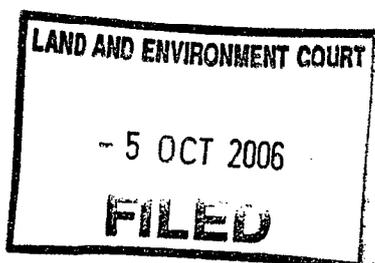
Order



By consent the Court orders that:

1. The appeal be upheld.
2. Development Consent be granted for Alexandria Landfill Pty Limited to use the premises at 10-16 Albert Street St Peters (aka 314 Princes Highway St Peters) and otherwise known as Alexandria Landfill for the purposes set out in, and subject to, the Conditions of Consent annexed hereto and marked "Annexure A".
3. Each party bear its own costs.

Ordered: 28 September 2006



"ANNEXURE A"

CONDITIONS OF CONSENT

Development Consent to use the premises for waste transfer, recycling and resource recovery involving sorting, crushing, shredding, screening, stockpiling and on-selling recyclables and associated plant and vehicle maintenance all in conjunction with the continued use of the premises as a solid waste landfill depot relating to the property situated at:

10-16 ALBERT STREET, ST PETERS (AKA 314 PRINCES HIGHWAY ST PETERS)

The Development Consent is subject to the following conditions:

Index:

- Chapter 1 – Licenses**
- Chapter 2 – Bunds**
- Chapter 3 – Panel Wall**
- Chapter 4 – Designated Operations Area**
- Chapter 5 – Stockpiles**
- Chapter 6 – Loads**
- Chapter 7 – Wheel Wash**
- Chapter 8 – Water Spray**
- Chapter 9 – Water Quality**
- Chapter 10 – Stormwater and Groundwater**
- Chapter 11 – Wind Measurement**
- Chapter 12 – High Wind**
- Chapter 13 – Dust Management**
- Chapter 14 – Roads**
- Chapter 15 – Parking**
- Chapter 16 – Utilities**
- Chapter 17 – Operations**
- Chapter 18 – Additional Conditions**



CHAPTER 1 – LICENSES

- 1.1 The development being carried out substantially in accordance with Drawing Nos. A2152001-2005 and details submitted to Marrickville Council ("Council") on 12 August 2003 and the Alexandria Landfill Site Water & Leachate Management Plan for Revised Filling Plan - October 2003 and additional information submitted to Council on 22 October 2003 and details of Interception and Sprinkler System submitted to Council on 13 April 2004 with the application for development consent and drawings

No. 05F and 06A, marked Plan 1 and Plan 2 respectively, given to the Land and Environment Court forming part of this Consent Condition and as amended by the following conditions.

- 1.2 The development the subject of this consent is limited to a period of 5 years from the date of this consent, being the date Consent is granted by the Court. However, if an application for an extension of time under this condition is lodged with the consent authority at least 3 months before the required date for cessation of the development under this condition, the development can continue to be carried out until such time as that modification application is finally determined. Any such modification application must include details of possible additional ingress and egress points to the site.
- 1.3 That the use shall cease within 6 months of the cessation of the current solid waste landfill operation if such use ceases prior to the 5 year limit contained in condition 1.2 above.
- 1.4 The person operating under this consent shall submit a geo-technical report on the stability of the cliff face and undertake any necessary work to prevent failure of the cliff face. The report shall also recommend and put in place regular inspections of the cliff face to ensure the ongoing safety of the site and adjacent properties. A copy of all future inspection reports shall be submitted to Council.
- 1.5 Deleted.
- 1.6 All site works complying with the occupational health and safety requirements of WorkCover NSW.
- 1.7 Any pollution reduction programs which the NSW Department of Environment and Conservation ("DEC") may attach to their licence for the proposal to address environmental management of the premises shall be complied with.
- 1.8 The licensee must operate the proposed recycling facility in accordance with the SWLMP (or any updated version reference) that was negotiated and agreed to by the DEC and the licensee.
- 1.9 The environmental protection measures as detailed in Section 8 of the Environmental Impact Statement, dated 7 August 2003 submitted with the application shall, except if inconsistent with any other conditions of the consent, be implemented and carried out.
- 1.10 A separate application being submitted to, and approved by, Council prior to the erection of any advertisements or advertising structures.
- 1.11 Hazardous and/or industrial waste arising from the operational activities being removed (generated) and/or transported in accordance with the requirements of the DEC and the NSW WorkCover Authority pursuant to the provisions of the following:-



- Protection of the Environment Operations Act 1997;
- Protection of the Environment Operations (Waste) Regulation 2005;
- Waste Minimisation & Management Act 1995;
- NSW Occupational Health & Safety Act 2000;
- NSW Construction Safety Act 1912 (Regulation 84A-J Construction Work involving Asbestos or Asbestos Cement 1983);
- The Occupational Health and Safety (Hazardous Substances) Regulation 1996;
and
- The Occupational Health and Safety (Asbestos Removal Work) Regulation 1996.

CHAPTER 2 – BUNDS

2.1 The person operating under this consent shall,

- (a) increase the volume and height of the existing bund shown edged yellow on Plan 1 (“Existing Bund”) to a height and to the approximate dimensions shown in Plan 1 and in the cross section on Plan 2; and
- (b) vegetate the Existing Bund. This must include growing vegetation or putting a crusting agent on all sides of the Existing Bund and keeping it vegetated or covered with a crusting agent thereafter; and
- (c) build a new bund of the approximate dimensions shown in Plan 1, of inert solid material on the area shown edged blue on Plan 1 and in the cross section on Plan 2 (“New Bund”); and
- (d) vegetate the New Bund. This must include growing vegetation or putting a crusting agent on all sides of the New Bund and keeping it vegetated or covered with a crusting agent thereafter.

CHAPTER 3 – PANEL WALL

- 3.1 The person operating under this consent must maintain the Panel installed between points marked “X” and “Y” on plan 1 to prevent dust migration onto the neighbouring property at 1-3 Burrows Road Alexandria.
- 3.2 The Panel must be of the same or a similar material to the material of the acoustic boundary wall already installed by Tip Fast.
- 3.3 Thereafter the person operating under this consent must maintain that Panel in a good state of repair and condition.



CHAPTER 4 - DESIGNATED OPERATIONS AREAS

- 4.1 The person operating under this consent will ensure that stockpiles of materials the particle size of which is less than 20mm (being soil or fines or sand) shall only be located in the area shown on Plan 1 as hatched pink ("the Pit Area") and the stockpiles of materials so placed will be either:
- (a) within range of an operational sprinkler and kept damp to prevent dust migration; or
 - (b) covered with a fabric cover to ensure that no dust is able to escape from the stockpile; or
 - (c) hardened with a crusting agent; or
 - (d) protected to ensure that no dust is able to escape from the stockpile.
- 4.2 The person operating under this consent must ensure that any land or materials in:
- (a) the Pit Area must not exceed a height of RL 10 and any processing which occurs in the Pit Area must be done below a height of RL 8;
 - (b) the Hatched Area (save for the Existing Bund and the New Bund) must not be used for the processing, crushing or grinding of any materials and must not exceed a height of RL 10 and must not be used for the stockpiling of materials unless the material has at least one dimension which is greater than 100mm, such stockpiles not to exceed the height of the higher of the Existing Bund and the New Bund;
 - (c) The area shown hatched blue on Plan 1 must:
 - (i) not include any stockpiles of materials unless the relevant material has at least one dimension which is greater than or equal to 30mm except that bitumen of any dimension may be stockpiled in that area; and
 - (ii) not exceed the height of the higher of the Existing Bund and the New Bund; and
 - (iii) not be used for processing, crushing or grinding other than within a waste processing and transfer facility that is within a permanent or temporary building or structure (except that bitumen may be processed in that area). If no such structure or building currently exists, the person operating under this consent must apply for development consent for such a structure or building in order to carry out those activities; and



- (d) the area shown hatched green on Plan 1 may include "show piles" that are contained within concrete walls and wetted but they must not exceed the height of the higher of the Existing Bund and the New Bund; and
 - (e) the area shown hatched red on Plan 1 must:
 - 1. not include any stockpiles of materials unless the relevant material has at least one dimension which is greater than or equal to 30mm; and
 - 2. not exceed the height of the higher of the Existing Bund and the New Bund; and
 - 3. not be used for processing, crushing or grinding at any time.
- 4.3 The sizes of the materials in the show piles do not have dimension restrictions. The show piles will be limited to the size of show bays.

CHAPTER 5 – STOCKPILES

- 5.1 The operator must ensure that all stockpiles are wetted prior to material being removed from them for processing, and that during processing, they are kept wet and high-pressure water sprays are utilized to prevent the migration of dust.
- 5.2 Crushing, grinding and screening of the stockpiles shall be subject to stringent dust mitigation measures utilising water sprays on the processing equipment at all times without a break during processing so that the materials being processed or moved are sufficiently wetted so as to prevent fugitive dust emissions.

CHAPTER 6 – LOADS

- 6.1 All vehicles carrying materials to or from the site must have their loads covered with tarpaulins or similar covers. The operator must advertise on its website, all advertising brochures and all advertisements that it is only able to receive covered loads.

CHAPTER 7 – WHEEL WASH

- 7.1 All vehicles leaving the Site must be first put through a wheel wash except those that have not been in a landfilling or processing area.
- 7.2 The roadway between the wheel wash and the exit of the site is to be kept clean by satisfactory methods employed within the site addressing tracking of mud and sediments.



CHAPTER 8 – WATER SPRAY

- 8.1 All haul roads and stockpile areas must be regularly watered to prevent dust emissions from the Site migrating onto neighbouring land.
- 8.2 The vehicle routes in use around the site, except for concreted hardstand, are to be kept damp from 7am to 5 pm Monday to Friday and 7am to 4pm Saturday.
- 8.3 Dust emissions from the stockpiles and other areas of the Site shall be suppressed at all times by a permanently installed irrigation system and by a water truck.
- 8.4 The installed suppression system shall be designed such that it will automatically operate to spray a sufficient amount of water to suppress dust and to prevent fugitive emissions whenever wind speeds as measured by the anemometer installed on the Site exceed 30 km/hour and when it is not raining, even when the Site is not open. If the water sprays create a nuisance to neighbouring sites located between 292 degrees from the North West through to 45 degrees from the North East (measured clockwise) of the Premises, such water spraying operations within that area are to be suspended until further notice from council. For the purposes of this clause, water spraying operations at the southern end of the site along the boundary of the Tip Fast premises (location indicated on plan 1 as "Water spray installation") for the benefit of the property known as 1 – 3 Burrows Road must not be suspended unless the owner of 1 – 3 Burrows Road requires suspension, in which case the person operating under this consent must suspend forthwith until further notice by that owner.
- 8.5 Dust sprays and/or dust collection systems must be installed and operating on all crushing, grinding and screening equipment at the Site.
- 8.6 The site operator must install sprinkler or spray systems along points marked "water spray installation" on Plan 1. Person operating under this consent must maintain all sprinklers or spray systems in good condition.
- 8.7 The person operating on this consent must install sprinkler or spray systems along the perimeter escarpment of the pit area of the site. Person operating under this consent must maintain all sprinklers or spray systems in good condition.

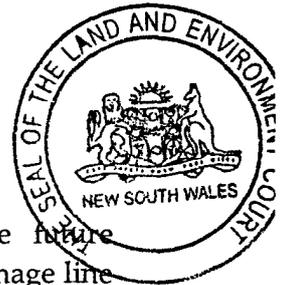


CHAPTER 9 – WATER QUALITY

- 9.1 Any water (other than any water directly from Sydney Water's mains supply) that is used for dust control, fire fighting or the like on the Site shall be:
- (a) of a quality that would be acceptable to Sydney Water as trade waste; and
 - (b) of primary human contact quality such that it will cause no harm to the health of persons who may come into contact with such water.
- 9.2 If any water is used on the Site (other than any water directly from Sydney Water's mains supply) then it shall be tested as required by DEC NSW by an independent water expert.
- 9.3 If the water quality shown by the tests fails to meet the specified criteria, the processing of materials shall cease unless the water used for dust suppression and the like is replaced with water that is compliant with DEC NSW requirements.
- 9.4 If the required water in such a case is not available the processing of material shall cease forthwith.

CHAPTER 10 – STORMWATER AND GROUNDWATER

- 10.1 The person operating under this consent shall be responsible for the future maintenance, upgrade, improvements and/or renewal of the stormwater drainage line approved by Marrickville Council Determination No.199901506. Details of the proposed future maintenance/inspections of the existing stormwater pipeline including a schedule of regular inspections shall be submitted to and accepted by Marrickville Council. A copy of all future inspection reports shall also be submitted to Council.
- 10.2 The stormwater drainage line within the property shall be inspected by Closed Circuit Television (CCTV) and a video copy provided to Council so as to determine the condition of the existing drainage line through the site. Any defects in the drainage line shall be repaired at no cost to Council. The stormwater line shall again be inspected upon completion of any necessary repairs and a video copy provided to Council.
- 10.3 The terms of Approval for Integrated development relating to Water Licence (Part V Water Act, 1912). Under the provisions of Part V (s116) of the Water Act (1912), this licence shall be valid for the period of the development consent.
- 10.4 That the licensee shall allow the NSW Department of Natural Resources, or its authorised representatives, subject to appropriate occupational health and site safety



provisions, full and free access to the works (i.e groundwater interception works and groundwater investigation/monitoring bores), for the purpose of undertaking inspection or test of works and its fittings, and shall carry out any work or alterations deemed necessary by the Department of Natural Resources to ensure the protection and maintenance of the works, or the control of the water extracted and for the protection of the quality and the prevention from pollution/contamination of surface and subsurface water.

10.5 The licensee shall notify the NSW Department of Natural Resources, if the works (ie groundwater interception works, investigation/monitoring bores) are to be abandoned and, contingent with site safety requirements, seal off the works by:

- backfilling the work to ground level with clay or cement, or
- other methods agreed to or directed by the NSW Department of Natural Resources.

10.6 Any groundwater interception works for purposes of leachate control, groundwater investigation and/or groundwater monitoring are required to be licensed and a bore licence application shall be submitted and a licence obtained from the NSW Department of Natural Resources. Completion details (Form A - Particulars of completed bore) of all bores and/or detailed construction information for the groundwater interception works are required to be forwarded to the NSW Department of Natural Resources within three (3) months of the date of this Determination.

10.7 Any licence granted authorises groundwater interception to address leachate control and dust suppression use on-site only and no entitlement to the groundwater intercepted for any other water supply purpose is authorised.

10.8 The licensee will ensure that operational site plans promote the sustainable use and management of local natural resources.

10.9 The licensee shall not allow any discharge of intercepted waters into or onto:

- any adjoining public or crown land;
- any other persons land without written permission;
- any creek, river, water course or aquifer without approval from the determining authority;
- any native vegetation as defined under the Native Vegetation Conservation Act (1997); or
- any wetlands of environmental significance.

10.10 An efficient monitoring system must be installed to the satisfaction of the NSW Department of Natural Resources to measure the groundwater interception (dewatering) activity, both quality and quantity. Any variation with the requirements given in this Condition must be approved by the NSW Department of Planning .



- 10.11 The proponent is to prepare an annual environmental management report and forward a copy to the NSW Department of Natural Resources. The environmental report should include the following:-
- (a) volume of groundwater intercepted and pumped off-site for each of the two Botany Sands interception systems (weekly volumes);
 - (b) groundwater levels in the four shale boreholes and in the Botany Sands monitoring bore (monthly measurements); and
 - (c) the results of bi-annual water quality samples from monitored groundwater and surface water systems including groundwater from the interception works and stormwater discharge. The list of analytes should include those given in the Department's 'Recommended Bore Licence Minimum Analytical Suite' for the Botany Sands Aquifer (see attached information sheet).
- 10.12 After receipt of the licence, the proponent shall provide NSW Department of Natural Resources on an annual basis with the interpreted report on monitoring, detailing the quantity of water pumped from the facility in the previous 12 months as per condition 10.11 (a), the water level data described in condition 10.11(b), water quality data described in condition 10.11 (c) and detailing any changes to the environment that may trigger the need for remedial action.
- 10.13 Tabulated hydrologic and hydraulic calculations that demonstrate the adequacy of the existing site stormwater drainage system being submitted to and accepted by Council before the issue of a Construction Certificate. Such calculations shall include any remedial measures necessary to rectify defects in the existing system. Where the existing system is to be interfaced with proposed site drainage, the calculations shall clearly demonstrate the adequacy of the existing drainage network to accept the additional stormwater flows.
- 10.14 The operation of the premises being conducted in a manner which does not pollute waters as defined by the Protection of the Environment Operations Act 1997.
- 10.15 All wastewater and stormwater treatment devices (including drainage systems, sumps and traps) being regularly maintained in order to remain effective. All solid and liquid wastes collected from the device must be disposed of in accordance with the Protection of the Environment Operations Act, 1997.
- 10.16 Only clean and unpolluted water shall be permitted to discharge from the subject premises into Council's stormwater drainage system.
- 10.17 Sign(s) being displayed and maintained adjacent to all stormwater drains on the premises, clearly indicating 'Clean water only - No wastewater or rubbish'.



CHAPTER 11 - WIND MEASUREMENT

- 11.1 An anemometer shall be maintained on the Site at all times and shall be installed and operated in accordance with its manufacturer's instructions.
- 11.2 The anemometer shall be linked to a device that issues a warning and which activates mist sprays along the perimeter escarpment of the Pit Area in the south east of the site and appropriate sprays in areas where processing is carried out in the open air when wind speeds exceed 30 km/h and it is not raining. If the water sprays create a nuisance to neighbouring sites located between 292 degrees from the North West through to 45 degrees from the North East (measured clockwise) of the Premises, such water spraying operations within that area are to be suspended until further notice from council. For the purposes of this clause, water spraying operations at the southern end of the site along the boundary of the Tip Fast premises (location indicated on plan 1 as "Water spray installation") for the benefit of the property known as 1 - 3 Burrows Road must not be suspended unless the owner of 1 - 3 Burrows Road requires suspension, in which case the person operating under this consent must suspend forthwith until further notice by that owner.
- 11.3 The anemometer shall be maintained and checked regularly to ensure it is in good working order during the hours of operation of the Site.

CHAPTER 12 - HIGH WIND

- 12.1 When the wind speed is measured above 30 kms per hour and when it is not raining those parts of the Site with a potential for dust generation must be continuously kept damp or high pressure mist sprays shall be activated along the perimeter of the Pit Area or any area used for processing. If the water sprays create a nuisance to neighbouring sites located between 292 degrees from the North West through to 45 degrees from the North East (measured clockwise) of the Premises, such water spraying operations within that area are to be suspended until further notice from council. For the purposes of this clause, water spraying operations at the southern end of the site along the boundary of the Tip Fast premises (location indicated on plan 1 as "Water spray installation") for the benefit of the property known as 1 - 3 Burrows Road must not be suspended unless the owner of 1 - 3 Burrows Road requires suspension, in which case the person operating under this consent must suspend forthwith until further notice by that owner.

CHAPTER 13 - DUST MANAGEMENT

- 13.1 Prior to the use commencing a plan of management detailing treatment techniques to eliminate the tracking of sediment onto the egress road and onto public streets by vehicles exiting the site shall be submitted to Council's satisfaction; such plan shall include daily cleaning of the roadway between the entry and the weighbridge and



details of a truck wheel wash and other exit treatment techniques in order to stabilise the area so as to eliminate the tracking of sediments onto the egress road and public streets by vehicles exiting the site.

- 13.2 Appropriate measures shall be adopted to prevent run off or liquids or mud onto neighbouring land.
- 13.3 An employee of the business shall regularly inspect the roadways within 100 metres of the site entrance to check for any material deposited thereon by vehicles entering or leaving the site and if such is observed the deposits shall be promptly and completely cleaned up (not washed or swept into Council's gutters and drains).
- 13.4 The results of the air sampling tests to be recorded, assessed and reviewed by an Independent Consultant practicing in air quality assessments and submitted to Council within twelve (12) months of the operation of the premises, with any recommendations of the Independent Consultant being incorporated into the operation of the premises.
- 13.5 All mechanical, degreasing and pressure cleaning operations being conducted within the workshop/maintenance building. In this regard, a Trade Waste Permit is to be obtained from Sydney Water prior to the commencement of the use.
- 13.6 The operation of the premises being carried out in accordance with the requirements of the WorkCover Authority and the DEC at all times. In this regard it may be necessary to obtain licences under the Waste Minimisation and Management Regulations 1997 and the Protection of the Environment (operations) Act 1997.
- 13.7 (a) That existing and future vehicle routes forming part of the lower level roads to the pit area at the site shall be covered with dust suppressing material, such as wetted wood chips in accordance with the Site's Dust Management Plan (DMP).
- (b) That existing and future vehicle route on the upper level of the site be paved in concrete or asphalt or other dust suppressing material within three months of this consent being granted.
- (c) That existing and future vehicle routes are to be kept as free of dust as practicable at all times.
- 13.8 The Hatched Area on Plan 1 must be levelled to a height of no more than RL 10 and paved, concreted or covered with compacted bitumen. The person operating under this consent must maintain that area at that level and must maintain the paved, concreted or compacted bitumen so as to minimise the escape of dust. This is subject to condition 4.2(b).



- 13.9 When moving materials for the purpose of carrying out condition 13.8 materials must be kept wetted at all times and the site operator must also use its best endeavours not to cause a dust nuisance.
- 13.10 That any future filling, from the date of this consent, in the road proposal affected area shall be clean fill and fully compacted.
- 13.11 Any filling on the Site must be done with materials permitted by the DEC site licence and must be fully compacted.
- 13.12 Tipping drop heights being minimised to prevent fugitive dust emissions.
- 13.13 The person operating under this consent must submit to the DEC/EPA and implement a Dust Management Plan ("DMP") within 3 months from the date of this Determination.
- 13.14 The DMP should include but should not be limited to:
- Controlling dust emissions from processed waste stockpiles;
 - Controlling dust emissions from unprocessed waste stockpiles;
 - Controlling dust emissions from processing waste materials; and
 - Preventing dust, waste or waste water from the wheel wash being tracked from the premises by vehicles on the premises.

The DMP is to be prepared by an appropriately qualified and independent person.

CHAPTER 14 – ROADS

- 14.1 All deliveries to and from the site using trucks of 2 tonne or greater capacity, being restricted to using Canal Road, Burrows Road, Campbell Road, Barwon Park Road and the Princes Highway. Vehicles of 2 tonne or greater capacity shall not use Euston Road, north of Huntley Street, nor Sydney Park Road. Signs to facilitate this route being erected at the weighbridge and front gate and company drivers shall being so instructed and regular customers/suppliers shall be advised in writing.
- 14.2 Access to the site shall be as follows:
- (a) Outside the hours of 7.00am to 6.00 pm Mondays to Fridays and 7.30am to 5.00pm Saturdays, all trucks of greater than 2 tonne capacity arriving or departing the site shall not use Campbell Street or Campbell Road east of Barwon Park Road. To facilitate this signs shall be erected at the weighbridge and front gate, company drivers shall be so instructed and regular customers/suppliers shall be advised in writing.



(b) Access Hours to the site through 1 Holland Street and Access Hours to 1 Holland Street is dealt with in Condition 18.3.

- 14.3 At no time shall any truck arrive or depart the site via Albert Street or Campbell Lane;
- 14.4 All vehicles entering and leaving the site in a forward direction.
- 14.5 No semi trailers or trucks with dog trailers accessing the site on Sundays.
- 14.6 A 15 km/h speed limit shall apply on the site and shall be signposted accordingly.
- 14.7 No access to and from the site shall be via Albert Street from the Princes Highway.
- 14.8 A road opening permit shall be obtained for all works carried out in public roads or Council controlled lands. Restorations shall be in accordance with Marrickville Council's Restorations Code. Failure to obtain a road opening permit will incur an additional charge for unauthorised openings in the amount of \$1,321.30, as provided for in Council's adopted fees and charges.
- 14.9 The owner or builder shall sign a written undertaking that they shall be responsible for the full cost of repairs to footpath, kerb and gutter, or other Council property damaged as a result of construction of the proposed development. Council may utilise part or all of any Building Security Deposit (B.S.D.) or recover in any competent jurisdiction, any costs to Council for such repairs.

CHAPTER 15 – PARKING

- 15.1 Twenty five (25) off-street car parking spaces being provided, paved, line marked and maintained at all times in accordance with the standards contained within Marrickville Development Control Plan No. 19 - Parking Strategy prior to the commencement of the use.
- 15.2 All parking spaces and turning area thereto being provided in accordance with the design requirements set out within Marrickville Council's Development Control Plan No. 19 - Parking Strategy, and being used exclusively for parking and not for storage or any other purpose.
- 15.3 All parking spaces and access thereto shall be used exclusively for parking and access and shall not be used for storage or any other purpose.
- 15.4 If at any time during this consent more than twenty (20) persons are employed on a full-time permanent basis by the person operating under this Consent and are present at the premises at any one time the Site Operator shall provide one additional (1) parking spot for every additional three (3) full time permanently employed persons



- 15.5 All vehicles used by employees must be parked within the premises.
- 15.6 No vehicles associated with the use shall park or queue on surrounding streets.
- 15.7 No vehicles arriving or departing the site or standing on street awaiting the site's opening contrary to the hours of operation restrictions contained in Condition 17.1.
- 15.8 No bins or trucks or trailers being parked or left on the street should they arrive outside the hours set out in Condition 17.1 and appropriate procedures to ensure this shall be prepared and communicated regularly to all company, contract or other drivers who would bring bins/ trucks to the site.
- 15.9 The person operating under this consent shall take steps to encourage 'back loading' of recovered materials - that is the removal of processed materials in trucks used to bring raw waste to the site.

CHAPTER 16 – UTILITIES

- 16.1 That the person operating under this Consent shall liaise with the Sydney Water Corporation, Energy Australia, AGL and a telecommunications provider concerning the provision of utility services to the site and any works to such services resulting from the development shall be at no cost to Council.
- 16.2 That, if required by the electricity supply authority, an area of land for a substation to be established shall be dedicated to such authority in accordance with their size and locational requirements provided these are not in the required landscaped setback areas.
- 16.3 That all materials and equipment associated with the use shall be stored on the premises in a neat and tidy manner behind the existing fence and not visible external to the site.

CHAPTER 17 – OPERATIONS

17.1 The hours of operation being restricted to:

- (a) For landfill, processing of materials and arrival and departure of trucks 7.00am to 6.00pm Mondays to Fridays, and 7.30am to 4.00pm Saturdays;
- (b) For inward movement of goods only (no processing or outwards goods movement) 9.00am to 3.00pm Sundays (in addition to the above hours); and



- (c) For inward movements of goods only (no processing or outwards goods movement) 9.00am to 3.00pm on public holidays for trucks of not more than 2 Tonnes.
- (d) For maintenance and office activities 7.00am to 7.00pm Mondays to Fridays, 7.30am to 5.00pm Saturdays and 9.00am to 3.00pm Sundays and public holidays.
- 17.2 No putrescible, medical or hazardous waste shall be received at the recycling facility or processed at any time and all loads shall be checked upon arrival to ensure such.
- 17.3 Paper or plastic received at the site shall be stored in a contained environment to prevent them being windblown off the site until such time as they can be disposed of or removed from the site.
- 17.4 Any liquid waste, medical waste, toxic, contaminated or hazardous wastes received at the site shall be turned away and if any such waste is discovered in other loads it shall be stored and disposed of in accordance with the requirements of the DEC as expeditiously as possible. Only waste of a type permitted by the DEC Environment Protection Authority's Environment Protection Licence shall be accepted for disposal at the site.
- 17.5 All incoming loads shall be inspected to ensure compliance with Condition 17.4 above.
- 17.6 No dangerous goods being stored on the site other than fuels and lubricants required for the operation of plant and equipment on the site.
- 17.7 That no controlled composting of green wastes (general garden vegetation), involving the use of offal, animal products or food waste or similar putrescible materials, shall occur on the site.
- 17.8 The development shall be undertaken in accordance with the proposal contained in Development Application DA200300514 and supporting documentation. The proponent is limited to processing 240,000 tonnes per annum of waste through the recovery facility.
- 17.9 Only the following range of materials may be separated for recycling and reprocessing at the facility:-
- wood and green waste;
 - metals;
 - glass;
 - plastics; and
 - inert aggregate and inert construction and demolition materials.
- 17.10 The stockpiles of recovered materials must not exceed the following limits:



Timber for reuse – 2000 Tonnes
 Shredded timber and green waste – 2000 Tonnes
 Metal scrap – 500 Tonnes
 Glass – 500 Tonnes
 Plastic – 500 Tonnes

17.11 The use of the premises shall not give rise to:

- (a) Transmission of offensive noise to any place of different occupancy, and
- (b) A sound pressure level at any affected premises that exceeds the background (LA90) noise level in the absence of the noise under consideration by more than 5dB(A). The source noise level shall be assessed as an LA eg, 15 min and adjusted in accordance with EPA guidelines for tonality, frequency weighting, impulsive characteristics, fluctuations and temporal content, and
- (c) A sound pressure level at any affected premises that exceeds the recommended planning levels outlined in the EPA Industrial Noise guidelines.

17.12 Noise and vibration from the use and operation of any plant and equipment and /or building services associated with the premises shall not give rise to "offensive noise" as defined under the Protection of the Environment (Operations) Act 1997.

17.13 That the use of the premises shall not give rise to the emission into the surrounding environment of gases, vapours, dusts or other impurities at levels or concentrations which are injurious or prejudicial to health.

17.14 Any site works or the like necessary for the carrying out of this development (landscaping, installation of irrigation pipes etc) being carried out between the hours of 7.00 am and 6.00pm Mondays to Fridays.

18 ADDITIONAL CONDITION

18.1 That the nature strip in front of 1 Holland Street shall be kept in a clean, tidy and weed free condition at all times.

18.2 That 1 Holland Street shall be used only for bin storage, metal scaffolding and equipment storage, office use and showroom, truck, bus, vehicle, plant and equipment parking, mechanical repairs to trucks, vehicles, plant and equipment, sorting, transfer, stacking of glass, metals, plastics, brick and concrete tiles and pavers. 1 Holland Street should not involve oil changing, vehicle washing or like activities that generate a potential for water pollution.

18.3 Access shall be permitted to the site via 1 Holland Street and access to 1 Holland Street shall be subject to the following conditions applicable to the site and subject also to:



(a) Hours of access and egress as follows:

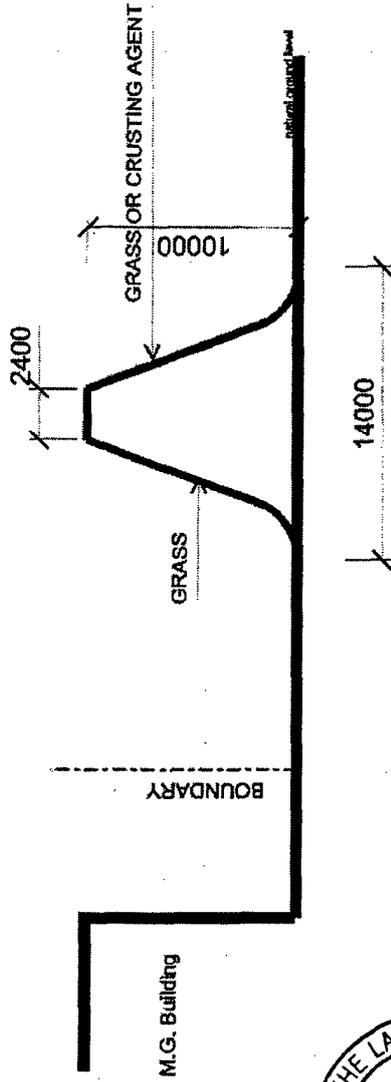
- a. 7.00am to 7.00am Mon to Friday
- b. 7.30am to 5.00pm Saturday
- c. 9.00am to 3.00pm Sundays and public holidays;

(b) All trucks and vehicles (including cars) shall travel via Burrows Road or Euston Road and then via Campbell Rd and Harber Street to enter or leave the site.

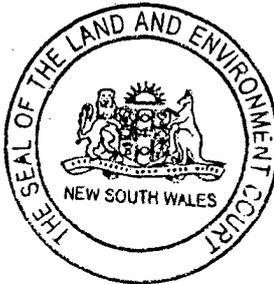
***** THE END *****



PLAN 2



TYPICAL CROSS SECTION OF
PROPOSED BOUNDARY BUND
APPROXIMATE DIMENSIONS



<small>NOTES: 1. THIS PLAN IS A PRELIMINARY DESIGN AND IS SUBJECT TO CHANGE WITHOUT NOTICE. 2. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED. 3. THE BUND SHALL BE CONSTRUCTED TO THE DIMENSIONS SHOWN ON THIS PLAN. 4. THE BUND SHALL BE CONSTRUCTED TO THE DIMENSIONS SHOWN ON THIS PLAN. 5. THE BUND SHALL BE CONSTRUCTED TO THE DIMENSIONS SHOWN ON THIS PLAN.</small>		<small>DATE</small> 27/10/05	<small>ASSESSMENT</small> MAG/16 of Bund	<small>SCALE</small> A
<small>CLIENT</small> Dial A Dump Pty. Ltd. Alexandria Landfill Pty. Ltd.	<small>PROJECT</small> DIAL A DUMP PTY. LTD. ALEXANDRIA LANDFILL	<small>DATE</small> 27/10/05	<small>ASSESSMENT</small> MAG/16 of Bund	<small>SCALE</small> A
<small>PROJECT</small> Dial A Dump Alexandria Landfill Proposed Waste Transfer Station Proposed Bund	<small>PROJECT</small> DIAL A DUMP PTY. LTD. ALEXANDRIA LANDFILL	<small>DATE</small> 27/10/05	<small>ASSESSMENT</small> MAG/16 of Bund	<small>SCALE</small> A
<small>PROJECT</small> Dial A Dump Alexandria Landfill Proposed Waste Transfer Station Proposed Bund	<small>PROJECT</small> DIAL A DUMP PTY. LTD. ALEXANDRIA LANDFILL	<small>DATE</small> 27/10/05	<small>ASSESSMENT</small> MAG/16 of Bund	<small>SCALE</small> A

AGREEMENT PURSUANT TO SECTION 34(3) OF THE LAND AND ENVIRONMENT COURT ACT 1979

COURT DETAILS

Court Land and Environment Court of New South Wales
Class 1
Case number 12/10489

TITLE OF PROCEEDINGS

Applicant **Alexandria Landfill Pty Ltd**
Respondent **Marrickville Council**

TERMS OF AGREEMENT

1. The Parties have reached agreement as to the terms of a decision in the proceedings that would be acceptable to the parties (being a decision that the Court could have made in the proper exercise of its functions).
2. The terms of the agreement are that:
 - a. The appeal is upheld.
 - b. Approval is granted to modification application No.200300514.01 to modify determination No.200300514 to use the premises at 314 Princes Highway, St Peters for waste transfer, recycling and resource recovery involving sorting, crushing, shredding, screening, stockpiling and on-selling recyclables and associated plant and vehicles maintenance all in conjunction with the continued use of the premises as a solid waste landfill depot subject to the conditions of consent at Annexure A.
 - c. There is no order as to costs.
3. The Parties request that the Court makes orders accordingly.

SIGNATURE

Signature of legal representative

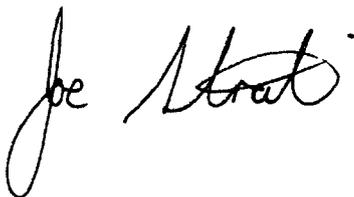


Capacity

Applicant's Solicitor

Date of signature

Signature of legal representative

A handwritten signature in black ink that reads "Joe Strati". The signature is written in a cursive style with a large, looping initial "J" and a distinct "Strati" ending.

Capacity

Respondent's Solicitor

Date of signature

7 November 2012

ANNEXURE A: CONDITIONS OF CONSENT

Development consent No.200300514 issued by the Land and Environment Court on 28 September 2006 is modified as follows:

1. Condition 1.2 is substituted with the following:

"1.2 The development the subject of this consent is limited to a period of 5 years from the date of determination of application No. 200300514.01, being the date the Land and Environment Court approves the application ("**Approval Date**"). However, if an application for an extension of time under this condition is lodged with the consent authority at least 3 months before the required date for cessation of the development under this condition, the development can continue to be carried out until such time as that modification application is finally determined. Any such modification application must include details of possible additional ingress and egress points to the site."

2. Condition 4.4 is inserted as follows:

"4.4 Within 12 months of the Approval Date (or such later date as may be agreed between the person acting on this Consent and Marrickville Council), all mixed waste must be dealt with within a structure constructed pursuant to and in accordance with development consent No.200700278 issued by Marrickville Council on 28 February 2008 as modified by Marrickville Council on 7 November 2012.

Should the land upon which mixed waste is dealt with under this condition 4.4 be compulsorily acquired by RMS, the entity acting upon this Consent shall have 6 months from the acquisition date within which the mixed waste can be dealt with otherwise than in accordance with this condition 4.4 provided all reasonable endeavours are taken to minimise the level of dust, noise and odours generated from the waste

3. Condition 4.5 is inserted as follows:

"4.5 Within 6 months of the Approval Date, the person acting on this consent must provide to Council and the EPA a map showing the areas of the Premises, known to have been landfilled, where intermediate cover or capping has been applied and provide information that demonstrates that intermediate capped areas are covered with material having a hydraulic conductivity of less than 1×10^{-5} m/s to a depth of at least 300mm.

If the intermediate covered areas do not have a hydraulic connectivity of less than 1×10^{-5} m/s and/or have not had cover applied to a depth of 300mm, the proponent must install an intermediate cap to the satisfaction of the EPA within a timeframe specified by the EPA."

4. Condition 10.18 is inserted as follows:

"10.18 A Trade Waste Agreement with Sydney Water for discharge of leachate to sewer is to be maintained."

5. Condition 13.7(b) is amended to read as follows:

“(b) Within 3 months of the Approval Date, the roads marked purple on the document attached to this Consent and marked “*Plan 3*” shall be paved in concrete or asphalt or other dust suppressing material. Such roads, together with the roads marked green on Plan 3, shall be maintained in their paved state whenever development is carried out pursuant to this Consent.”

6. Condition 17.15 is inserted as follows:

“17.15 The person acting on this Consent must engage a suitably qualified expert to conduct assessments and prepare a report identifying the extent of any potentially offensive odour emissions that may be generated beyond the boundary of the Premises.

The scope of the report must be developed in consultation with the EPA and may include revised air dispersion modelling based on actual site emissions data, field investigations according to German standards, and/or use of field olfactometers, and analysis of detailed complaints records and on-site meteorological data.”

7. Condition 17.16 is inserted as follows:

“17.16 The person acting on this Consent shall:

- a) Implement suitable measures to prevent unnecessary proliferation of litter both on and off site; and
- b) Inspect and, using best endeavours, clear the site and surrounding area of litter on a daily basis.”

8. Condition 18.4 is inserted as follows:

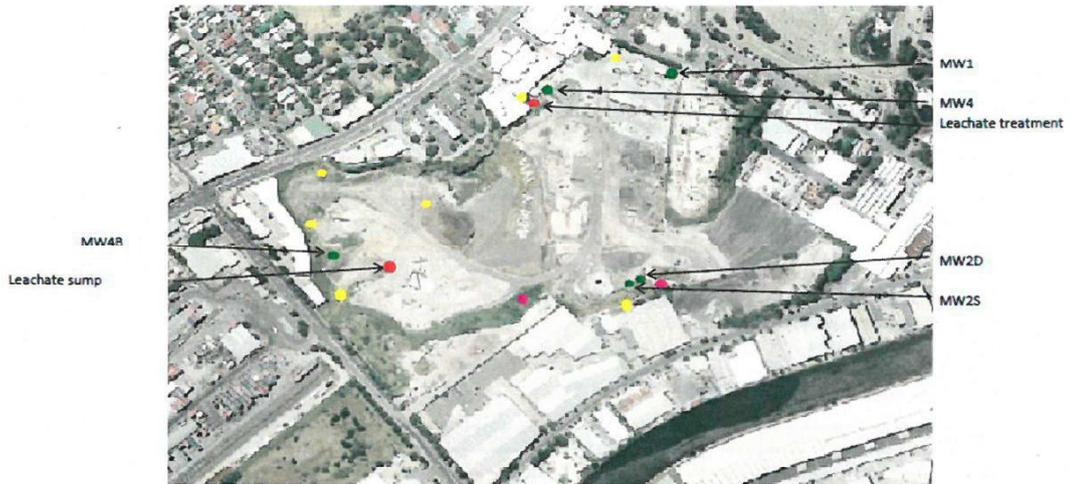
“18.4 That mining or gas exploration or extraction activities be prohibited on the site due to the proximity to residences, the safety and health risks associated with gas extraction, and the uncertainty over the effect of coal seam gas extraction on the local environment and aquifers, and the potential to further contaminate the land.”

Leachate Discharge Quality Data

Alexandria Landfill Pty Ltd and Boiling Pty Ltd

10-16 Albert Street, St Peters

EPL Numbers: 4627 and 12594



Key	
MW1 =	Bore 1
MW2D =	Bore 2
MW2S =	Bore 3
MW3 =	Bore 4
MW4 =	Bore 5

ALEXANDRIA LANDFILL

PREMIER WASTE MANAGEMENT FACILITY

Dust Monitoring Gauge Locations



Alexandria Landfill Pty Ltd and Boiling Pty Ltd

Leachate quality monitoring

ALEXANDRIA LANDFILL

PREMIER WASTE MANAGEMENT FACILITY

Disclaimer: Monitoring data contained in this document is made available as required by Section 66(6) of the Protection of the Environment Operations Act 1997 and in accordance with the requirements issued in writing by the Environment Protection Authority. To the best of the Licensees' knowledge, the data in this table is correct, except where specifically noted. The information and data in this table must not be published elsewhere or used in any way without prior consent from the Licensees. For more details on publication of pollution monitoring data refer to the NSW EPA Website www.epa.nsw.gov.au

Sampled:	20/11/2012		
Obtained:			
Published:	14/04/2013		
Licensee: Alexandria Landfill Pty Ltd and Boiling Pty Ltd			
Address: 10-16 Albert Street, St Peters			
EPL Nos. 4627 and 12594			
Sampling point: leachate sump			
Monitoring frequency: quarterly			
Pollutant	Unit	Limit	Measurement
pH	pH units		
Total Dissolved Solids (TDS)	mg/L		3360
Calcium	mg/L		100
Magnesium	mg/L		91
Sodium	mg/L		1050
Potassium	mg/L		198
Alkalinity as CaCO3	mg/L		2230
Sulphate	mg/L		<1
Chloride	mg/L		1170
Aluminium	mg/L		0.6
Arsenic	mg/L		0.004
Barium	mg/L		2.24
Cadmium	mg/L		<0.0001
Chromium	mg/L		0.015
Cobalt	mg/L		0.005
Copper	mg/L		0.001
Lead	mg/L		0.001
Manganese	mg/L		0.17
Zinc	mg/L		0.013
Iron	mg/L		7.45
Mercury	mg/L		<0.0001
Hexavalent Chromium	mg/L		<0.01
Fluoride	mg/L		0.7
Ammonia as N	mg/L		209
Nitrite as N	mg/L		0.03
Nitrate as N	mg/L		>\<0.01
Total Organic Carbon	mg/L		112
Chemical Oxygen Demand	mg/L		395
Phenol	µg/L		
Total suspended phenols	µg/L		-
Organochlorine pesticides	µg/L		ND
Organophosphorus pesticides	µg/L		ND
Naphthalene	µg/L		
Tot PAHs	µg/L		
Total Petroleum Hydrocarbons			
C6-C9 fraction	µg/L		40
C10-C14 fraction	µg/L		410
C15-C28 fraction	µg/L		4020
C29-C36	µg/L		<50
BTEX			
Benzene	µg/L		1
Toluene	µg/L		<2
Ethylbenzene	µg/L		<2
meta- & para-Xylene	µg/L		<2
ortho-Xylene	µg/L		<2

Alexandria Landfill Pty Ltd and Boiling Pty Ltd
Leachate quality monitoring



Disclaimer: Monitoring data contained in this document is made available as required by Section 66(6) of the Protection of the Environment Operations Act 1997 and in accordance with the requirements issued in writing by the Environment Protection Authority. To the best of the Licensees' knowledge, the data in this table is correct, except where specifically noted. The information and data in this table must not be published elsewhere or used in any way without prior consent from the Licensees. For more details on publication of pollution monitoring data refer to the NSW EPA Website www.epa.nsw.gov.au

Sampled:	14/08/2012		
Obtained:			
Published:	14/04/2013		
Licensee: Alexandria Landfill Pty Ltd and Boiling Pty Ltd			
Address: 10-16 Albert Street, St Peters			
EPL Nos. 4627 and 12594			
Sampling point: leachate sump			
Monitoring frequency: quarterly			
Pollutant	Unit	Limit	Measurement
pH	pH units		
Total Dissolved Solids (TDS)	mg/L		4130
Calcium	mg/L		80
Magnesium	mg/L		71
Sodium	mg/L		1330
Potassium	mg/L		252
Alkalinity as CaCO ₃	mg/L		2600
Sulphate	mg/L		<10
Chloride	mg/L		1320
Aluminium	mg/L		0.6
Arsenic	mg/L		0.007
Barium	mg/L		2.58
Cadmium	mg/L		<0.0001
Chromium	mg/L		0.02
Cobalt	mg/L		0.006
Copper	mg/L		0.001
Lead	mg/L		0.002
Manganese	mg/L		0.086
Zinc	mg/L		0.028
Iron	mg/L		4.72
Mercury	mg/L		<0.0001
Hexavalent Chromium	mg/L		<0.01
Fluoride	mg/L		0.6
Ammonia as N	mg/L		190
Nitrite as N	mg/L		<0.01
Nitrate as N	mg/L		<0.01
Total Organic Carbon	mg/L		140
Chemical Oxygen Demand	mg/L		440
Phenol	µg/L		
Total suspended phenols	µg/L		-
Organochlorine pesticides	µg/L		-
Organophosphorus pesticides	µg/L		*
Naphthalene	µg/L		
Tot PAHs	µg/L		
Total Petroleum Hydrocarbons			
C6-C9 fraction	µg/L		30
C10-C14 fraction	µg/L		690
C15-C28 fraction	µg/L		5100
C29-C36	µg/L		<50
BTEX			
Benzene	µg/L		2
Toluene	µg/L		<2
Ethylbenzene	µg/L		<2
meta- & para-Xylene	µg/L		<2
ortho-Xylene	µg/L		<2

Alexandria Landfill Pty Ltd and Boiling Pty Ltd
Leachate quality monitoring

ALEXANDRIA LANDFILL

PREMIER WASTE MANAGEMENT FACILITY

Disclaimer: Monitoring data contained in this document is made available as required by Section 66(6) of the Protection of the Environment Operations Act 1997 and in accordance with the requirements issued in writing by the Environment Protection Authority. To the best of the Licensees' knowledge, the data in this table is correct, except where specifically noted. The information and data in this table must not be published elsewhere or used in any way without prior consent from the Licensees. For more details on publication of pollution monitoring data refer to the NSW EPA Website www.epa.nsw.gov.au

Sampled:	11/05/2012		
Obtained:	18/06/2012		
Published:	/09/2012		
Licensee: Alexandria Landfill Pty Ltd and Boiling Pty Ltd			
Address: 10-16 Albert Street, St Peters			
EPL Nos. 4627 and 12594			
Sampling point: leachate sump			
Monitoring frequency: quarterly			
Pollutant	Unit	Limit	Measurement
pH	pH units		
Total Dissolved Solids (TDS)	mg/L		3520
Calcium	mg/L		108
Magnesium	mg/L		85
Sodium	mg/L		1020
Potassium	mg/L		184
Alkalinity as CaCO ₃	mg/L		1950
Sulphate	mg/L		<1
Chloride	mg/L		1020
Aluminium	mg/L		0.07
Arsenic	mg/L		0.003
Barium	mg/L		1.61
Cadmium	mg/L		<0.0001
Chromium	mg/L		0.008
Cobalt	mg/L		0.005
Copper	mg/L		<0.001
Lead	mg/L		0.001
Manganese	mg/L		0.132
Zinc	mg/L		0.017
Iron	mg/L		6.06
Mercury	mg/L		<0.0001
Hexavalent Chromium	mg/L		<0.01
Fluoride	mg/L		0.6
Ammonia as N	mg/L		232
Nitrite as N	mg/L		<0.01
Nitrate as N	mg/L		<0.01
Total Organic Carbon	mg/L		110
Chemical Oxygen Demand	mg/L		396
Phenol	µg/L		
Total suspended phenols	µg/L		<LOR
Organochlorine pesticides	µg/L		<LOR
Organophosphorus pesticides	µg/L		<LOR
Naphthalene	µg/L		2.7
Tot PAHs	µg/L		2.7
Total Petroleum Hydrocarbons			
C6-C9 fraction	µg/L		40
C10-C14 fraction	µg/L		360
C15-C28 fraction	µg/L		3260
C29-C36	µg/L		60
BTEX			
Benzene	µg/L		<1
Toluene	µg/L		<2
Ethylbenzene	µg/L		<2
meta- & para-Xylene	µg/L		<2
ortho-Xylene	µg/L		<2

Sampled:
 Obtained:
 Published:

Licensee: Alexandria Landfill Pty Ltd and Boiling Pty Ltd
 Address: 10-16 Albert Street, St Peters
 EPL Nos. 4627 and 12594
 Sampling point: leachate sump
 Monitoring frequency: quarterly

Pollutant	Unit	Limit	Measurement
pH	pH units		
Total Dissolved Solids (TDS)	mg/L		
Calcium	mg/L		
Magnesium	mg/L		
Sodium	mg/L		
Potassium	mg/L		
Alkalinity as CaCO ₃	mg/L		
Sulphate	mg/L		
Chloride	mg/L		
Aluminium	mg/L		
Arsenic	mg/L		
Barium	mg/L		
Cadmium	mg/L		
Chromium	mg/L		
Cobalt	mg/L		
Copper	mg/L		
Lead	mg/L		
Manganese	mg/L		
Zinc	mg/L		
Iron	mg/L		
Mercury	mg/L		
Hexavalent Chromium	mg/L		
Fluoride	mg/L		
Ammonia as N	mg/L		
Nitrite as N	mg/L		
Nitrate as N	mg/L		
Total Organic Carbon	mg/L		
Chemical Oxygen Demand	mg/L		
Phenol	µg/L		
Total suspended phenols	µg/L		
Organochlorine pesticides	µg/L		
Organophosphorus pesticides	µg/L		
Naphthalene	µg/L		
Tot PAHs	µg/L		
Total Petroleum Hydrocarbons			
C6-C9 fraction	µg/L		
C10-C14 fraction	µg/L		
C15-C28 fraction	µg/L		
C29-C36	µg/L		
BTEX			
Benzene	µg/L		
Toluene	µg/L		
Ethylbenzene	µg/L		
meta- & para-Xylene	µg/L		
ortho-Xylene	µg/L		

Alexandria Landfill Pty Ltd and Boiling Pty Ltd
Groundwater quality monitoring

ALEXANDRIA LANDFILL

PREMIER WASTE MANAGEMENT FACILITY

Disclaimer: Monitoring data contained in this document is made available as required by Section 66(6) of the Protection of the Environment Operations Act 1997 and in accordance with the requirements issued in writing by the Environment Protection Authority. To the best of the Licensees' knowledge, the data in this table is correct, except where specifically noted. The information and data in this table must not be published elsewhere or used in any way without prior consent from the Licensees. For more details on publication of pollution monitoring data refer to the NSW EPA Website www.epa.nsw.gov.au

Sampled:	20/04/2013	Licensee: Alexandria Landfill Pty Ltd and Boiling Pty Ltd
Obtained:	3/06/2013	Address: 10-16 Albert Street, St Peters
Published:	30/06/2013	EPL Nos. 4627 and 12594

Pollutant	Unit	Limit	Monitoring frequency	Bore 1	Bore 2	Bore 3	Bore 4	Bore 5
pH	pH units		Quarterly					
EC	µS/cm							
Eh	mV							
Temperature	°C							
Total Dissolved Solids (TDS)	mg/L		Quarterly					
Calcium	mg/L		Quarterly					
Magnesium	mg/L		Quarterly					
Sodium	mg/L		Quarterly					
Potassium	mg/L		Quarterly					
Alkalinity as CaCO3	mg/L		Quarterly					
Sulphate	mg/L		Quarterly					
Chloride	mg/L		Quarterly					
Aluminium	mg/L		Yearly					
Arsenic	mg/L		Yearly					
Barium	mg/L		Yearly					
Cadmium	mg/L		Yearly					
Chromium	mg/L		Yearly					
Cobalt	mg/L		Yearly					
Copper	mg/L		Yearly					
Lead	mg/L		Yearly					
Manganese	mg/L		Yearly					
Zinc	mg/L		Yearly					
Iron	mg/L							
Mercury	mg/L		Yearly					
Hexavalent Chromium	mg/L		Yearly					
Fluoride	mg/L		Yearly					
Ammonia as N	mg/L		Quarterly					
Nitrite as N	mg/L							
Nitrate as N	mg/L		Yearly					
Dissolved Organic Carbon	mg/L		Yearly					
Total phenol	mg/L		Yearly					
Total speciated phenols	µg/L							
Organochlorine pesticides	µg/L		Yearly					
Organophosphorus pesticides	µg/L		Yearly					
Tot PAHs	µg/L		Yearly					
Total Petroleum Hydrocarbons								
C6-C9 fraction	µg/L		Yearly					
C10-C14 fraction	µg/L		Yearly					
C15-C28 fraction	µg/L		Yearly					
C29-C36	µg/L		Yearly					
BTEX								
Benzene	µg/L		Yearly					
Toluene	µg/L		Yearly					
Ethylbenzene	µg/L		Yearly					
meta- & para-Xylene	µg/L		Yearly					
ortho-Xylene	µg/L		Yearly					

Sampled:	11/05/2012	Licensee: Alexandria Landfill Pty Ltd and Boiling Pty Ltd
-----------------	------------	--

Obtained: 18/06/2012 Address: 10-16 Albert Street, St Peters
 Published: /09/2012 EPL Nos. 4627 and 12594

Pollutant	Unit	Limit	Monitoring frequency	Bore 1	Bore 2	Bore 3	Bore 4	Bore 5
pH	pH units		Quarterly					
EC	µS/cm							
Eh	mV							
Temperature	°C							
Total Dissolved Solids (TDS)	mg/L		Quarterly	3880	9400	1410		3000
Calcium	mg/L		Quarterly	117	352	185		29
Magnesium	mg/L		Quarterly	120	548	15		62
Sodium	mg/L		Quarterly	1160	2280	219		985
Potassium	mg/L		Quarterly	58	41	55		11
Alkalinity as CaCO3	mg/L		Quarterly	2060	334	157		152
Sulphate	mg/L		Quarterly	<1	268	239		311
Chloride	mg/L		Quarterly	1090	5690	476		1310
Aluminium	mg/L		Yearly					
Arsenic	mg/L		Yearly					
Barium	mg/L		Yearly					
Cadmium	mg/L		Yearly					
Chromium	mg/L		Yearly					
Cobalt	mg/L		Yearly					
Copper	mg/L		Yearly					
Lead	mg/L		Yearly					
Manganese	mg/L		Yearly					
Zinc	mg/L		Yearly					
Iron	mg/L							
Mercury	mg/L		Yearly					
Hexavalent Chromium	mg/L		Yearly					
Fluoride	mg/L		Yearly					
Ammonia as N	mg/L		Quarterly	67.8	2.68	0.18		0.34
Nitrite as N	mg/L							
Nitrate as N	mg/L		Yearly					
Dissolved Organic Carbon	mg/L		Yearly					
Total phenol	mg/L		Yearly					
Total speciated phenols	µg/L							
Organochlorine pesticides	µg/L		Yearly					
Organophosphorus pesticides	µg/L		Yearly					
Tot PAHs	µg/L		Yearly					
Total Petroleum Hydrocarbons								
C6-C9 fraction	µg/L		Yearly					
C10-C14 fraction	µg/L		Yearly					
C15-C28 fraction	µg/L		Yearly					
C29-C36	µg/L		Yearly					
BTEX								
Benzene	µg/L		Yearly					
Toluene	µg/L		Yearly					
Ethylbenzene	µg/L		Yearly					
meta- & para-Xylene	µg/L		Yearly					
ortho-Xylene	µg/L		Yearly					

Sampled: Licensee: Alexandria Landfill Pty Ltd and Boiling Pty Ltd
 Obtained: Address: 10-16 Albert Street, St Peters
 Published: EPL Nos. 4627 and 12594

Pollutant	Unit	Limit	Monitoring frequency	Bore 1	Bore 2	Bore 3	Bore 4	Bore 5
pH	pH units		Quarterly					
EC	µS/cm							
Eh	mV							
Temperature	°C							
Total Dissolved Solids (TDS)	mg/L		Quarterly					
Calcium	mg/L		Quarterly					
Magnesium	mg/L		Quarterly					
Sodium	mg/L		Quarterly					
Potassium	mg/L		Quarterly					
Alkalinity as CaCO3	mg/L		Quarterly					
Sulphate	mg/L		Quarterly					
Chloride	mg/L		Quarterly					
Aluminium	mg/L		Yearly					

Arsenic	mg/L		Yearly					
Barium	mg/L		Yearly					
Cadmium	mg/L		Yearly					
Chromium	mg/L		Yearly					
Cobalt	mg/L		Yearly					
Copper	mg/L		Yearly					
Lead	mg/L		Yearly					
Manganese	mg/L		Yearly					
Zinc	mg/L		Yearly					
Iron	mg/L							
Mercury	mg/L		Yearly					
Hexavalent Chromium	mg/L		Yearly					
Fluoride	mg/L		Yearly					
Ammonia as N	mg/L		Quarterly					
Nitrite as N	mg/L							
Nitrate as N	mg/L		Yearly					
Dissolved Organic Carbon	mg/L		Yearly					
Total phenol	mg/L		Yearly					
Total speciated phenols	µg/L							
Organochlorine pesticides	µg/L		Yearly					
Organophosphorus pesticides	µg/L		Yearly					
Tot PAHs	µg/L		Yearly					
Total Petroleum Hydrocarbons								
C6-C9 fraction	µg/L		Yearly					
C10-C14 fraction	µg/L		Yearly					
C15-C28 fraction	µg/L		Yearly					
C29-C36	µg/L		Yearly					
BTEX								
Benzene	µg/L		Yearly					
Toluene	µg/L		Yearly					
Ethylbenzene	µg/L		Yearly					
meta- & para-Xylene	µg/L		Yearly					
ortho-Xylene	µg/L		Yearly					

**Alexandria Landfill Fly Ash and Bottom Fly Ash
Dust Deposition Monitoring**

ALEXANDRIA LANDFILL
REGULATED UNDER RCRA AND CERCLA

Notice: Monitoring data contained in this document is made available as required by Section 106(j) of the Pollution of the Environment Enforcement Act (PTEEA) and is made available with the understanding that it is being provided to the public for informational purposes only. It is not intended to be used for any other purpose without prior consent from the licensee. For more details on jurisdiction of pollution monitoring data refer to the

Sampling point	Monitoring Frequency	Parameter	Unit	Limit	Measurement
D03	Monthly	Total Incombustible Solids	g/m ³ /month	4	4.9
		Total Incombustible Solids	g/m ³ /month	4	2.1
D03	Monthly	Total Incombustible Solids	g/m ³ /month	4	24.6
		Total Incombustible Solids	g/m ³ /month	4	5.5
D05	Monthly	Total Incombustible Solids	g/m ³ /month	4	9.9
		Total Incombustible Solids	g/m ³ /month	4	2.8
D07	Monthly	Total Incombustible Solids	g/m ³ /month	4	2.4

Sampling: 14/01/2014 **Licensee:** Alexandria Landfill Fly Ash and Bottom Fly Ash
Observed: 9/07/2014 **Address:** 10-18 Albert Street, St Peters
Published: 14/08/2014 **EPL No.:** 4827 and 13394

Sampling point	Monitoring Frequency	Parameter	Unit	Limit	Measurement
D03	Monthly	Total Incombustible Solids	g/m ³ /month	4	2.8
		Total Incombustible Solids	g/m ³ /month	4	2.4
D03	Monthly	Total Incombustible Solids	g/m ³ /month	4	24.6
		Total Incombustible Solids	g/m ³ /month	4	5.5
D05	Monthly	Total Incombustible Solids	g/m ³ /month	4	10.9
		Total Incombustible Solids	g/m ³ /month	4	4.2
D07	Monthly	Total Incombustible Solids	g/m ³ /month	4	6

**Alexandria Landfill Fly Ash and Bottom Fly Ash
Dust Deposition Monitoring**

ALEXANDRIA LANDFILL
REGULATED UNDER RCRA AND CERCLA

Notice: Monitoring data contained in this document is made available as required by Section 106(j) of the Pollution of the Environment Enforcement Act (PTEEA) and is made available with the understanding that it is being provided to the public for informational purposes only. It is not intended to be used for any other purpose without prior consent from the licensee. For more details on jurisdiction of pollution monitoring data refer to the

Sampling point	Monitoring Frequency	Parameter	Unit	Limit	Measurement
D03	Monthly	Total Incombustible Solids	g/m ³ /month	4	2.4
		Total Incombustible Solids	g/m ³ /month	4	5.4
D03	Monthly	Total Incombustible Solids	g/m ³ /month	4	24.6
		Total Incombustible Solids	g/m ³ /month	4	5.5
D05	Monthly	Total Incombustible Solids	g/m ³ /month	4	10.9
		Total Incombustible Solids	g/m ³ /month	4	4.2
D07	Monthly	Total Incombustible Solids	g/m ³ /month	4	6

Sampling: 14/01/2014 **Licensee:** Alexandria Landfill Fly Ash and Bottom Fly Ash
Observed: 9/07/2014 **Address:** 10-18 Albert Street, St Peters
Published: 14/08/2014 **EPL No.:** 4827 and 13394

Sampling point	Monitoring Frequency	Parameter	Unit	Limit	Measurement
D01	Monthly	Total Incombustible Solids	g/m ³ /month	4	5.2
		Total Incombustible Solids	g/m ³ /month	4	2
D03	Monthly	Total Incombustible Solids	g/m ³ /month	4	6
		Total Incombustible Solids	g/m ³ /month	4	5.6
D05	Monthly	Total Incombustible Solids	g/m ³ /month	4	4.5
		Total Incombustible Solids	g/m ³ /month	4	2.6
D07	Monthly	Total Incombustible Solids	g/m ³ /month	4	4.5

Alexandria Landfill Pty Ltd and Baling Pty Ltd
Dust Deposition Monitoring
XXXXXXXXXXXXXXXXXXXX

Disclaimer: Monitoring data contained in this document is made available as required by Section 499(1) of the Protection of the Environment Operations Act 1997 and is not intended to be used for any purpose other than that for which it was collected. The information and data in this table should not be published elsewhere or used in any way without prior consent from the data owner. For more details on publication of pollution monitoring data refer to the

Sampling point	Frequency	Substance	Unit	Limit	Measurement
D01	Monthly	Total Incombustible Solids	g/m ³ /month	4	6.3
D02	Monthly	Total Incombustible Solids	g/m ³ /month	4	2
D03	Monthly	Total Incombustible Solids	g/m ³ /month	4	8
D04	Monthly	Total Incombustible Solids	g/m ³ /month	4	6.5
D05	Monthly	Total Incombustible Solids	g/m ³ /month	4	4.5
D06	Monthly	Total Incombustible Solids	g/m ³ /month	4	2.0
D07	Monthly	Total Incombustible Solids	g/m ³ /month	4	4.5

Sampling point	Frequency	Substance	Unit	Limit	Measurement
D01	Monthly	Total Incombustible Solids	g/m ³ /month	4	11.9
D02	Monthly	Total Incombustible Solids	g/m ³ /month	4	4
D03	Monthly	Total Incombustible Solids	g/m ³ /month	4	9.5
D04	Monthly	Total Incombustible Solids	g/m ³ /month	4	10.1
D05	Monthly	Total Incombustible Solids	g/m ³ /month	4	4.4
D06	Monthly	Total Incombustible Solids	g/m ³ /month	4	2
D07	Monthly	Total Incombustible Solids	g/m ³ /month	4	4.2

**Alameda Landfill P6 List and Belling P6 List
Dust Deposition Monitoring**

Disclaimer: Monitoring data contained in this document is made available as required by Section 86501 of the
Provisions of the Environmental Protection Act 1987 and is considered with the requirements based on testing by the
Environmental Protection Authority. In the best of the licensee's knowledge, the data in this table is correct, except
where specifically noted. The information and data in this table must not be published elsewhere or used in any way
without prior consent from the licensee. For more details on publication of pollution monitoring data refer to the

Sample ID	15/12/2013	Licensee: Alameda Landfill P6 List and Belling P6 List			
Collection	8/1/2014	Address: 22-28 Albert Street, St Peters			
Publication	14/03/2014	EP No. 4927 and 12584			
Sample name	Monitoring Frequency	Parameter	Units	Units	Measurement
D201	Monthly	Total Incombustible Solids	g/m ³ /month	4	21.9
D202	Monthly	Total Incombustible Solids	g/m ³ /month	4	9.8
D203	Monthly	Total Incombustible Solids	g/m ³ /month	4	16.1
D204	Monthly	Total Incombustible Solids	g/m ³ /month	4	14
D205	Monthly	Total Incombustible Solids	g/m ³ /month	4	12.6
D206	Monthly	Total Incombustible Solids	g/m ³ /month	4	4.9
D207	Monthly	Total Incombustible Solids	g/m ³ /month	4	11.3

Sample ID	15/12/2013	Licensee: Alameda Landfill P6 List and Belling P6 List			
Collection	8/1/2014	Address: 22-28 Albert Street, St Peters			
Publication	14/03/2014	EP No. 4927 and 12584			
Sample name	Monitoring Frequency	Parameter	Units	Units	Measurement
D201	Monthly	Total Incombustible Solids	g/m ³ /month	4	13.7
D202	Monthly	Total Incombustible Solids	g/m ³ /month	4	6
D203	Monthly	Total Incombustible Solids	g/m ³ /month	4	8.4
D204	Monthly	Total Incombustible Solids	g/m ³ /month	4	0.4
D205	Monthly	Total Incombustible Solids	g/m ³ /month	4	8.6
D206	Monthly	Total Incombustible Solids	g/m ³ /month	4	3.3
D207	Monthly	Total Incombustible Solids	g/m ³ /month	4	3.3

Alexandria Landfill Pty Ltd and Bellina Pty Ltd
Dust Deposition Monitoring
XXXXXXXXXXXXXXXXXXXX

Disclaimer: Monitoring data contained in this document is made available as required by Section 462(1) of the Protection of the Environment Operations Act 1987 and is provided as an information source to assist in the assessment of the Environmental Protection Authority. In the absence of any further monitoring data to this table a correct record of what was actually tested. The information contained in this table must not be published elsewhere or used in any way other than as intended from the licensee. The next date of publication of pollution monitoring data will be in the

Sampling point	Monitoring Frequency	Publication	Units	Limit	Measurement
D01	Monthly	Total Incombustible Solids	g/m ³ /month	4	9.2
D02	Monthly	Total Incombustible Solids	g/m ³ /month	4	7
D03	Monthly	Total Incombustible Solids	g/m ³ /month	4	9.9
D04	Monthly	Total Incombustible Solids	g/m ³ /month	4	7.6
D05	Monthly	Total Incombustible Solids	g/m ³ /month	4	9.1
D06	Monthly	Total Incombustible Solids	g/m ³ /month	4	2.9
D07	Monthly	Total Incombustible Solids	g/m ³ /month	4	2.9

Sampling point	Monitoring Frequency	Publication	Units	Limit	Measurement
D01	Monthly	Total Incombustible Solids	g/m ³ /month	4	9.6
D02	Monthly	Total Incombustible Solids	g/m ³ /month	4	4.9
D03	Monthly	Total Incombustible Solids	g/m ³ /month	4	7.7
D04	Monthly	Total Incombustible Solids	g/m ³ /month	4	6.2
D05	Monthly	Total Incombustible Solids	g/m ³ /month	4	1.6
D06	Monthly	Total Incombustible Solids	g/m ³ /month	4	1.6
D07	Monthly	Total Incombustible Solids	g/m ³ /month	4	2.2

**Alexander Landfill Fly Ash and Bottom Fly Ash
Dust Deposition Monitoring**



Disclaimer: Monitoring data presented in this document is made available as required by Section 66(2) of the Freedom of Information Act (FOIA) and is provided as a public service. It is not intended to be used for regulatory or enforcement purposes. The information contained in this table must not be published elsewhere or used in any way without prior consent from the licensee. For more details on publication of monitoring data refer to the

Sampling point	Monitoring frequency	Parameter	Unit	Limit	Measurement
D01	Monthly	Total Incombustible Solids	g/m ³ /month	4	0.6
		Total Incombustible Solids	g/m ³ /month	4	0.9
D02	Monthly	Total Incombustible Solids	g/m ³ /month	4	2.7
		Total Incombustible Solids	g/m ³ /month	4	5.3
D03	Monthly	Total Incombustible Solids	g/m ³ /month	4	1.6
		Total Incombustible Solids	g/m ³ /month	4	1.6
D04	Monthly	Total Incombustible Solids	g/m ³ /month	4	1.6
		Total Incombustible Solids	g/m ³ /month	4	2.3

Sampling point	Monitoring frequency	Parameter	Unit	Limit	Measurement
D01	Monthly	Total Incombustible Solids	g/m ³ /month	4	1.4
		Total Incombustible Solids	g/m ³ /month	4	1
D02	Monthly	Total Incombustible Solids	g/m ³ /month	4	2.2
		Total Incombustible Solids	g/m ³ /month	4	2.1
D03	Monthly	Total Incombustible Solids	g/m ³ /month	4	1.6
		Total Incombustible Solids	g/m ³ /month	4	1.6
D04	Monthly	Total Incombustible Solids	g/m ³ /month	4	1.6
		Total Incombustible Solids	g/m ³ /month	4	1.6

**Alexandria Landfill Pty Ltd and Soling Pty Ltd
Dust Deposition Monitoring**



Disclaimer: Monitoring data contained in this document is made available as required by Section 68(4) of the Protection of the Environment Operations Act 1997 and in accordance with the requirements issued in writing by the Environment Protection Authority. To the best of the licensee's knowledge, the data in this table is correct, correct when available and used. The information contained in this table must not be published otherwise or used in any way without prior consent from the licensee. For more details on publication of pollution monitoring data refer to the

Sampling point	Monitoring frequency	Parameter	Unit	Limit	Measurement
D01	Monthly	Total Incombustible Solids	µg/m ³ /month	4	3.8
D02	Monthly	Total Incombustible Solids	µg/m ³ /month	4	3.5
D03	Monthly	Total Incombustible Solids	µg/m ³ /month	4	3.4
D04	Monthly	Total Incombustible Solids	µg/m ³ /month	4	4.5
D05	Monthly	Total Incombustible Solids	µg/m ³ /month	4	3.9
D06	Monthly	Total Incombustible Solids	µg/m ³ /month	4	3.5
D07	Monthly	Total Incombustible Solids	µg/m ³ /month	4	3.3

Sampling point	Monitoring frequency	Parameter	Unit	Limit	Measurement
D01	Monthly	Total Incombustible Solids	µg/m ³ /month	4	5.3
D02	Monthly	Total Incombustible Solids	µg/m ³ /month	4	2
D03	Monthly	Total Incombustible Solids	µg/m ³ /month	4	5.3
D04	Monthly	Total Incombustible Solids	µg/m ³ /month	4	5
D05	Monthly	Total Incombustible Solids	µg/m ³ /month	4	2.5
D06	Monthly	Total Incombustible Solids	µg/m ³ /month	4	3.8
D07	Monthly	Total Incombustible Solids	µg/m ³ /month	4	3.8

**Alexandria Landfill Pty Ltd and Soling Pty Ltd
Dust Deposition Monitoring**

ALEXANDRIA LANDFILL

10/10/2013

Disclaimer: Monitoring data contained in this document is made available as required by Section 89(1) of the Protection of the Environment Operations Act 1997 and is restricted to the information stated or stated by the Environmental Protection Authority. In the event of any discrepancy, the data on this table is correct, unless where specified, otherwise. The information on this table does not constitute an admission or proof in any way without prior consent from the licensee. For more details on jurisdiction of pollution monitoring sites refer to the

Sampling point	Monitoring Frequency	Method	Units	Units	Measurement
D01	Monthly	Total Incombustible Solids	g/m ³ /month	4	9
D02	Monthly	Total Incombustible Solids	g/m ³ /month	4	9.5
D03	Monthly	Total Incombustible Solids	g/m ³ /month	4	4.4
D04	Monthly	Total Incombustible Solids	g/m ³ /month	4	10
D05	Monthly	Total Incombustible Solids	g/m ³ /month	4	3.5
D06	Monthly	Total Incombustible Solids	g/m ³ /month	4	3.2
D07	Monthly	Total Incombustible Solids	g/m ³ /month	4	4

Sampling point	Monitoring Frequency	Method	Units	Units	Measurement
D01	Monthly	Total Incombustible Solids	g/m ³ /month	4	12.6
D02	Monthly	Total Incombustible Solids	g/m ³ /month	4	6.7
D03	Monthly	Total Incombustible Solids	g/m ³ /month	4	12.5
D04	Monthly	Total Incombustible Solids	g/m ³ /month	4	6.5
D05	Monthly	Total Incombustible Solids	g/m ³ /month	4	10.1
D06	Monthly	Total Incombustible Solids	g/m ³ /month	4	2.9
D07	Monthly	Total Incombustible Solids	g/m ³ /month	4	6.5

Alexandria Landfill Pty Ltd and Belling Pty Ltd
Dust Deposition Monitoring



Dustfall Monitoring (as required) will be carried out in accordance with the requirements specified by Section 88(1)(c) of the Protection of the Environment Operations Act 1997 and in accordance with the requirements stated in writing by the Environmental Protection Authority. In the event of the presence of weathering, the data in this table is subject to a certain degree of variability. The information in this table should not be published or otherwise made available to the public or other persons unless the information is used for the purposes of public access to information or otherwise as required by law.

Sampling point	Frequency	Method	Unit	Unit	Measurement
D03	Monthly	Total Incombustible Solids	kg/m ² /month	4	10.9
D02	Monthly	Total Incombustible Solids	kg/m ² /month	4	2.2
D03	Monthly	Total Incombustible Solids	kg/m ² /month	4	6.2
D04	Monthly	Total Incombustible Solids	kg/m ² /month	4	6.4
D05	Monthly	Total Incombustible Solids	kg/m ² /month	4	4.2
D06	Monthly	Total Incombustible Solids	kg/m ² /month	4	2.9
D07	Monthly	Total Incombustible Solids	kg/m ² /month	4	2.6

Sampling point	Frequency	Method	Unit	Unit	Measurement
D01	Monthly	Total Incombustible Solids	kg/m ² /month	4	24.7
D02	Monthly	Total Incombustible Solids	kg/m ² /month	4	9.6
D03	Monthly	Total Incombustible Solids	kg/m ² /month	4	9.1
D04	Monthly	Total Incombustible Solids	kg/m ² /month	4	1.09
D05	Monthly	Total Incombustible Solids	kg/m ² /month	4	9.8
D06	Monthly	Total Incombustible Solids	kg/m ² /month	4	2.8
D07	Monthly	Total Incombustible Solids	kg/m ² /month	4	4.3

ALEXANDRIA LANDFILL FY13 AND BULLING PTY LTD

Dust Deposition Monitoring

ALEXANDRIA LANDFILL

13/05/2013

Disclaimer: Monitoring data contained in this document is made available as required by Section 50(2) of the Protection of the Environment Operations Act 1997 and is consistent with the requirements set out in writing by the Environmental Protection Authority. To the best of the information known, the data in this table represent current information available. This information and data is this table may not be published elsewhere or used in any way without prior approval from the licensee. For more details on publication of public information refer to the other EPA Website: www.epa.nsw.gov.au

Sampled: 15/1/2013 Licensee: Alexandria Landfill Pty Ltd and Bulling Pty Ltd
 Date/Time: 14/1/2013 Address: 20-28 Albert Street, St Peters
 Published: 21/1/2013 EPA Nos. 4627 and 12284

Sampling point	Monitoring Frequency	Parameter	Unit	Limit	Measurement
D01	Monthly	Total Incombustible Solids	$\mu\text{g}/\text{m}^3$ /month	4	11.8
D02	Monthly	Total Incombustible Solids	$\mu\text{g}/\text{m}^3$ /month	4	14.2
D03	Monthly	Total Incombustible Solids	$\mu\text{g}/\text{m}^3$ /month	4	8.8
D04	Monthly	Total Incombustible Solids	$\mu\text{g}/\text{m}^3$ /month	4	11.1
D05	Monthly	Total Incombustible Solids	$\mu\text{g}/\text{m}^3$ /month	4	3.2
D06	Monthly	Total Incombustible Solids	$\mu\text{g}/\text{m}^3$ /month	4	2.4
D07	Monthly	Total Incombustible Solids	$\mu\text{g}/\text{m}^3$ /month	4	3.5

Sampled: 11/09/2012 Licensee: Alexandria Landfill Pty Ltd and Bulling Pty Ltd
 Date/Time: 13/09/2012 Address: 20-28 Albert Street, St Peters
 Published: 20/10/2012 EPA Nos. 4627 and 12284

Sampling point	Monitoring Frequency	Parameter	Unit	Limit	Measurement
D01	Monthly	Total Incombustible Solids	$\mu\text{g}/\text{m}^3$ /month	4	14.9
D02	Monthly	Total Incombustible Solids	$\mu\text{g}/\text{m}^3$ /month	4	7.4
D03	Monthly	Total Incombustible Solids	$\mu\text{g}/\text{m}^3$ /month	4	24.4
D04	Monthly	Total Incombustible Solids	$\mu\text{g}/\text{m}^3$ /month	4	8.1
D05	Monthly	Total Incombustible Solids	$\mu\text{g}/\text{m}^3$ /month	4	3.4
D06	Monthly	Total Incombustible Solids	$\mu\text{g}/\text{m}^3$ /month	4	3.4
D07	Monthly	Total Incombustible Solids	$\mu\text{g}/\text{m}^3$ /month	4	3.4

ALEXANDRIA LANDFILL Pty Ltd and Belling Pty Ltd

Dust Deposition Monitoring

ALEXANDRIA LANDFILL

Monitoring information contained in this document is made available as required by Section 482C of the Access to Information Act (ATIA) and is consistent with the requirements set out in the Access to Information Act. This document is provided for informational purposes only. It is not intended to be used for legal or other purposes. The information contained in this document may be published elsewhere in whole or in part without prior consent from the Government. For more details on publication of public information, visit the Access to Information Act website at www.cic.gc.ca.

Reporting point	Monitoring frequency	Parameter	Unit	Limit	Measurement
D01	Monthly	Total Incombustible Solids	µg/m ³ /month	4	4.4
D02	Monthly	Total Incombustible Solids	µg/m ³ /month	4	0.6
D03	Monthly	Total Incombustible Solids	µg/m ³ /month	4	0.6
D04	Monthly	Total Incombustible Solids	µg/m ³ /month	4	0.5

Reporting point	Monitoring frequency	Parameter	Unit	Limit	Measurement
D01	Monthly	Total Incombustible Solids	µg/m ³ /month	4	
D02	Monthly	Total Incombustible Solids	µg/m ³ /month	4	
D03	Monthly	Total Incombustible Solids	µg/m ³ /month	4	
D04	Monthly	Total Incombustible Solids	µg/m ³ /month	4	
D05	Monthly	Total Incombustible Solids	µg/m ³ /month	4	
D06	Monthly	Total Incombustible Solids	µg/m ³ /month	4	
D07	Monthly	Total Incombustible Solids	µg/m ³ /month	4	

**Alexandria Landfill Pty Ltd and Belling Pty Ltd
Leachate Discharge Quality**

**Regulatory Compliance
ALEXANDRIA LANDFILL**

WATER RESOURCES AUTHORITY ACT 2001

Disclaimer: All monitoring data submitted to the Authority is made available in accordance with Section 40B(1) of the Protection of the Environment Operations Act 1997 and is made available with the requirement being to bring to the Authority's attention any data which is the subject of the Authority's knowledge, the data is the data which is made available in the form of the report. The information and data in this table must not be published elsewhere or used in any other way.

Sampled: 27/09/2014				Location: Alexandria Landfill Pty Ltd and Belling Pty Ltd						
Closed: 28/09/2014				Address: 30-38 Albert Street, St Peters						
Published: 15/09/2014				EPA Nos: 6027 and 6234						
Test Parameter	Units	LGR	Value	Test Parameter	Units	LGR	Composite Sample		Mass Discharged	
							Standard Concentration (mg/L)	Results	Standard Daily Mass (kg/d)	Sampling results (kg)
Start time	hr		7:15 am on 27/09/2014	Total Dissolved Solids	mg/L	1	2000	5030	450	1.40
End time	hr		7:30 am on 28/09/2014	Suspended Solids	mg/L	1	200	18	20	0.03
Water Reading (mm)	mm		60487	Boron	mg/L	1	1	1.0	1	0.001
Water Reading (mm)	mm		60521	Iron	mg/L	0.1	10	1.0	1	0.001
PH	ph units		7.0	Ammonia as N	mg/L	0.5	100	40.0	20	10.000
Volume	L		60							
Discharge	L		60							
Discharge	L		60							

Sampled: 28/09/2014				Location: Alexandria Landfill Pty Ltd and Belling Pty Ltd						
Closed: 4/10/2014				Address: 30-38 Albert Street, St Peters						
Published: 28/09/2014				EPA Nos: 6027 and 6234						
Test Parameter	Units	LGR	Value	Test Parameter	Units	LGR	Composite Sample		Mass Discharged	
							Standard Concentration (mg/L)	Results	Standard Daily Mass (kg/d)	Sampling results (kg)
Start time	hr		8:15 am on 28/09/2014	Total Dissolved Solids	mg/L	1	2000	5030	450	1.40
End time	hr		8:30 am on 28/09/2014	Suspended Solids	mg/L	1	200	48	20	0.03
Water Reading (mm)	mm		59374	Boron	mg/L	1	1	1.0	1	0.001
Water Reading (mm)	mm		59384	Iron	mg/L	0.1	10	4.0	1	0.001
PH	ph units		7.0	Ammonia as N	mg/L	0.5	100	70.0	20	10.000
Volume	L		72							
Discharge	L		72							
Discharge	L		72							

**Alexandria Landfill Fly Ash and Bottom Fly Ash
Leachate Discharge Quality**



Information reflecting information in this document is made available as required by Section 66(2) of the Publication of Government Information Act 1997 and is consistent with the requirements found in writing to the Environment Protection Authority. In the best of the Government's knowledge, the data in this table is correct, exact where specified under the appropriate and data in this table, except for possible precision or unit in use.

Sample: 1/12/2013 Disposal: 16/12/2013 Publication: 14/04/2013			Location: Alexandria Landfill Fly Ash and Bottom Fly Ash Address: 10-11 Albert Street, St Helens SPL Nos: 4627 and 12394							
Test Description	Units	LDR	Value	Test Parameter	Units	LDR	Composite Sample		Mean Discharged	
							Standard Concentration (mg/L)	Results	Maximum Daily Mass (kg)	Sampling rate (kg/day)
Start time	hr		08:00 am on 16/12/2013	Total Dissolved Solids	mg/L	1	10000	870	100	100
End time	hr		02:30 pm on 16/12/2013	Suspended Solids	mg/L	1	100	61	10	0.30
Water Sampling (start)	hr		11:50:00	Ammonia as N	mg/L	0.1	100	40.0	10	0.0040
Water Sampling (end)	hr		11:50:00	pH (start)				7 to 10	0.1	-
Flow	m ³		100	pH (end)				7 to 10	0.1	-
Volume	L		20	Ammonia as N	mg/L	0.5	100	0.7	10	0.0007
Discharges (Discharged)	L		20							

Sample: 12/12/2013 Disposal: 17/12/2013 Publication: 14/04/2013			Location: Alexandria Landfill Fly Ash and Bottom Fly Ash Address: 10-11 Albert Street, St Helens SPL Nos: 4627 and 12394							
Test Description	Units	LDR	Value	Test Parameter	Units	LDR	Composite Sample		Mean Discharged	
							Standard Concentration (mg/L)	Results	Maximum Daily Mass (kg)	Sampling rate (kg/day)
Start time	hr		7:15 am on 12/12/2013	Total Dissolved Solids	mg/L	1	10000	920	100	100
End time	hr		02:30 pm on 12/12/2013	Suspended Solids	mg/L	1	100	54	10	0.54
Water Sampling (start)	hr		11:17:00	Ammonia as N	mg/L	0.1	100	6	10	0.0006
Water Sampling (end)	hr		11:17:00	pH (start)				7 to 10	0.1	-
Flow	m ³		100	pH (end)				7 to 10	0.1	-
Volume	L		20	Ammonia as N	mg/L	0.5	100	1.4	10	0.0014
Discharges (Discharged)	L		20							

Sample: 16/12/2013 Disposal: 14/01/2014 Publication: 14/04/2013			Location: Alexandria Landfill Fly Ash and Bottom Fly Ash Address: 10-11 Albert Street, St Helens SPL Nos: 4627 and 12394							
Test Description	Units	LDR	Value	Test Parameter	Units	LDR	Composite Sample		Mean Discharged	
							Standard Concentration (mg/L)	Results	Maximum Daily Mass (kg)	Sampling rate (kg/day)
Start time	hr		7:00 am on 16/12/2013	Total Dissolved Solids	mg/L	1	10000	970	100	100
End time	hr		02:30 pm on 16/12/2013	Suspended Solids	mg/L	1	100	5-6 mg	10	0.00
Water Sampling (start)	hr		10:45:00	Ammonia as N	mg/L	0.1	100	0.8	10	0.0008
Water Sampling (end)	hr		10:45:00	pH (start)				7 to 10	0.1	-
Flow	m ³		100	pH (end)				7 to 10	0.1	-
Volume	L		20	Ammonia as N	mg/L	0.5	100	0.3	10	0.0003
Discharges (Discharged)	L		20							

Alexandria Landfill Pty Ltd and Sealing Pty Ltd

Leachate Discharge Quality



Disclaimer: Monitoring data contained in this document is such as to be required to comply with Section 482(1) of the Protection of the Environment Operations Act 2007 and is consistent with the requirements based as set forth by the Environmental Protection Authority. It is the best of the knowledge, skills and care of the person who prepared this document.

Sampled: 21/07/2012	Location: Alexandria Landfill Pty Ltd and Sealing Pty Ltd
Discharge: 21/07/2012	Address: 20-26 Abbott Street, St Helens
Publication: 29/07/2012	SP, Nos. 4627 and 43394

Test Parameter	Units	SDR	Value	Test Parameter	Units	SDR	Composite Sample		Mass Discharged	
							Standard Concentration (mg/L)	Results	Maximum Daily Mass (kg)	Sampling results (kg)
Total Dissolved Solids	mg/L	1	10700	10700	3640	493	177			
Suspended Solids	mg/L	1	620	34	38	1.7				
Barium	mg/L	1	0.7	1	0.2289					
Iron	mg/L	0.1	80	2.84	4	0.142				
Aluminium as Al	mg/L	0.5	100	1.1	25	0.124				

Test Parameter	Units	SDR	Discharge Sample		Mass Discharged		
			Standard Concentration (mg/L)	Results	Maximum Daily Mass (kg)	Sampling results (kg)	
Ammonia as N	mg/L	0.5	100	1.8	25	0.0762	
pH (leach)	ppH units	0.1	7 to 10	8.3	-	-	
pH (leach)	ppH units	0.1	7 to 10	8.4	-	-	

Sampled: 21/07/2012	Location: Alexandria Landfill Pty Ltd and Sealing Pty Ltd
Discharge: 21/07/2012	Address: 20-26 Abbott Street, St Helens
Publication: 29/07/2012	SP, Nos. 4627 and 43394

Test Parameter	Units	SDR	Value	Test Parameter	Units	SDR	Composite Sample		Mass Discharged	
							Standard Concentration (mg/L)	Results	Maximum Daily Mass (kg)	Sampling results (kg)
Total Dissolved Solids	mg/L	1	10200	8400	493	258				
Suspended Solids	mg/L	1	800	30	38	1.7				
Barium	mg/L	1	0.8	1	0.2606					
Iron	mg/L	0.1	80	1.53	4	0.2666				
Aluminium as Al	mg/L	0.5	100	0.8	25	0.2483				

Test Parameter	Units	SDR	Discharge Sample		Mass Discharged		
			Standard Concentration (mg/L)	Results	Maximum Daily Mass (kg)	Sampling results (kg)	
Ammonia as N	mg/L	0.5	100	0.5	25		
pH (leach)	ppH units	0.1	7 to 10	8	-	-	
pH (leach)	ppH units	0.1	7 to 10	8.1	-	-	

Sampled: 21/07/2012	Location: Alexandria Landfill Pty Ltd and Sealing Pty Ltd
Discharge: 21/07/2012	Address: 20-26 Abbott Street, St Helens
Publication: 29/07/2012	SP, Nos. 4627 and 43394

Test Parameter	Units	SDR	Value	Test Parameter	Units	SDR	Composite Sample		Mass Discharged	
							Standard Concentration (mg/L)	Results	Maximum Daily Mass (kg)	Sampling results (kg)
Total Dissolved Solids	mg/L	1	10700	3640	493	150				
Suspended Solids	mg/L	1	620	34	38	1.7				
Barium	mg/L	1	0.7	1	0.2289					
Iron	mg/L	0.1	80	2.47	4	0.2612				
Aluminium as Al	mg/L	0.5	100	1.4	25	0.121				

Test Parameter	Units	SDR	Discharge Sample		Mass Discharged		
			Standard Concentration (mg/L)	Results	Maximum Daily Mass (kg)	Sampling results (kg)	
Ammonia as N	mg/L	0.5	100	0.6	25	0.0262	
pH (leach)	ppH units	0.1	7 to 10	8.3	-	-	
pH (leach)	ppH units	0.1	7 to 10	8.4	-	-	

Appendix I

Botany Sands Groundwater Interception System

Figure 6: Botany Sands Groundwater Interception System

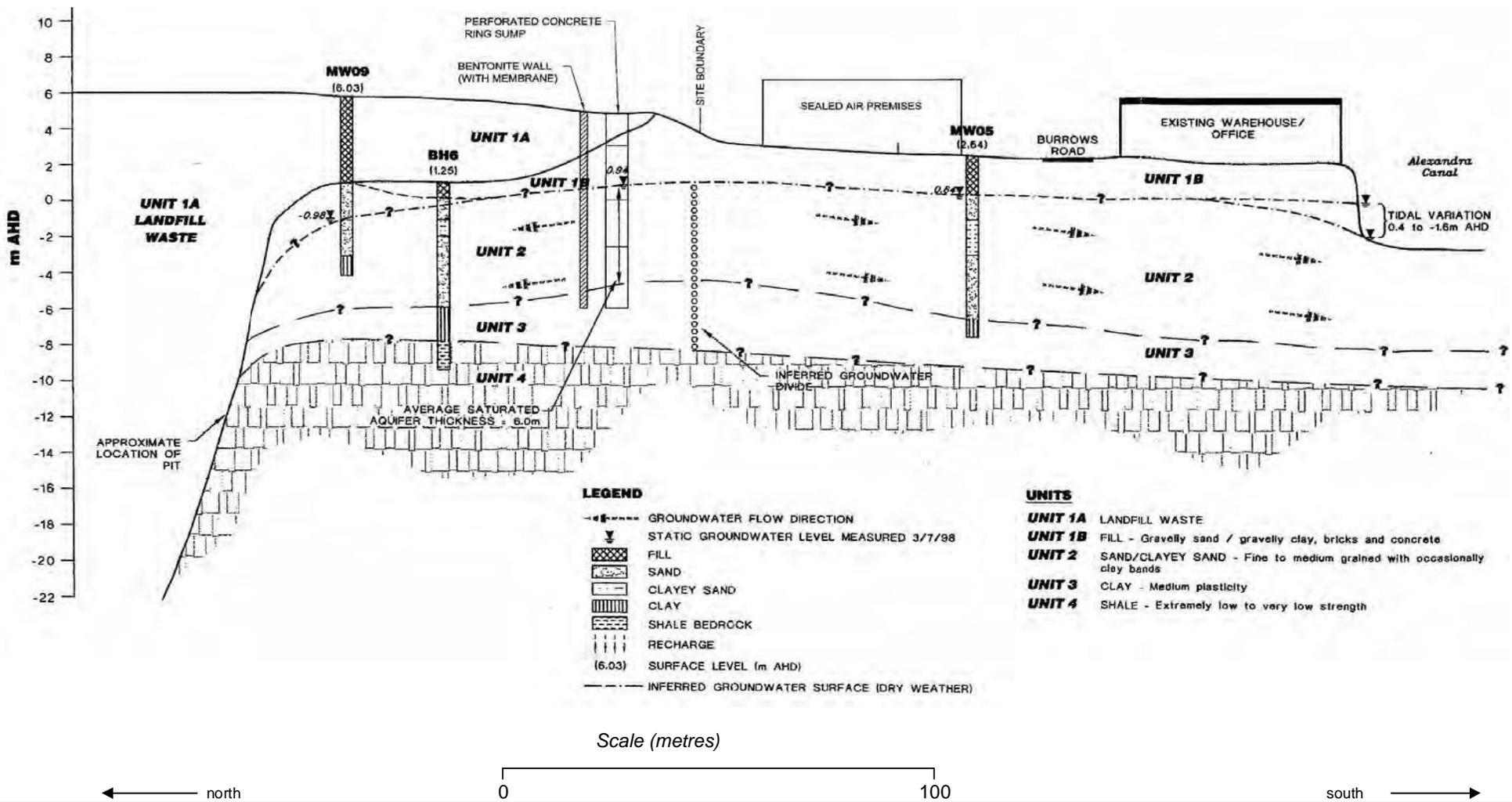


FIGURE 6: BOTANY SANDS GROUNDWATER INTERCEPTION SYSTEM (after WWC, 1998b)

Project: Alexandria Landfill Site Revised SWLMP, March 2012
 Location: Albert Street, St Peters, Sydney
 Client: DADI
 Project No: AJ01



JPG Engineering Notes

CALCULATION / SKETCH SHEET

DESCRIPTION: ALEXANDRIA LANDFILL LEACHATE MANANGEMENT SYSTEMS JOB No: J1430
INSPECTION NOTES SHEET 1 of 3
INSPECTION DATE : 12/01/15

1. Dust Suppression Tank System
 - No power on main panel (including incoming side)
 - Groundwater pit level probes disconnected
2. Water Cart Fill Tanks
 - Power isolated
 - Isolated tank water supply to 1" pressure pump – A/C leaking pump discharge
3. Small Stormwater / Groundwater Pit
 - No power
 - Appears level probe set removed (recently)
4. Main Stormwater Sump (Concrete Block Sump)
 - Minimal water in area (rain in previous days – 26mm - 10, 11, 12 Jan 15 – 119mm in Dec 14)
 - Junction Boxes in pit filled with epoxy i.e. assume regularly under water (unable to test)
5. Leachate Riser (Panel Access Code required) (Pumps were off and were left off !!)
 - Level ≈7.0m below top – Level Probe reading 9.97 m
 - Ran pump for ≈ 2mins – Level Probe reading 10.21m (Indicating Level is measured from top down?)
 - Note : Leachate level was 9.0 m below top of riser on 30/12/14
 - Leachate riser 240 V power supply to dosing pump NOT weatherproof – should be upgraded
6. Intermediate Leachate Riser (750mm concrete pipe)
 - Discharges to Main Leachate Riser via 75 OD HDPE on north side of riser
 - Controller Access Code required
 - Note : riser not running
7. Appears Main Leachate Sump power supply comes from southern batter panel – 16mm² underground supply from Canal Road (4 x 16mm²) - confirmed
 - Panel has level probe telemetry – Indratel
 - Panel has subsided, as a result the conduits have been pulled out of the panel – replace or repair.

8. LTP – Discharge meter reading, note power to meter off 30/12/14 – 6/1/15.
- 645 543 m3
 - 453 m3 discharged (6 days only 6/1 to 12/1/15)

Discharge flow	6.15 l/s	(2 x 2 hr discharge periods)		
Current cycle	<u>SBR 2</u>			
Aeration	0605	→	1400 hrs	} 3 timers, 1 per drive
	1805	→	0200 hrs	
Fill	0605	→	0805 hrs	
	1805	→	2005 hrs	
Discharge	0400	→	0600 hrs	
	1600	→	1800 hrs	

IE: 2 Hr Fill / 8 hr Fill – Aerate / 2 hr settle / 2 hr discharge

	<u>SBR 1</u>		Discharge	Start
(out of service)	Finish	1000 hrs	} 1 timer only – aerate / feed currently unknown	
	Start	1200 hrs		
	Finish	2200 hrs		

9. Radio telemetry between Leachate Risers and the Leachate Plant has been installed by Indratel (Note Indratel do WAMC Landfills). Rang Manager at Indratel who advised that they have been maintaining the site for the last 12 years. He noted that the landfill were not good at keeping any documentation or information on their systems. However, Indratel do have all the radio telemetry software that will describe the Process Interlocks between the LTP and risers. This information will be made available.

Refer to the attached Process Flow Diagram sketch of the existing Leachate Treatment System.

10. The existing system comprises :
- 2 crude SBRs (1 at approx. 60m3 operating volume and a second at around 100m3 operating volume). Note that the smaller SBR #1 is not currently in use.
 - The SBRs are fed from a 27 000 litre feed tank by dedicated feed pumps
 - A 110 OD HDPE pipe and a 90 OD HDPE feed leachate and/or contaminated stormwater to the feed tank from the landfill. The source of all effluent inputs to the tank is still to be determined.
 - Appears that input to the feed tank is inhibited via radio telemetry based on Feed Tank level permissives.
 - The operating SBR (SBR #2) is an 8 metre diameter x 2.4m high concrete tank operating at a top water level at approximately 2.1m
 - Aeration is provided via a number of submersible aspirating aerators located around the perimeter of the SBR.
 - The SBR's have mesh covers installed over them to prevent foam generated during aeration from being blown into the adjacent premises and surrounds.
 - There does not appear to be any PLC control system or any obvious fail-safe system feed back in the event of instrument or equipment failure. (to be confirmed)
 - Control of the out of service SBR 1 is not obvious with only 1 timer unit being found.
 - SBR 2 appears to be controlled via 3 dual adjustable timers, starting and stopping the SBR Feed Pump, Aerators and Discharge Pump.
 - The SBR's are operating on 12 hr cycles comprising

Feed	2 hrs	(commencing at 0600 and 1800 each day)
Aerate	8 hrs	
Settle	2 hrs	
Discharge	2 hrs	

- The SBR 2 Sewer Discharge Pump was run and flow allowed to stabilise. The observed discharge rate was 6.15 l/s, noting Sydney Water's Trade Waste Licence maximum allowable discharge flow rate of 6.0 l/s.
As such, the current maximum daily treatment and discharge rate is 4 hrs per day at 6.15 l/s or 89 m³ per day for SBR 2 only.
- Refer to the attached extract (3 pages) from the 2011 Sydney Water Trade Waste Agreement for the site.
- The inputs to the LTP at this stage are unknown. Leachate discharged to sewer between 30/12/14 and 12/1/15 (453 m³) cannot be accounted for if the main leachate riser pumps have been off, as we believe they have. Note that the feed Tank was full, so effluent is coming from somewhere?
- Samples of effluent discharge to sewer were taken and will be analysed for the current listed trade waste analytes.

Recommendations

- I. Obtain controller (PLC) access codes for both risers. (Note that both riser pump systems are off as at 12.1.15). Alternatively, gain access otherwise or replace controllers
- II. Having gained access to the leachate riser systems, put all systems into operation and monitor to identify :
 - Current actual system operation
 - Process interlocks
 - System inadequacies with regard to safety and environment
 - Source of leachate and contaminated stormwater feed to the LTP
 - Current system statutory compliance
- III. During the day or days of operation monitoring establish short term and long term recommendations and budget estimates for both current and future operation and upgrade.

JPG 13/1/15



CUSTOMER:

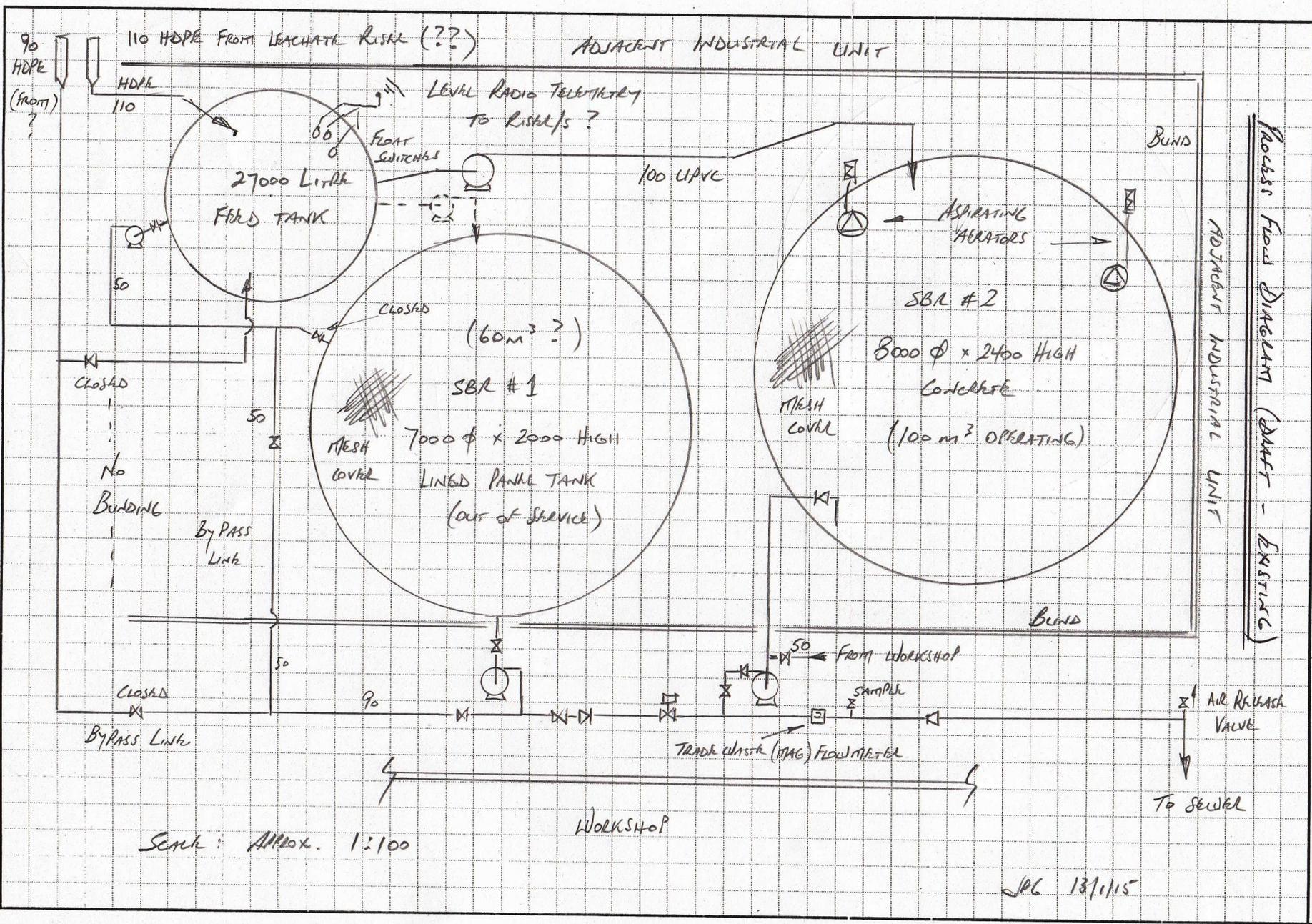
JOB No: J1430

DESCRIPTION:

ALEXANDRIA LANDFILL
Leachate Treatment Plant

SHEET 1 of

DATE: 13 Jan. 2015



Process Flow Diagram (Draft - Existing)

Consent to Discharge Industrial Trade Wastewater

SYDNEY WATER CORPORATION

and

ALEXANDRIA LANDFILL PTY LTD

A.C.N. 098 849 971

Trading as

ALEXANDRIA LANDFILL PTY LTD

A.B.N. 26 098 849 971

ACTIVITY: GARBAGE TIP (GE06)

RISK INDEX: 05

CONSENT NO: 29304

CONNECTION NO: 2

PROPERTY NUMBER: 4059264

This CONSENT is made on
Executed for and on behalf of
Sydney Water Corporation

day: month: year:

By

.....
(Signature)
Sally Armstrong
Manager, Business Customer Services

In the presence of:

Witness

.....
(Signature)

Executed for and on behalf of
the Customer:

.....
(Print name of witness)

By

.....
(Signature)

IAN MALOUF SOLE DIRECTOR / SECRETARY

.....
(Print name and position of person signing)

who warrants s/he has sufficient authority to execute this consent.

In the presence of:

Witness

.....
(Signature)

JACQUELINE BRAUMAN

.....
(Print name of witness)

This consent must be executed by the Customer prior to execution by Sydney Water and submitted by the Customer to Sydney Water for its consideration. Submission of a consent executed by the Customer under no circumstances obliges Sydney Water to enter into or complete the consent. Submission of an executed consent by the Customer constitutes an application for a consent which Sydney Water may in its reasonable discretion reject, or with the consent of the Customer modify any of the proposed terms thereto.

SCHEDULE 1
(SUBJECT TO PUBLIC DISCLOSURE)

TRADE WASTEWATER WHICH MAY BE DISCHARGED

1. Trade wastewater substances

- (a) The Customer may discharge trade wastewater into the Sewer in a manner whereby the substance characteristics of the trade wastewater are of a type and discharged at a rate, level or concentration equal to or less than that described in this schedule.
- (b) The Customer must not discharge trade wastewater into the Sewer in a manner whereby the trade wastewater discharged;
 - (i) contains, possesses or produces a substance characteristic not provided in, or which may be determined as being contrary to that described in this schedule.
 - (ii) is at or of a rate, level, or concentration not provided in, or which may be determined as being contrary to, that described in this schedule.

SUBSTANCE	LTADM (kg/day)	MDM (kg/day)	Standard (mg/L)
AMMONIA (AS N)	1.50000	25.00000	100.000
SUSPENDED SOLIDS	5.00000	20.00000	600.000
TOTAL DISSOLVED SOLIDS	450.00000	674.00000	10000.000
BARIUM	0.21000	1.00000	5.000
IRON	0.70000	4.00000	50.000

RECONCILIATION PROCEDURES:

LONG TERM AVERAGE DAILY MASS:

The Long Term Average Daily Mass is a twelve month arithmetic average of ALL daily mass discharges as calculated for each composite sample. The Daily Mass discharged is to be calculated for each of the above substances, and checked against the above Long Term Average Daily Mass (kg/day) on the basis of average concentrations of substances discharged (mg/L) over any 24 hour period as determined from composite samples, obtained by either the Customer (in accordance with Schedule 2) or Sydney Water, or a combination of sample results by both.

This average concentration (mg/L) is to be multiplied by the total discharge (kL) as recorded by the Customer's discharge flow meter over the 24 hour period in order to calculate the Daily Mass of substances discharged (kg). Exceeding the Long Term Average Daily Mass does not constitute a Breach, but may incur a Critical Mass Charge as detailed in Schedule 3.

ACCEPTANCE STANDARD:

The Composite Sample Concentration is to be determined for each of the above substances, and checked against the above Acceptance Standard (mg/L) for each sample obtained. Exceeding the Acceptance Standard constitutes a Breach and will also incur an increased Quality Charge as detailed in Schedule 3.

The Discrete Sample Concentration is to be determined for each of the substances identified at Schedule 2, 2 (b) and checked against the above Acceptance Standard (mg/L) for each sample obtained. Exceeding the Acceptance Standard constitutes a Breach.

MAXIMUM DAILY MASS:

The Daily Mass discharged is to be calculated for each of the above substances, and checked against the above Maximum Daily Mass (kg/day) on the basis of average concentrations of substances discharged (mg/L) over any 24 hour period as determined from composite samples, obtained by either the Customer (in accordance with Schedule 2) or Sydney Water, or a combination of sample results by both.

This average concentration (mg/L) is to be multiplied by the total discharge (kL) as recorded by the Customer's discharge flow meter over the 24hour period in order to calculate the Daily Mass of substances discharged (kg). Exceeding the Maximum Daily Mass constitutes a Breach.

2. The trade wastewater discharged must at all times have the following properties:

- Temperature - Not to exceed 38 degrees Celsius.
- Colour - Determined on a system specific basis
- pH - Within the range 7.0 to 10.0.
- Fibrous material - None which could cause an obstruction to Sydney Water's sewerage system.
- Gross solids (other than faecal) - A maximum linear dimension of less than 20 mm, a maximum cross section dimension of 6 mm, and a quiescent settling velocity of less than 3 m/h.
- Flammability - Where flammable and/or explosive substances may be present, the Customer must demonstrate to the satisfaction of Sydney Water that there is no possibility of explosions or fires occurring in the sewerage system. The flammability of the discharge must never exceed 5% of the Lower Explosive Limit (LEL) at 25° Celsius.

3. Rate of discharge of waste to sewer:

- (a) Instantaneous maximum rate of gravitated discharge 6.0 litres per second
- (b) Maximum daily discharge 620.0 kilolitres
- (c) Average daily discharge 121.0 kilolitres

RECONCILIATION PROCEDURE:

The data obtained from applying these procedures is to be checked by the interface of a chart recorder to the Customer's flow metering equipment, or by the installation of flow metering equipment by Sydney Water, for a minimum of 7 days.

This page has been left blank intentionally.

Appendix E

Asbestos Management Plan

Appendix E Asbestos Management Plan

Asbestos Management Plan

Alexandria Landfill, Alexandria, NSW



Asbestos Management Plan

Alexandria Landfill, Alexandria, NSW

Client: WestConnex Delivery Authority

ABN: 33 855 314 176

Prepared by

AECOM Australia Pty Ltd

Level 21, 420 George Street, Sydney NSW 2000, PO Box Q410, QVB Post Office NSW 1230, Australia

T +61 2 8934 0000 F +61 2 8934 0001 www.aecom.com

ABN 20 093 846 925

26-Mar-2015

Job No.: 60327128

AECOM in Australia and New Zealand is certified to the latest version of ISO9001, ISO14001, AS/NZS4801 and OHSAS18001.

© AECOM Australia Pty Ltd (AECOM). All rights reserved.

AECOM has prepared this document for the sole use of the Client and for a specific purpose, each as expressly stated in the document. No other party should rely on this document without the prior written consent of AECOM. AECOM undertakes no duty, nor accepts any responsibility, to any third party who may rely upon or use this document. This document has been prepared based on the Client's description of its requirements and AECOM's experience, having regard to assumptions that AECOM can reasonably be expected to make in accordance with sound professional principles. AECOM may also have relied upon information provided by the Client and other third parties to prepare this document, some of which may not have been verified. Subject to the above conditions, this document may be transmitted, reproduced or disseminated only in its entirety.

Quality Information

Document Asbestos Management Plan
Ref 60327128
Date 26-Mar-2015
Prepared by Adrian Spankie / Tim Kulmar
Reviewed by Jason Clay

Revision History

Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
A	16-Mar-2015	Draft	Anthony Davis Associate Director	
B	26-Mar-2015	Final	Anthony Davis Associate Director	

Table of Contents

1.0	Introduction	1
2.0	Background	3
	2.1 Site Activities	3
	2.2 Potential Risk	3
3.0	Reference Documents	4
4.0	Definitions	5
5.0	Objectives of an Asbestos Management Plan	7
6.0	Responsibilities	8
	6.1 Key Personnel at the Site.	9
	6.2 Organisation Chart for the Site	9
7.0	Employee Information and Training	11
8.0	Contractor Training	12
9.0	Asbestos Work Procedures and Methodologies for Alexandria Landfill	13
	9.1 Introduction	13
	9.2 Areas not being disturbed	13
	9.3 Safe Work Procedures	13
	9.4 Air Monitoring	14
	9.5 Clearance Inspections	15
10.0	Uncovering of Suspected Asbestos Materials	16
11.0	Incidents	17
12.0	Emergency Procedures	18
13.0	Reviews of the Asbestos Management Plan	19
14.0	Asbestos Management Records	20
Appendix A		
	Site Plan	A
Appendix B		
	Emergency Procedures	B
Appendix C		
	Air Monitoring Procedures	C
Appendix D		
	Methods for Work with Asbestos	D

List of Tables

Table 1	Asbestos Management Plan - Organisational Responsibilities	9
---------	--	---

List of Figures

Figure 1	Alexandria Landfill Organisation Chart	10
----------	--	----

1.0 Introduction

AECOM Australia Pty Ltd (AECOM) has been engaged by the WestConnex Delivery Authority (WDA) to prepare this Asbestos Management Plan (AMP) for the management of asbestos containing materials (ACM) that may be encountered within WDA owned land including:

- The Alexandria Landfill land comprising:
 - The main Alexandria Landfill (ALF)
 - Albert Street Lot
 - 1A Holland street Lot
- Roads and Maritime Service (RMS) land comprising:
 - Canal Rd
 - Albert St (i.e. Bradshaw Mountain)

The above properties are hereafter referred to as the Site. The Boundaries of the Site may be adjusted from time to time as required depending on operational needs and additional acquisitions (e.g. Rudders Bond Store) or possessions (e.g. Council Recycling Premises on RMS land). The Plan should be updated accordingly as and when required.

This Site has been used as a landfill for many years and as such is known to contain waste including ACM.

The WDA has created an Interim Site Management Plan (ISMP) for the Site and is currently developing a comprehensive suite of Management Plans for the Site including this Asbestos Management Plan.

The WDA as a 'person conducting a business or undertaking' (PCBU) has a legal obligation under the NSW *Work Health & Safety Act 2011* (WHS Act) and the NSW *Work Health & Safety Regulation 2011* (WHS Regulation) to ensure the health and safety of each of its workers at work. WDA also has an obligation to ensure the workplace health and safety of others is not affected by the way they conduct their business.

As part of this obligation, WDA has recognised that asbestos-related issues must be adequately addressed, and, as such, is in the process of preparing procedures designed to manage asbestos issues that may arise. These will include this AMP as well as others such as Safe Work Method Statements (SWMS), Asbestos Removal Control Plans (ARCP), induction plans and asbestos awareness training. An asbestos register will be created for the Site that will detail any known asbestos containing materials at the Site and a risk assessment for each item.

The purpose of this AMP is to address WDA's legal obligation under the WHS Act and Regulation (2011), as it relates specifically to the presence of asbestos at the Site. This AMP is a working document designed to effectively manage and minimise asbestos-related health risks to personnel working on, living adjacent to, or visiting the Site.

This AMP has been prepared to protect the safety and health of workers and visitors to the Site. Future work undertaken at the Site may be in an asbestos-containing environment and may involve asbestos removal. The works must be carried out in a manner that ensures the protection of the health and wellbeing of WDA workers and other contractors and ensures that all personnel employed at the Site are aware of ACM and their locations.

Where projects involve toxic and hazardous materials it is a requirement of New South Wales legislation to put in place a hazardous materials management plan preceding the commencement of works.

Any work with asbestos or that may expose a worker to asbestos must only be carried out in accordance with the requirements of the WHS Act and Regulation. In all cases involving friable asbestos this will mean that works may only be undertaken by a Class A licensed asbestos removal workers with a licensed asbestos assessor carrying air monitoring. For all but the most minor work with non-friable asbestos the work must also only be under the control of Class A or B licensed asbestos removalists and even non-licensable work will require workers trained and equipped to an equivalent standard.

WDA is required to commit to the implementation and execution of work health and safety practices which fully comply with the relevant statutory regulations in the State of New South Wales and that protect the health and well-being of their workers, all other Site personnel and the public.

This commitment will be demonstrated by the implementation of this AMP and the implementation, monitoring and adjustment of procedures and processes, which will minimise the risk of exposure of workers to asbestos fibre.

This AMP is based on the identification and recognition of ACM and their risks, and the controls and precautions needed. The strong involvement of all levels of the workforce including managers and employees will ensure the successful attainment of the objectives of this AMP.

2.0 Background

WDA assumed ownership of the Site on Friday 19 December 2014 and took possession of the land at close of business on 22 December 2014.

The Site has been used as a landfill since the 1980's and is known to contain asbestos waste which may be present across the Site. The Site is proposed to be closed as part of the New M5 WestConnex road development project and requires an AMP to be in place to ensure that exposure to asbestos is prevented at all stages of the project and in the long term once the works are complete.

AECOM Australia Pty Ltd (AECOM) was commissioned by Dimitry Belov (on behalf of WDA) to prepare this initial AMP to manage the current asbestos at the Site. This AMP will remain in effect until such time that the managing contractor has been engaged and a new AMP has been developed that takes into account the scope of works to be undertaken by the managing contractor.

2.1 Site Activities

The initial work on the Site will consist of surveys, inspections and other activities to plan the motorway. These activities will include excavations that will disturb the landfill material.

As the Site contains unknown waste material which may all be contaminated with friable and non-friable asbestos, any work that disturbs the surface of the Site may disturb ACM and could potentially give rise to airborne asbestos fibres.

Any areas that can be determined not to contain or be at risk of containing ACM will not require the application of this AMP. However, workers in those areas should be aware of the risk of unexpected finds of ACM or other hazardous materials and have an unexpected finds procedure in place such as described in **Appendix B**.

Unless a material can be certified not to contain asbestos then it should be treated as if it may contain non-friable or friable asbestos fibre. Under the National Environmental protection Measures (NEPM) assessment guidelines, any free asbestos fibres or asbestos fines in a soil or waste should be assessed as friable.

Any work to excavate or move any potentially asbestos contaminated soil or other material must therefore only be carried out under controlled conditions and supervised by a NSW Class A licensed asbestos removalist as defined in the WHS Regulation. Observation, verification and air monitoring of asbestos removal and allied work should be carried out by a licensed asbestos assessor.

If additional suspected ACM is identified at any point on the site during other works, a licensed asbestos removalist will isolate the area and then remove or encapsulate the material and make the area safe. A licensed asbestos assessor will inspect and test the materials to determine if they are an ACM. If confirmed as an ACM the assessor will confirm whether the environmental controls implemented during the works were effective and test for elevated asbestos fibre levels during any subsequent works.

It is noted that the boundaries of the Site may be adjusted from time to time as required depending on operational needs and additional WDA land acquisitions. The Plan should be updated accordingly as and when required.

A plan showing the current Site layout is included in **Appendix A**.

2.2 Potential Risk

The risk to human health from asbestos is related to the inhalation of asbestos fibres. Therefore, any asbestos cement fragments or friable material present a negligible risk if buried and undisturbed. Friable asbestos may generate elevated airborne fibre levels if lying on the soil surface or disturbed and cement fragments may also do so if they are broken up and pulverised such as may occur during excavation or materials processing activities.

3.0 Reference Documents

This AMP satisfies the requirements of the Safe Work Australia Asbestos Codes of Practice and Guidance Notes, these being:

- *The Code of Practice: How to Manage and Control Asbestos in the Workplace, 2011.*
- *The Code of Practice: How to Safely Remove Asbestos, 2011, and*
- *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres, 2nd Edition [NOHSC: 3003 (2005)].*

The AMP is consistent with NSW legislative requirements, these being:

- *Work Health and Safety Act 2011.*
- *Work Health and Safety Regulation 2011.*
- *Protection of the Environment Operations Act, 1997.*
- *Environmentally Hazardous Chemicals Act 1985, and*
- *Protection of the Environment Operations (Waste) Regulation 2014.*
- *National Environmental Protection Measures (NEPM) 1999, amended 2013.*

In addition, the AMP has considered the following Australian and New Zealand Standards:

- *AS1319-1994 Safety Signs in the Occupational Environment.*
- *AS/NZS1715-2009 Selection, Use & Maintenance of Respiratory Protective Equipment.*
- *AS/NZS1716-2003 Respiratory Protective Devices.*
- *AS/NZS 60335.2.69:2003 Household and similar electrical appliances – Safety - Particular requirements for wet and dry vacuum cleaners, including power brush, for industrial and commercial use, and*
- *AS4260-1997 High Efficiency Particulate Air (HEPA) Filters – Classification, Construction and Performance.*

Exposure standards are referenced from:

- *Workplace Exposure Standards (WES) for Airborne Contaminants, SafeWork Australia, 22 December 2011.*

4.0 Definitions

The use of the words below in italics in this document indicates the word or words have the following defined meaning:

<i>Asbestos:</i>	The asbestiform varieties of mineral silicates belonging to the serpentine or amphibole groups of rock forming minerals including the following: <ul style="list-style-type: none">(a) actinolite asbestos,(b) grunerite (or amosite) asbestos (brown),(c) anthophyllite asbestos,(d) chrysotile asbestos (white),(e) crocidolite asbestos (blue),(f) tremolite asbestos,(g) a mixture that contains 1 or more of the minerals referred to in (a) to (f).
<i>Asbestos-containing material (ACM):</i>	Means any material or thing that, as part of its design, contains asbestos.
<i>Asbestos-contaminated dust or debris (ACD):</i>	Means dust or debris that has settled within a workplace and is, or assumed to be, contaminated with asbestos.
<i>Asbestos Register:</i>	A register recording the type, condition and location of all asbestos and asbestos containing materials for all premises under WDAWDA control.
<i>Asbestos vacuum cleaner:</i>	A vacuum cleaner that complies with Class H requirements in AS/NZS 60335.2.69 <i>Industrial vacuum cleaners</i> or its equivalent and whose filters conform to AS 4260-1997 <i>High efficiency particulate air (HEPA) filters – Classification, construction and performance</i> .
<i>Class A licence:</i>	Means a licence that authorises the carrying out of Class A asbestos removal work and Class B asbestos removal work by or on behalf of the licence holder. This allows the licence holder to conduct friable asbestos removal work and non-friable asbestos, ACM or ACD removal work.
<i>Class B licence:</i>	Means a licence that authorises the carrying out of Class B asbestos removal work by or on behalf of the licence holder. This allows the holder to conduct the removal of more than 10 square metres of non-friable asbestos or ACM removal work and/or the removal of ACD associated with the removal of more than 10 square metres of non-friable asbestos.
<i>Class A asbestos removal work:</i>	Work requiring a Class A asbestos removal license.
<i>Class B asbestos removal work:</i>	Work requiring a Class B asbestos removal license.
<i>Competent person:</i>	A person possessing adequate qualifications, such as suitable training and sufficient knowledge, experience and skill, for the safe performance of the specific work.

<i>Control Level:</i>	The airborne concentration of a particular substance which, if exceeded, indicates a need to implement a control, action or other requirement. Control levels are generally set at no more than half the National Exposure Standard (NES for the substance. Control levels are occupational hygiene 'best practice', and are not health-based standards
<i>Control Monitoring:</i>	Means air monitoring, using static or positional instruments to measure the level of airborne asbestos fibres in an area during work on ACM. Control monitoring is designed to assist in assessing the effectiveness of control measures. Its results are not representative of actual occupational exposures, and should not be used for that purpose.
<i>Friable (asbestos):</i>	Means material that is in a powder form or that can be crumbled, pulverised or reduced to powder by hand pressure when dry, and contains asbestos.
<i>Hierarchy of hazard control:</i>	Measures taken to minimise risk to the lowest level reasonably practicable in the descending order of: Elimination, Substitution, Engineering controls, Administrative controls, and Personal Protective Equipment (PPE).
<i>Licensed asbestos removal work:</i>	Means asbestos removal work for which a Class A asbestos removal licence or a Class B asbestos removal licence is required.
<i>Licensed asbestos assessor:</i>	Means a person licenced to carry out air monitoring and clearance inspections during and following work with friable asbestos.
<i>Non-friable (or bonded) asbestos:</i>	Material containing asbestos that is not friable, including material containing asbestos fibres reinforced with a bonding compound.
<i>PCBU:</i>	Person conducting a business or undertaking.
<i>Person with management or control of a workplace:</i>	<p>Means a PCBU to the extent that the business or undertaking involves the management or control, in whole or in part, of the workplace.</p> <p>The person with management or control of a workplace must ensure, so far as is reasonably practicable, that the workplace, the means of entering and exiting the workplace and anything arising from the workplace are without risks to the health and safety of any person.</p>
<i>Worker:</i>	<p>In accordance with the <i>Work Health and Safety Act 2011</i>, a person who carries out work in any capacity for a PCBU, including work as:</p> <ul style="list-style-type: none">(a) an employee, or(b) a contractor or subcontractor, or(c) an employee of a contractor or subcontractor, or(d) an employee of a labour hire company who has been assigned to work in the person's business or undertaking, or(e) an outworker, or(f) an apprentice or trainee, or(g) a student gaining work experience, or(h) a volunteer, or(i) a person of a prescribed class. <p>For the purpose of Work Health and Safety Act 2011, a police officer is:</p> <ul style="list-style-type: none">(a) a worker, and(b) at work throughout the time when the officer is on duty or lawfully performing the functions of a police officer, but not otherwise. <p>The PCBU is also a worker if the person is an individual who carries out work in that business or undertaking.</p>

5.0 Objectives of an Asbestos Management Plan

The ultimate goal for WDA is to have a workplace that is free from any risk caused by asbestos. In the interim, the WDA intends to manage asbestos hazards based on prioritisation and assessment of risk.

This AMP details WDA's approach towards managing the asbestos hazards identified at the Site, by documenting procedures designed to minimise the risk of exposure to asbestos at the Site, for employees, maintenance personnel, contractors, construction workers and visitors.

This AMP has been developed in line with the Code of Practice: *How to Manage and Control Asbestos in the Workplace* which states:

An asbestos management plan sets out how asbestos or ACM that is identified at the workplace will be managed, for example what, when and how it is going to be done.

An asbestos management plan must include:

- *the identification of asbestos and ACM, for example a reference or link to the asbestos register for the workplace, and the locations of signs and labels*
- *decisions, and reasons for the decisions, about the management of asbestos at the workplace, for example safe work procedures and control measures*
- *procedures for detailing accidents, incidents or emergencies of asbestos at the workplace*
- *workers carrying out work involving asbestos, for example consultation, information and training responsibilities.*

Additionally, an asbestos management program should be seen as part of an organisation's overall approach to risk management. Where the evaluation process has revealed a likelihood of exposure to asbestos fibres all practicable steps should be taken to ensure that employees are not unnecessarily exposed. A thorough examination of work practices is an essential preliminary action. Procedures designed to ensure that employees are not exposed to asbestos likely to cause danger to their health should then be adopted.

The ultimate aim of this AMP is to ensure that no persons whether employed at the site, visiting the site or contracted to work on the Site are exposed to the risk of the inhalation of airborne asbestos fibre. In addition, it is essential that all employees, visitors and contractors be fully informed of the control strategies that have been established and the factual health consequences of exposure to airborne asbestos fibre.

6.0 Responsibilities

Management (officers) and the property owners and controllers are responsible for ensuring that appropriate preventative and control measures are implemented and maintained. This can be achieved by use of an AMP as a preventative and control measure. An AMP provides guidance and resource to inform and protect personnel required to work at the sites where ACM and asbestos contamination and hence to protect their health, safety and well-being.

Employees must also be committed to working in accordance with this AMP and participate in maintaining the health and safety of themselves and their co-workers. Asbestos awareness training will be provided as a minimum for any workers who may work in an area containing asbestos or whose work may affect asbestos on the site.

To achieve the goals, consultation must occur between management and employees in maintaining and improving the intentions of this AMP to ensure that conditions are maintained safely.

Full consultation, involvement and information sharing should occur between management and employees through a well-established consultative mechanism. Any results of air monitoring or similar testing will be displayed daily and added as an item on daily pre-start meetings.

A general duty is imposed on any person conducting a business or undertaking (PCBU) at a workplace to eliminate, as far as is reasonably practicable, a person's exposure to airborne asbestos, or if not reasonably practicable, to minimise so far as is reasonably practicable. A PCBU must ensure that the exposure standard for asbestos is not exceeded at the workplace.

A PCBU has a responsibility in relation to asbestos to:

- Provide and maintain, so far as practicable, safe and healthy work environments and practices generally, and have a written policy on the control of asbestos (such as within this AMP).
- Ensure, so far as is reasonably practicable, that all asbestos or ACM at the workplace is identified by a competent person.
- Comply with legislative provisions.
- Liaise where appropriate with employees on a continuous basis so that the existence and condition of asbestos in the working environment is known.
- Provide adequate instruction and training for employees and supervision of health and safety measures.
- Consult with employees, their representatives and organisations and the State Regulator on the control of exposure to airborne asbestos.
- Anticipate the need for the control of asbestos risks to be initiated in any particular case.
- Provide appropriate protective clothing and equipment, hygiene procedures and personal decontamination facilities.
- Prepare, complete and submit documents for obtaining necessary approvals.

Workers have a responsibility in relation to asbestos to:

- Take reasonable care for their own health and safety.
- Take reasonable care that their acts or omissions do not adversely affect the health and safety of other persons.
- Comply with instructions given for their own safety and health and that of others generally.
- Comply with all work procedures and instructions related to asbestos.
- Co-operate with supervisors and managers in their fulfilment of legislative obligations.
- Report immediately to their supervisor any perceived safety or health risk.
- Wear and maintain in good order all protective clothing and apparatus provided by the manager or supervisor for personal protection and maintain same in good order.
- Ensure all equipment is in good working order.

Employer and employee organisations have a responsibility in relation to asbestos for:

- Consulting on health and safety matters generally and on measures that may need to be taken on asbestos in occupied areas, on machinery and equipment.
- Keeping themselves informed of advice given by competent persons in relation to inspections and meeting health and safety commitments.
- Co-operating on any reasonable request for the variation to work hours and hours of work.
- Advising members of their rights, obligations and responsibilities under occupational health legislation.

Visitors have a responsibility in relation to asbestos to:

- Comply with instructions given for their own safety and health and that of others generally.
- Comply with all work procedures and instructions related to asbestos.
- Co-operate with WDA staff in their fulfilment of legislative obligations.
- Take care of their safety and health and that of others.
- Report immediately to WDA any perceived safety or health risk.

6.1 Key Personnel at the Site.

The following key personnel are responsible for the implementation of the control measures discussed in this document:

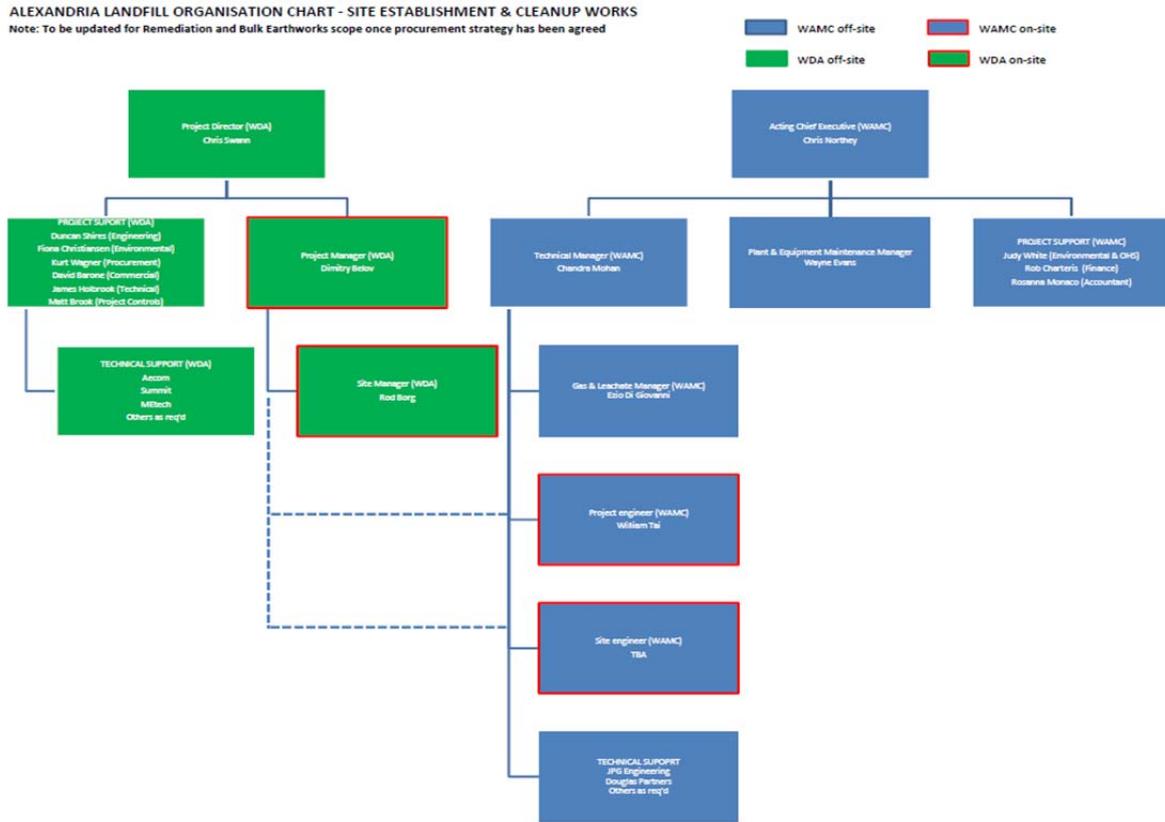
Table 1 Asbestos Management Plan - Organisational Responsibilities

Item	Activities	Department/Person Responsible
AMP compliance/Owner of Asbestos Register	Implementation Establish document controls Communication to key stakeholders	Dimitry Belov
Asbestos audits & register	Updates to register, communication of register	Michael Evans
Asbestos awareness training (staff)	Prepare and Implement program	Duncan Shires
Worker compliance/Implementation of Controls/Stop Work	Adherence to AMP requirements	Rod Borg
Upgrade of Controls	Adherence to AMP requirements	Dimitry Belov
Contractor compliance	Adherence to AMP requirements	Rod Borg
Licensed Asbestos Assessor	Air monitoring, site inspections, sampling, clearance inspections.	Waste Assets Management Corporation (WAMC)
Updates to AMP and controls	Reviews and updates to AMP, SWMS and other asbestos controls	Dimitry Belov

6.2 Organisation Chart for the Site

The organisational chart for Site establishment and clean-up works is provided in **Figure 1** Alexandria Landfill Organisation Chart below.

Figure 1 Alexandria Landfill Organisation Chart



7.0 Employee Information and Training

Training and sharing of information is one of the most important elements of this AMP. All categories of personnel employed at the Site and visitors to the Site and who may be involved in the asbestos work should be given appropriate Asbestos Awareness Training to ensure adequate awareness of the health risks of asbestos, methods of prevention and control, proper work practices, emergencies and use of personal protective equipment.

Asbestos Awareness Training should be conducted for all employees as required to keep employees abreast of updated information and procedures and to reaffirm WDA health and safety requirements.

A person conducting a business or undertaking must ensure workers who they reasonably believe may be involved in asbestos removal work in the workplace or the carrying out of asbestos-related work are trained in the identification, safe handling and suitable control measures for asbestos and ACM.

A person conducting a business or undertaking must ensure that information, training and instruction provided to a worker are suitable and adequate, having regard to:

- *the nature of the work carried out by the worker;*
- *the nature of the risks associated with the work at the time the information, training or instruction is provided;*
- *the control measures implemented.*

The Asbestos Awareness Training for employees should be conducted in a manner, so far as is reasonably practicable, in which the employee is able to understand and will be given in verbal and written form and with the use of visual aids and worker participation. These approaches are to be used in a manner that will ensure adequate awareness of the health and safety risks at site, methods of prevention and control and appropriate work practices.

The training program will include, but not be limited to, the provision of information on the following:

- Health effects of exposure to asbestos.
- Type and presence of asbestos in the workplace.
- Roles and responsibilities under the AMP.
- Location and use of the Asbestos Register
- Nature of operations which could result in asbestos exposure.
- Safe work procedures to prevent exposure to asbestos fibres.
- What to do if asbestos is disturbed.
- Exposure standards and control levels relating to asbestos.
- Preventative and control measures.
- Labelling and Signage.
- Airborne Asbestos Monitoring Program.
- Purpose of exposure monitoring or health monitoring.
- Personal protective equipment (PPE) and decontamination procedures.

Training records will be maintained for each employee and visitor at the Site for the duration of the work and for five years after cessation of the work. The records should be available for inspection by the regulator upon request.

8.0 Contractor Training

A person conducting a business or undertaking must ensure workers who they reasonably believe may be involved in asbestos removal work in the workplace or the carrying out of asbestos-related work are trained in the identification, safe handling and suitable control measures for asbestos and ACM.

Contractors who are going to be working with or in contact with the asbestos work will be provided with an appropriate level of Site specific training during the induction process to ensure that they are aware of the requirements of the AMP and also, that they are aware of any ACM that may impact upon their work. Site specific induction procedures will include where necessary, asbestos management and personal protective requirements, with emphasis placed on the workers responsibility in relation to asbestos matters, and the health hazards that may result if these responsibilities are neglected.

Pre-start meetings will be given every day at the site prior to work commencing. These talks will give updated information on the results of air monitoring for asbestos and any new details regarding work processes.

9.0 Asbestos Work Procedures and Methodologies for Alexandria Landfill

9.1 Introduction

This section describes the procedures and possible methodologies to be used by managers and workers during investigations, surveys, excavation, handling and disposal or placement of potentially asbestos impacted fill material from locations at the Site.

Areas that can be determined to not contain any asbestos contamination can be excluded from these procedures although an unexpected finds procedure should still be in place (see **Appendix B**).

A licensed asbestos assessor is to closely observe any works at the site that may disturb asbestos containing materials. Any such works must be under the control of a licensed asbestos removal contractor who must also develop their own Asbestos Removal Control Plan (ARCP).

9.2 Areas not being disturbed

In areas of the Site where no works are taking place but it is suspected that asbestos containing materials may exist there will only be a potential risk if these materials are exposed on the ground surface. If there are buried ACM on the Site they cannot give rise to airborne fibres unless uncovered.

Where potentially friable asbestos containing materials are observed on the surface precautions to prevent fibre release would include covering the material with fill or a geofabric layer held down with fill. Areas such as these should be fenced and signed to prevent accidental disturbance.

Areas containing non-friable asbestos waste such as cement, vinyl tiles and the like can be fenced and signed without capping if the licensed asbestos assessor does not consider that fibre release under normal conditions is likely. If weather conditions or other factors such as possible disturbance are likely to give rise to fibre release then the materials may be capped as above.

Background air monitoring as detailed in **Section 9.4** and **Appendix C** may be undertaken around such areas to provide reassurance that fibre release is not occurring at a level where elevated airborne fibre levels can be detected.

9.3 Safe Work Procedures

Any works that will disturb potentially asbestos contaminated materials whether it is intended to be asbestos removal or just an investigation must be carried out in accordance with the WHS Regulation and the WorkCover Codes of Practice.

Safe Work Procedures are required for any work that may disturb asbestos. In most cases this work will only be carried out under the control of a licensed asbestos removalist and licensed asbestos assessor. Removalists are required to draw up their own Asbestos Removal Control Plan (ARCP) for work with asbestos and the controls within these should mirror the requirements of the WHS Regulation, codes of practice and the WDA site specific controls such as are detailed within this AMP and the ISMP.

Other workers and contractors working under the control of the removalists must adhere to these procedures and plans by following them directly or by including them into their own SWMS.

AECOM has detailed some outline procedures for working with asbestos that give a list of controls and procedures that should be adopted. These are listed in **Appendix D**.

The procedures specified by AECOM are designed to be adhered to during all stages of the investigation works in areas of the Site that cannot be certified to be asbestos free to ensure that the health and wellbeing of all workers associated with the project, and occupying adjacent areas.

The specifications provided by AECOM are intended as a guide only and do not override the requirements of relevant legislation, codes of practice, Australian Standards or other accepted best practices and minimum standards.

As stated in **Section 3** above, unless a material can be certified not to contain asbestos then it should be treated as if it may contain non-friable or friable asbestos fibre. Free fibre in soil will lead to it being classified as friable asbestos.

Work may be divided into friable and non-friable and for the purposes of compliance with WHS Regulations free fibre arising from a non-friable material such as cement debris may be classified as non-friable work. In this AMP two basic work methods are detailed in **Appendix D**. The first is for work with, including removal of soil or waste including free fibre arising from that material and the second is for any work with friable asbestos such as ropes, pipe lagging, limpet sprays and insulation that may be identified within the landfill material.

9.4 Air Monitoring

- 1) Air monitoring may be undertaken at the Site to establish if elevated airborne fibre levels are present around stockpiles, areas of waste and during works. This may include background, control, personal and clearance monitoring. Air monitoring procedures are detailed in **Appendix C**.
- 2) Background monitoring may be undertaken at locations where suspected or confirmed asbestos is identified such as around stock piles. This may be repeated daily or only when there is a change in conditions depending on the advice from the Licensed Asbestos Assessor.
- 3) Control air monitoring should be undertaken at the boundaries of any Asbestos Work Area and at other locations such as vehicle cabs by the Licensed Asbestos Assessor during all stages of works that may disturb asbestos contaminated soils and waste. All air monitoring will be carried out by the Licensed Asbestos Assessor to NATA Standards and in accordance with the Code of Practice *How to Remove Asbestos Safely, 2011*.
- 4) Clearance monitoring must be undertaken in work areas on the successful completion of friable asbestos removal work after a visual clearance inspection has been passed by the Licensed Asbestos Assessor. It may be carried out on the completion of non-friable asbestos work if deemed necessary by the licensed asbestos assessor or the WDA.
- 5) Personal monitoring may be carried out on a number of operatives in or working close to the asbestos work area. Personal air monitoring is carried out by placing monitors on personnel such as removal operatives and others whose work may place them at a risk of exposure to elevated fibre levels. It can be used to ensure control measures such as RPE are effective in preventing exposure to fibres.
- 6) Airborne asbestos fibre control limits applicable to any work with asbestos will include:
 - <0.01 fibres/mL - acceptable limit**
Equal to background and detectable limits. Level to achieve for air clearances.
 - >0.01 fibres/mL - alert level**
Review control measures, investigate the cause and implement controls to eliminate or minimise exposure.
 - >0.02 fibres/mL - action level**
Review control measures, investigate the cause and implement controls to eliminate or minimise exposure.
The licensed asbestos removalist must notify the regulator (WorkCover NSW) by phone followed by email, fax or written statement that work has ceased and the results of air monitoring). Work may only recommence following receipt of air clearance monitoring results of <0.01 fibres/mL).Refer to Page 24 for a procedure to be followed for the exceedance of these limits at the Site.
- 7) Where a result of monitoring is outside the site acceptable limits (see 6 above), the cause of the high reading is to be ascertained by the Asbestos Removal Contractor and the Licensed Asbestos Assessor with the Asbestos Removal Contractor responsible to take all remedial action at his own expense to ensure that further high readings are not repeated. Air clearance monitoring is to be undertaken following the completion of works to a phase of on completion of the entire work program. Upon receipt of the clearance air monitoring results of <0.01 fibres/mL and a satisfactory visual inspection of the area, the Asbestos Work Area may be dismantled.

- 8) Additional final air clearance monitoring may then be undertaken following the dismantling of the Asbestos Work Area if the Licensed Asbestos Assessor deems it necessary. Upon receipt of any final air clearance monitoring results of <math><0.01</math> fibres/mL, the Asbestos Work Area may be entered without the need for personal protective equipment and re-occupation can occur.

9.5 Clearance Inspections

Once any asbestos work is complete, the resultant area from will require inspection by the Licensed Asbestos Assessor. A visual clearance inspection will be carried out of the surfaces of the area to confirm whether no visual asbestos fragments remain on these surfaces. In the case of soil, a further turnover of the next layer of soil may be undertaken in order for it to be visually inspected. The contractor is to ensure that safe access is available to any excavations in order to carry out visual inspections.

If any additional fragments are identified; another 100mm of soil should be removed within the area specified by the Asbestos Assessor.

If any additional areas are identified that are suspected of containing asbestos contamination then additional sampling and analysis may be required to determine if asbestos is present. Any areas that are classed as being contaminated will have to be treated as new asbestos work areas and all the above procedures followed.

If ACM contaminated materials are to be left on Site they should be encapsulated in the short term using geofabric and soil/rocks to prevent disturbance or in the longer term in a waste cell. This capping and covering can be the subject of the clearance inspection process.

10.0 Uncovering of Suspected Asbestos Materials

The procedure to be followed in the event of suspected ACM being uncovered is shown in **Appendix B**.

The primary response should be to avoid any further disturbance of the material and prevent access by the placement of barricades.

If the material appears friable or there is a risk of further disturbance from the weather such as high winds the material may be dampened down and covered with heavy gauge polythene or geo-fabric either of which should then be secured with clean fill material, rocks or other heavy items.

Warning signs should be put in place and the discovery should be included in any daily toolbox talks.

All incidents concerning the uncovering of suspected ACM are to be dealt with and recorded via the WDA incident reporting system:

- Date and time of uncovering.
- Nature of the problem.
- Response action taken and date of action; and
- Noted for the purpose of updating the property Asbestos Register.

Once the material has been confirmed as containing asbestos the material may be removed in accordance with the AMP requirements or the signs taken down if it is confirmed as non-asbestos.

11.0 Incidents

When an incident is identified, it will be recorded on the WDA reporting system as detailed in the ISMP. The WDA or the Licensed Asbestos Assessor/Licensed Asbestos Removal Contractor will usually make these observations during routine site inspections.

All incidents are to be managed in accordance with the WDA incident reporting process as detailed in the ISPM and the Emergency Procedures detailed in Section 12 and illustrated in **Appendix B**.

12.0 Emergency Procedures

Emergency procedures on site will cover actions to be taken when asbestos is inadvertently uncovered, catastrophic events occur or air monitoring indicates high levels of airborne asbestos fibre. The procedures contained in **Appendix B** shall be followed in an emergency.

It is important to remember that the first priority must always be the safety of any persons either workers or others involved in the events. Uncovering of asbestos may occur due to human error or to catastrophic event. Catastrophic events may include but not limited to:

- Explosion.
- Industrial Accident.
- Failure of construction structures.
- Failure of an asbestos control (i.e. encapsulation, equipment etc).
- Earthquake.
- Flood.
- Fire.

In order to ensure that the occupational health impact of unavoidable catastrophic events is minimised, emergency procedures documented in **Appendix B** are to be followed.

All emergency action should take place as soon as possible after the event and the first priority is to stabilise the situation and to prevent further hazard or employee exposure.

13.0 Reviews of the Asbestos Management Plan

Reviews of the AMP should be performed on a regular basis and it may be updated as new information on site becomes available.

The review will encompass the entire workings of this AMP including such things as maintenance of registers, asbestos removal procedures, tendering, monitoring, asbestos related functioning etc.

The purpose of the review is to monitor compliance with the AMP and where appropriate improve it.

Reviews will be undertaken in accordance with the WHS Regulation (Reg 430) and relevant Codes of Practice.

14.0 Asbestos Management Records

All asbestos records will be stored and maintained by the WDA.

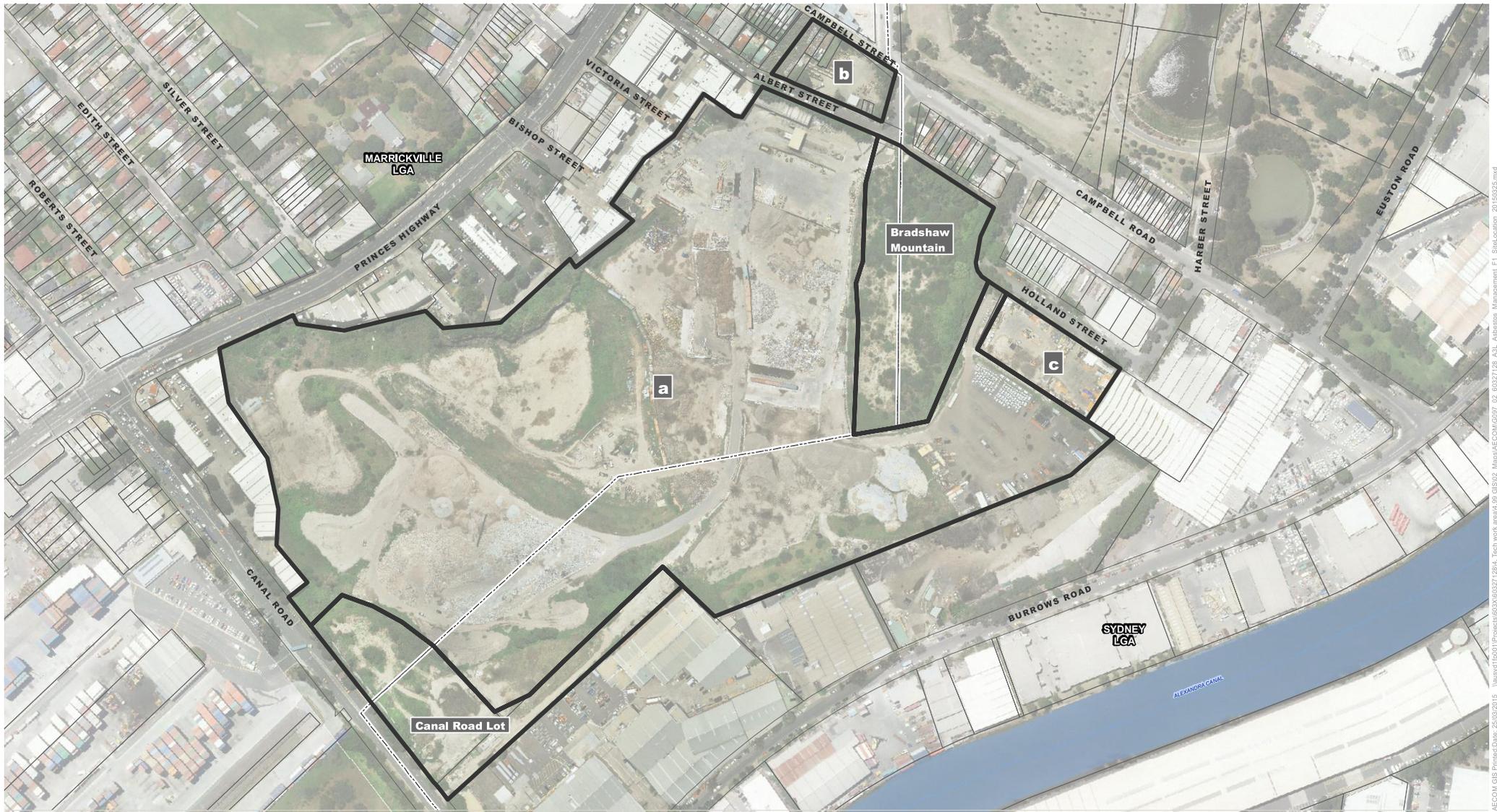
The records will be updated as required.

The record system will contain:

- Records of inspection and test plans.
- Records of corrective action.
- Records of audits.
- Original records of certification/approvals by statutory authorities.
- Records of surveys.
- Records of complaints from employees.
- Records of inspections, maintenance and tests results.
- Records of training and inductions; and
- Records of employee involvement in site works.

Appendix A

Site Plan



AECOM GIS Printed Date: 25/03/2015 11:59:11 AM Project: 60327128_02_60327128_A3L_Abstos Management Plan - Site Location - 20130325.mxd

CONFIDENTIAL GIS MAP

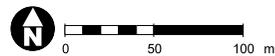
KEY

- Alexandria Landfill Site Boundary
- LPI DCDB Cadastre - Year 2014

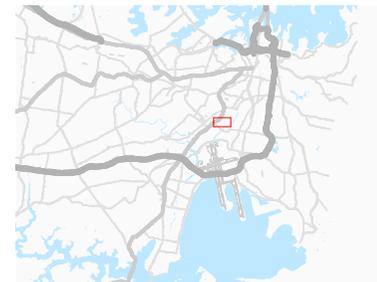
- a.** Alexandria Landfill
- b.** Albert Street Site
- c.** 1A Holland Street Lot
- a.** Canal Road Lot
- b.** Albert St (ie Bradshaw Mountain) Lot

WestConnex
Building for the future

AECOM



Disclaimer
Map produced by AECOM on behalf of WestConnex Development Authority.
Map data copyright 2014 WestConnex Delivery Authority, NSW. Spatial data used under license from Land and Property Management Authority, NSW © 2014.
AECOM/WDA makes no representations or warranties of any kind, about the accuracy, reliability, completeness, suitability or fitness for purpose in relation to the map content.



SCALE: 1:3,000 A3
SHEET: 1 of 1 COORDINATE SYSTEM: GDA 1994 MGA Zone 56

TITLE: WestConnex Motorway
FIGURE 1: Site Location Plan
Asbestos Management Plan Alexandria Landfill

PROJECT: WESTCONNEX STAGE 2 TA

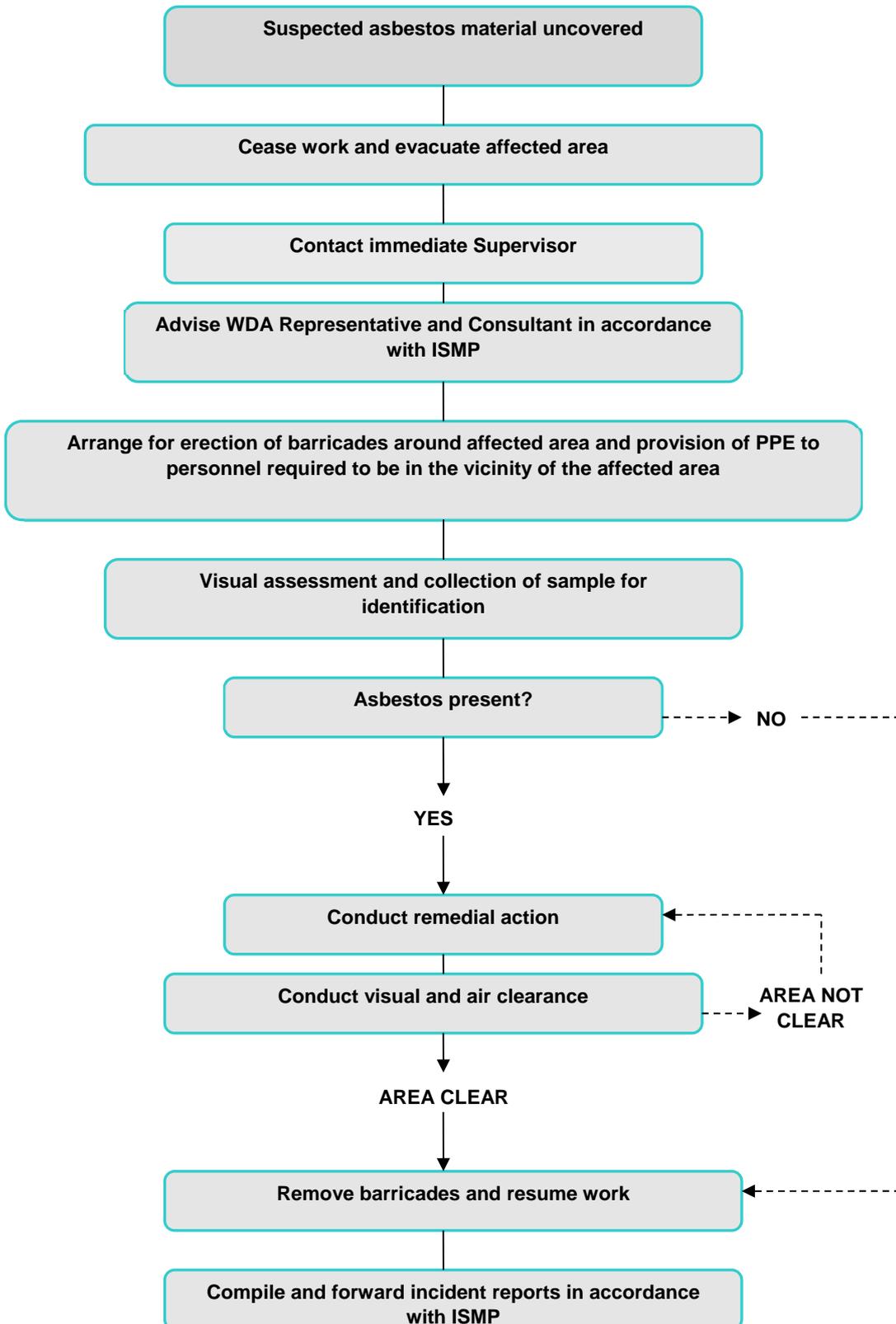
CLIENT: WESTCONNEX DELIVERY AUTHORITY

DRAWN	PROJECT #	MAP #	REV	Project
DN	60327128			
CHECK	DATE			
	25/03/2015	G097 02 60327128		

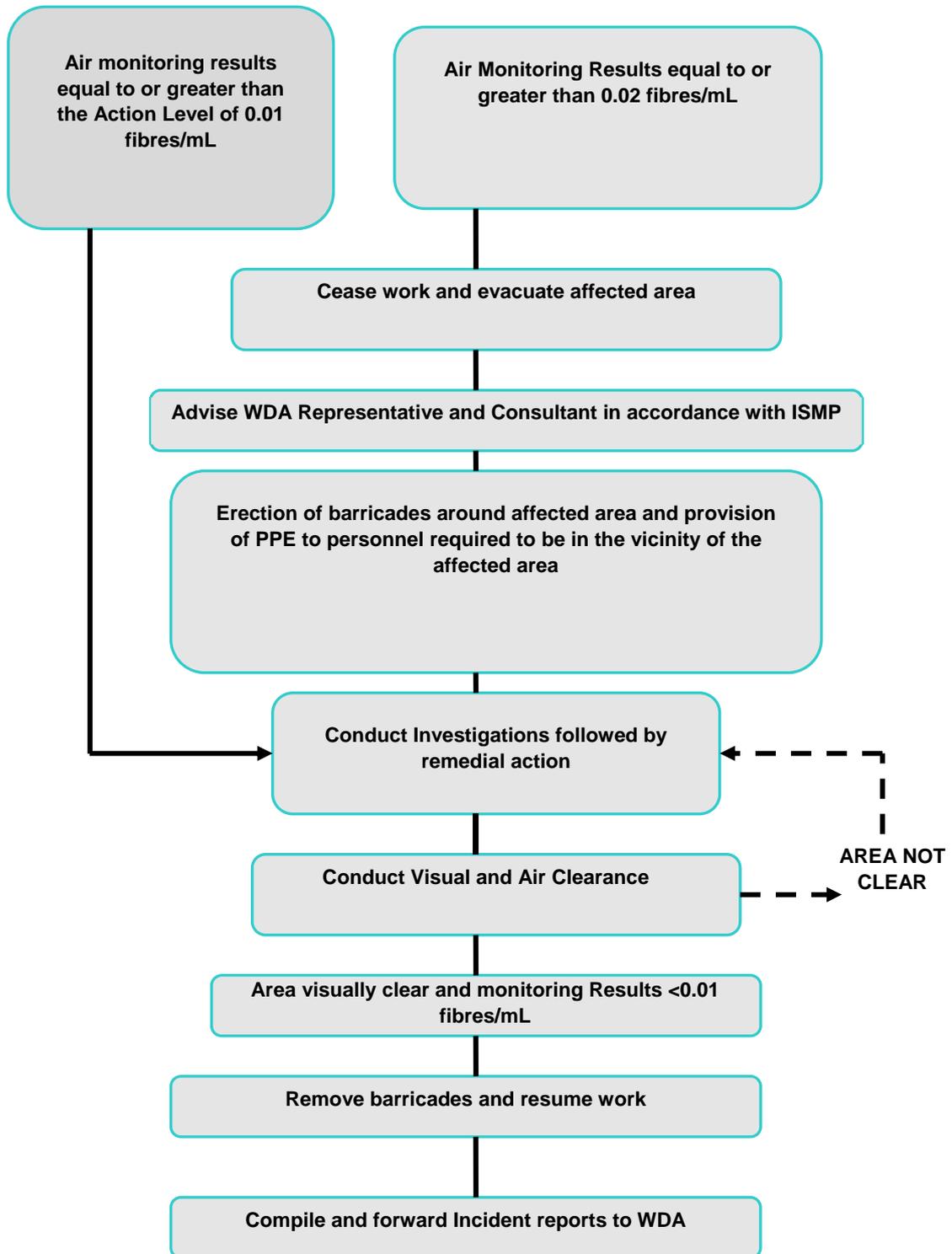
Appendix B

Emergency Procedures

Procedure for Uncovering Suspected Asbestos Materials and Emergencies



Procedure for Exceedance of Air Monitoring Limits



Appendix C

Air Monitoring Procedures

Asbestos Monitoring Procedure

Definitions

Personal monitoring	Samples taken within the <i>Worker Breathing Zone</i> that indicate the worker's exposure under representative working conditions. As they represent actual personal exposure, the results of such sampling can be directly compared with occupational exposure standards.
Control Monitoring	Static samples taken as an indicator of the effectiveness of process control techniques that are not representative of actual occupational exposures. As the results obtained from control monitoring do not reflect actual worker exposure, they cannot be compared with occupational exposure standards.
Clearance Monitoring	Static samples taken on completion of asbestos removal work to ensure that there are no residual elevated fibre levels.
Background Monitoring	Static samples prior to any work to determine the base elevated fibre level.

General Method Description

A sample is collected by drawing a measured quantity of air through a membrane filter by means of a sampling pump. The filter is later transformed from an opaque membrane into a transparent, optically homogeneous specimen. The fibres are then sized and counted, using a phase contrast microscope and eyepiece graticule. The result is expressed as fibres per millilitre of air, calculated from the number of fibres on the filter and the measured volume of air sampled.

Personal Monitoring

Involves direct monitoring of worker's exposure (i.e. personal exposure monitoring) to:

- a) To assess the exposure relative to an occupational exposure standard so that appropriate control measures can be implemented.
- b) To provide estimates of exposure for epidemiological investigations.

All sampling must be conducted in the breathing zone of a worker, so that the results are indicative of workers exposure. More than one single sample may be required, but the total sample duration should **never** be less than four hours and preferably over an entire shift.

Flow rates should be selected in the range 0.4 to 2.2 Litres/min so that a volume of 100 Litres \pm 20% (i.e. 80-120L) is collected over the desired single sample duration.

Flow rates must be checked with a calibrated field rotameter before and after sampling and if the measured flow rates differ by more than 10%, the sample should be rejected.

Control, Clearance and Background Monitoring

In-field Sampling Procedure:

- 1) Ensure that the sampling pump is set to the required flow rate before use (1.0, 2.0 litres per minute or 4.0 litres per minute).
- 2) Ensure pump is located in a suitable place so as to collect a representative sample of the area being tested
- 3) Ensure that the filter cassette is in free air at about chest height where possible. The filter cassette should not be located in a situation that could influence the result e.g. excessive heat, sampling head too close to a wall etc. The opening of the cassette should face downwards.
- 4) Sampling pumps placed outside should be protected from wet weather by covering them with a plastic bag, open at the base with the cassette and tubing uncovered.
- 5) At the completion of the sampling period, usually 2-8 hours, the pump flow rate must be checked prior to turning off the pump.
- 6) Cassettes must be stoppered at both ends for transportation to the laboratory for analysis. The sample cassettes should be transported in a resealable plastic bag.

The samples are always static, i.e. fixed position.

The total sample duration should preferably be not less than four hours. In urgent situations, total sample duration may be reduced to 100 mins, with an appropriate flow rate. The flow rate should be selected in the range between 1-4 Litres/minute so that a sufficient volume is collected over the desired single sample duration to meet the detection limit of the membrane filter method.

Appendix D

Methods for Work with Asbestos

Standard Work Procedure 1.

Work with Potentially Asbestos Contaminated Soil or Waste

The method below refers only to the work with soil or other waste that is impacted with non-friable asbestos debris and loose fibre/debris. It does not apply to work with friable asbestos such as insulation, limpet spray materials or pipe lagging. Work or disturbance to potentially asbestos impacted soil or waste is to take place in the following manner:

- 1) The work is to be supervised by a Class A or B Licensed Asbestos Removal Contractor in accordance with the Work Health & Safety Regulation 2011. A copy of the current license is to be furnished by the Asbestos Removal Contractor prior to the commencement of any works and is to be displayed in a prominent position on site.
- 2) The Asbestos Removal Contractor is to notify NSW Work Cover of the works prior to the commencement of any work. This normally requires 5 days. A copy of the notification is to be furnished and displayed on Site for the duration of the works.
- 3) All personnel employed by the Asbestos Removal Contractor are to be appropriately trained in asbestos work and removal. Copies of the appropriate certificates are to be supplied to the WDA or Licensed Asbestos Assessor prior to the commencement of work.
- 4) The immediate work area where ACM may be disturbed is to be known as the “**Asbestos Work Area**”. Access to the Asbestos Work Area should remain restricted until the potential disturbance of the ACM is complete. Barriers shall be erected around the Asbestos Work Area to restrict entry. Signs are to be placed in appropriate locations around the Asbestos Work Area by the Asbestos Removal Contractor with the words “*Asbestos Work Area, Do Not Enter*” or similar approved signage. This signage is only to be displayed for the duration of the ACM remediation work at the Site. It is to be placed at the Asbestos Work Area boundaries and at the entry to the decontamination area. The region surrounding and adjacent to the Asbestos Work Area is to be known as the “**Asbestos Work Site**”.
- 5) Suitable silt fencing and filtration is to be used at the Asbestos Work Site boundaries to prevent the escape of potentially asbestos contaminated water if required.
- 6) Personnel involved in the removal of the asbestos must wear respiratory protective equipment (RPE) conforming with the requirements of *AS/NZS 1716-2003 Respiratory Protective Devices* and *AS/NZS 1715:2009 ‘Selection, use and maintenance of respiratory protective equipment*, disposable overalls, boot covers and gloves. All PPE is compulsory and must be worn by all personnel undertaking asbestos removal or entering the asbestos work area.
- 7) The licensed asbestos removal supervisor must ensure that any other personnel entering the Asbestos Work Area are trained in the use of and wear the compulsory PPE. This should include how to follow decontamination procedures. Any staff entering the asbestos work areas should be properly inducted into the safe work method statements and receive asbestos awareness training.
- 8) A ‘wet’ decontamination unit is to be established at the entrance to the Asbestos Work Area. Personal entry to and exit from the Asbestos Work Area shall only be permitted via the decontamination unit. The decontamination unit shall also have a change area adjacent to and separate from the clean end of the decontamination unit. It is allowable to have more than one entry point but each point must be fully equipped.
- 9) The decontamination unit shall also have a clean change area adjacent to and separate from the clean end of the decontamination unit in order for staff to securely store street clothes and personal items.
 - Workers are to don the PPE at the decontamination unit.
 - Upon leaving the Asbestos Work Area, the coveralls and boot covers are to be removed and placed into 0.2mm polyethylene low-density plastic bags labelled as ‘Asbestos Waste’ (‘Asbestos Bags’); and
 - Any remaining PPE is to be removed inside the decontamination Area and personnel are to decontaminate or wash any exposed parts of the body. Hard hats, boots and glasses must be wiped with a damp cloth to remove dust and other contamination.

- 10) Any drains (if present) at ground level that may be affected by the ACM remediation works should be covered with filter material capable of capturing particles down to 5µm to prevent asbestos residue entering the drainage system. Filter material shall be inspected and replaced regularly. Soiled filter media is to be disposed of as asbestos waste.
- 11) Dust levels in the asbestos work areas must be strictly controlled and reduced to an absolute minimum, water sprays should be employed to do this but care must be taken to control water run-off as this may be contaminated.
- 12) If weather conditions do not allow the adequate control of dust e.g. high winds and or high temperatures then work should be stopped.
- 13) In most cases waste will be loaded directly into trucks for removal from Site. This may generate high dust levels during loading and this must be controlled by the use of damping and minimising drop heights.
- 14) Any plant operators who are not licensed asbestos removalists will operate and be supervised in the work area by the licensed asbestos removalists at the Site. No workers will enter asbestos work areas unless the asbestos removal licence holders are present (except for hygienists/assessors).
- 15) Truck drivers and plant operators must remain in their cabs while in the asbestos work areas and keep their windows closed. Plant that is operating daily in the asbestos work area will need a filtered air supply. This should be filtered via HEPA filters in accordance with AS4260-1997 High Efficiency Particulate Air Filters (HEPA) – Classification, Construction and Performance.
- 16) Truck drivers and plant operators must not leave their cabs while inside the work area except in the case of emergency or breakdown. They must keep PPE & RPE in the cab in case they do have to leave via the work area. Truck drivers and plant operators will not need to follow the wet decontamination route unless they exit their vehicles inside the work area. Otherwise they may exit their plant in the vehicle parking area where a dry decontamination (changing area) will be set up.
- 17) Trucks and plant should be equipped with two way radios to allow for communication with others in and outside the work areas.
- 18) Vehicles and other wheeled/tracked plant must not leave the work area except via a vehicle decontamination point. The decontamination point must include a wheel/track wash and other cleaning facilities to remove any debris picked up in the work area. Bunding will be required to collect waste water and that water will need to be filtered via a high efficiency (minimum 5µm) water filter prior to disposal. Unfiltered water must not be allowed to enter drains, particularly soak-aways as residual asbestos debris could dry out and give rise to airborne fibres.
- 19) A 'bag-out' area is to be established for the storage of any bagged asbestos waste prior to removal from the Site such as used PPE.
- 20) A Transitional Area is to be established between the Asbestos Work Area and the remainder of the site to undertake decontamination of any items other than vehicles or personnel that are to be removed from the Asbestos Work Area.
- 21) All items to be removed from the Asbestos Work Area are to be decontaminated at the Transitional Area using vacuuming and wet-wiping techniques. AECOM recommend that any items which would be unable to be effectively detail cleaned, or any item from which dust cannot be removed should be disposed of as asbestos waste.
- 22) An area shall be selected outside the Asbestos Work Area on the clean side to place cleaned items where they will not be subject to damage or contamination.
- 23) A visual inspection will be undertaken by the Licensed Asbestos Assessor to assess the appropriateness of the Asbestos Work Area prior to access the commencement of asbestos removal work. Work that may disturb Asbestos may only commence following the work area inspection.
- 24) No work that may disturb asbestos will be carried out unless control (para occupational) and/or personal (occupational) air monitoring is being undertaken.

- 25) Approved vacuum cleaners may be utilised during the asbestos work process to minimise potential fibre levels such as for cleaning decontamination areas cabs or equipment. Any vacuum cleaners that may be used during the decontamination process are to be approved for use with asbestos and are to be fitted with HEPA filters in accordance with AS4260-1997 High Efficiency Particulate Air Filters (HEPA) – Classification, Construction and Performance. The vacuum collection bags and filters are to be disposed of as asbestos waste.
- 26) Remove potential asbestos, asbestos contamination (if gross items of asbestos are observed) and any dust and debris from within the Asbestos Work Areas. Place all waste material inside in 0.2mm impervious plastic bags marked “Asbestos Waste” and seal with tape. Any large items of asbestos waste if discovered shall be wrapped in 0.2mm impervious plastic and sealed with tape for removal from the Asbestos Work Area.
- 27) Potentially contaminated soil that is excavated and left for disposal or placement on Site must be placed directly into skips or trucks for transport to an appropriate NSW licensed landfill site if being disposed of. The skips or trucks are to be sealed and leak proof to ensure that contaminated material cannot leak during transit if taken out of the work area. If material has to be stockpiled on site these stockpiles should be within the asbestos work area boundary and should be covered with geofabric or compacted at the end of the shift.
- 28) Where ‘Asbestos Bags’ are used for waste, they are to be sealed before being moved to the ‘bag-out’ area. Bags are to be filled to no more than ½ full, or so that the weight is manageable and does not result in manual handling injury or bag rupture. Bagged asbestos waste is to be placed into a second bag in the ‘bag-out’ area and sealed again and sprayed with poly-vinyl acetate (PVA) or ‘Bondcrete’ prior to removal from the ‘bag-out’ area.
- 29) Any bagged asbestos waste is to be removed from the ‘bag-out’ area and placed into trucks or bins that are lined with 0.2mm impervious plastic.
- 30) Any soiled PPE shall be placed into 0.2mm polyethylene low-density plastic bags labelled as ‘Asbestos Waste’. Bags are to be filled to no more than ½ full, sealed, placed into a second bag at the ‘bag-out’ area and sealed for appropriate disposal.
- 31) Any equipment within an Asbestos Work Area shall be only used in that area and when removed from the Asbestos Work Area shall be thoroughly decontaminated using vacuuming and wet-wiping techniques.
- 32) Asbestos waste and other waste material is to be disposed of in the appropriate manner at an appropriately licensed waste disposal facility. Permission to dispose the asbestos waste is to be obtained from the appropriate authority prior to the commencement of the ACM remediation work and a copy of the disposal dockets are to be provided to the WDA following each disposal event.
- 33) Any Asbestos Work Area will be inspected by the Licensed Asbestos Assessor to ensure that all potentially contaminated waste and debris from the Asbestos Work Area has been removed from the Asbestos Work Area and that no visible ACM contamination remains. It should be noted that all visual evidence of dust or debris (asbestos or otherwise) should be removed in order to satisfy the requirements of a satisfactory visual inspection. The Licensed Asbestos Assessor is to be accompanied by the Asbestos Removal Contractor at all times during clearance inspections.

Standard Work Procedure 2.

Friable Asbestos Removal

Friable asbestos has the potential to give rise to elevated fibre levels with minimal disturbance and so all works to friable asbestos require a higher level of control compared to non-friable asbestos work. At the Landfill Site there may be pockets of friable asbestos waste or bagged friable asbestos waste arising from the previous activities at the Site.

The codes of practice are written on the assumption that most friable asbestos removal will take place from structures rather than landfill sites but the procedures should be followed as closely as possible. Work with friable asbestos generally should not be undertaken with powered equipment or plant. If there is a situation at the site where large scale friable asbestos removal is identified then a variation to this procedure may be required to allow for the use of excavators although this will generally align to Procedure #1 above with some added controls.

- 1) The Asbestos Removal Contractor is to have a current license for friable (Class A) asbestos removal in accordance with the Work Health and Safety Regulation 2011. Asbestos removal work requiring a license shall be undertaken with reference at all times to the requirements specified in Section 3: Duties for licensed asbestos removal work in The Code of Practice: How to Safely Remove Asbestos.
- 2) The Asbestos Removal Contractor must submit a Notification at least 5 days prior to the commencement of non-friable asbestos removal work to the NSW Work Place Health and Safety Authority.
- 3) All personnel employed by the Asbestos Removal Contractor are to be appropriately trained in asbestos removal. Copies of the appropriate training records and qualifications must be available upon request.
- 4) In most cases, removal of friable asbestos should be carried out inside a sealed enclosure constructed from a timber, metal or plastic frame with a polythene skin to prevent elevated fibre levels occurring outside the work area. Exceptions will be where wrap & cut methods or glove bags can be used.
- 5) Signage is to be displayed on the Asbestos Work Area boundaries advising that asbestos removal works are being undertaken in accordance with the Code of Practice: How to Safely Remove Asbestos.
- 6) Personnel involved in the removal of the asbestos must wear, as a minimum, approved full-face cartridge-type respirators fitted with Class P3 particulate filters, disposable overalls, boot covers and gloves. All PPE is compulsory and must be worn by all personnel undertaking asbestos removal.
- 7) A four stage wet decontamination unit is to be established at the entrance to the Asbestos Work Area. Entry to and exit from the Asbestos Work Area shall only be permitted via the decontamination unit. The decontamination unit shall also have a clean change area adjacent to and separate from the clean end of the decontamination unit.
- 8) At the entry to the Asbestos Work Area an air lock chamber is to be erected. The wet decontamination unit is to be attached to this air lock chamber. The purpose of the air lock chamber is to provide a buffer zone between the Asbestos Work Area and decontamination unit to minimise the risk of asbestos contaminated dust escaping from the Asbestos Work Area. Entry to and exit from the Asbestos Work Area shall only be permitted via the decontamination unit. The decontamination unit shall also have a clean change area adjacent to and separate from the clean end of the decontamination unit.
- 9) A negative air dust control unit is to be attached to the air lock chamber adjacent to the decontamination unit to maintain airflow into the air lock chamber through the decontamination unit. The units should be operated continuously during the asbestos removal process to ensure negative pressure is maintained inside the Asbestos Work Area at all times. The exhaust equipment shall be provided to ensure that negative air pressure of minimum 12pa (water gauge) exists within the enclosure. A manometer will be used to check on the negative air pressure throughout the removal period. HEPA filters will be checked by the Licensed Asbestos Assessor prior to commencement of work.
- 10) An encapsulation is to be erected and all openings to the Asbestos Work Area are to be sealed with 0.2mm plastic or canvacon and tape. Plastic to overlap joins by 200mm. The floors are to be adequately protected with at least two layers of canvacon or 0.2mm plastic and any other protection deemed necessary by the Contractor to ensure that damage does not occur.
- 11) A 'bag-out' area is to be established for the storage of bagged asbestos waste prior to removal from the site.

- 12) All penetrations within the Asbestos Work Area are to be sealed using timber, impervious plastic, tape and foam sealant.
- 13) A visual inspection will be undertaken by the Licensed Asbestos Assessor to assess the completion and the integrity of the encapsulation prior to access the commencement of asbestos removal work. Asbestos removal work may only commence following the encapsulation inspection.
- 14) Water mist spray and approved vacuum cleaners are to be utilised at all times during the asbestos removal process. Vacuum cleaners used during the decontamination process are to be approved for use with asbestos and are to comply with AS/NZS 60335.2.69:2003 Household and similar electrical appliances – Safety, Part 2.69”: Particular requirements for wet and dry vacuum cleaners, including power brush, for industrial and commercial use and are to be fitted with HEPA filters in accordance with AS4260-1997 High Efficiency Particulate Air Filters (HEPA) – Classification, Construction and Performance. Standard domestic or industrial vacuum cleaners are not suitable. The vacuum collection bags and filters are to be disposed of as asbestos waste.
- 15) Remove all asbestos, asbestos contamination and any debris from within the Asbestos Work Areas. Place all waste material inside in 0.2mm impervious plastic bags marked “Asbestos Waste” and seal with tape. Large items or manageable sections of asbestos insulated pipe work and other debris shall be wrapped in 0.2mm impervious plastic and sealed with tape for removal from the Work Area.
- 16) Where ‘Asbestos Bags’ are used for waste, they are to be sealed before being moved to the ‘bag-out’ area. Bags are to be filled to no more than ½ full, or so that the weight is manageable and does not result in manual handling injury or bag rupture. Bagged asbestos waste is to be placed into a second bag in the ‘bag-out’ area and sealed again and sprayed with poly-vinyl acetate (PVA) or ‘Bondcrete’ prior to removal from the ‘bag-out’ area.
- 17) The bagged asbestos waste is to be removed from the ‘bag-out’ area and placed into trucks or bins that are lined with 0.2mm impervious plastic.
- 18) All surfaces located inside the Asbestos Work Area shall be thoroughly decontaminated by scraping of the surfaces or vacuuming where possible using an approved vacuum cleaner fitted with a HEPA filter to remove residual dust at the completion of the bulk removal process. Wet-wiping techniques may be used to wipe clean metal or concrete surfaces. All framing, pipes, ducts, fixed items etc., within the Asbestos Work Area are to be vacuumed and wet wiped of all visible asbestos contamination. This includes the cleaning of all fixed parts of the building structure. All loose items and debris are to be removed from these areas as asbestos contaminated waste. Vacuum bags, HEPA filters and rags used for wet-wiping are to be disposed of as asbestos waste.
- 19) All soiled PPE shall be placed into 0.2mm polyethylene low-density plastic bags labelled as ‘Asbestos Waste’. Bags are to be filled to no more than ½ full, sealed, placed into a second bag at the ‘bag-out’ area and sealed for appropriate disposal.
- 20) All equipment within the Asbestos Work Area shall be only used in that area and when removed from the Asbestos Work Area shall be thoroughly decontaminated using vacuuming and wet-wiping techniques.
- 21) Asbestos waste and other waste are to be disposed of in the appropriate manner at an approved waste disposal facility. Permission to dump the asbestos waste is to be obtained from the appropriate authority prior to the commencement of work. The Asbestos Removal Contractor shall provide dumping dockets to the Consultant Occupational Hygienist.
- 22) Transport and final disposal of asbestos waste material shall be carried out by the Asbestos Removal Contractor in a manner, which will prevent the liberation of asbestos dust into the atmosphere. Vehicles licensed for the transportation of asbestos waste shall only be used.
- 23) The Asbestos Work Area will be inspected to ensure asbestos contaminated waste and debris is removed from the Work Area. Clearance inspections and certification to be carried out by the Licensed Asbestos Assessor (who must be a licensed asbestos assessor). The Licensed Asbestos Assessor is to be accompanied by the Asbestos Removal Contractor at all times during clearance inspections.
- 24) All surfaces within the Asbestos Work Area are to be sprayed with a PVA or Bondcrete sealant following completion of the visual inspection.
- 25) Air clearance monitoring is to be carried out inside the Asbestos Work Area after the spraying of PVA.

- 26) All surfaces within the Asbestos Work Area are to be sprayed with PVA or a similar approved material following completion of the visual inspection.
- 27) Air monitors are to be placed around the Asbestos Work Area by the Licensed Asbestos Assessor during all stages of the work. Air clearance monitoring will also be carried out inside the Asbestos Work Area following successful completion of the visual inspection and application of PVA. All air monitoring and clearance inspections will be carried out by the Licensed Asbestos Assessor NATA standards and the requirements of the Work Health and Safety Regulation 2011 and the Code of Practice: How to Safely Remove Asbestos.
- 28) A final inspection will be carried out by the Licensed Asbestos Assessor to ensure all work has been carried out and areas cleaned satisfactorily. Sampling of the soil or other surfaces may be undertaken to confirm no residual asbestos contamination remains.
- 29) Final air clearance monitoring will then be undertaken. Upon receipt of the final air monitoring clearance results of <math><0.01</math> fibres/mL, the Asbestos Work Area may be entered without the need for personal protective equipment and re-occupation can occur.
- 30) All materials used for separation of the Asbestos Work Area from adjoining areas are to remain in place until the asbestos is removed from the adjoining areas.
- 31) Air monitoring should be undertaken whenever asbestos removal work is in progress. All air monitoring and clearance inspections will be carried out by the Licensed Asbestos Assessor to NATA Standards and in accordance with the requirements of the Work Health and Safety Regulation 2011 and the Code of Practice: How to Safely Remove Asbestos.
- 32) Clearance inspections are to be undertaken prior to the application of PVA and at completion of all work prior to the removal of the Asbestos Work Area barriers.

This page has been left blank intentionally.

Appendix F

Proposed Groundwater and Leachate Monitoring Plan

Appendix F Proposed Groundwater and Leachate Monitoring Plan

Groundwater and Leachate Monitoring Plan

Alexandria Landfill Closure Management Plan

Groundwater and Leachate Monitoring Plan

Alexandria Landfill Closure Management Plan

Client: Roads and Maritime Services

ABN: 76 236371088

Prepared by

AECOM Australia Pty Ltd

Level 21, 420 George Street, Sydney NSW 2000, PO Box Q410, QVB Post Office NSW 1230, Australia
T +61 2 8934 0000 F +61 2 8934 0001 www.aecom.com
ABN 20 093 846 925

21-Oct-2015

Job No.: 60327128

AECOM in Australia and New Zealand is certified to the latest version of ISO9001, ISO14001, AS/NZS4801 and OHSAS18001.

© AECOM Australia Pty Ltd (AECOM). All rights reserved.

AECOM has prepared this document for the sole use of the Client and for a specific purpose, each as expressly stated in the document. No other party should rely on this document without the prior written consent of AECOM. AECOM undertakes no duty, nor accepts any responsibility, to any third party who may rely upon or use this document. This document has been prepared based on the Client's description of its requirements and AECOM's experience, having regard to assumptions that AECOM can reasonably be expected to make in accordance with sound professional principles. AECOM may also have relied upon information provided by the Client and other third parties to prepare this document, some of which may not have been verified. Subject to the above conditions, this document may be transmitted, reproduced or disseminated only in its entirety.

Quality Information

Document	Groundwater and Leachate Monitoring Plan
Ref	60327128
Date	21-Oct-2015
Prepared by	Kate Pigram
Reviewed by	Anthony Davis

Table of Contents

1.0	Introduction	1
1.1	Background	1
1.2	Objectives of Monitoring Program	1
1.3	Work Health and Safety	2
2.0	Conceptual Hydrogeological Model	3
2.1	Lithology	3
2.2	Hydrogeology	3
2.3	Groundwater and leachate contamination	3
2.4	Impacts to human and ecological receptors	5
3.0	Monitoring Locations	6
3.1	Existing monitoring wells	6
3.2	Proposed monitoring locations	6
4.0	Groundwater/Leachate Level Monitoring	8
4.1	Leachate Levels	8
4.2	Leachate Extraction Rates	8
4.3	Groundwater Levels	8
4.4	Data Loggers	9
5.0	Sampling and Analysis	10
5.1	Sampling Locations and Frequencies	10
5.2	Monitoring Parameters and Methods	11
5.2.1	Additional Analytical Parameters	13
5.3	Methods and Procedures	13
5.3.1	Leachate	14
5.3.2	Groundwater	14
5.4	QA/QC Sample Requirements	14
5.4.1	Field Duplicate Samples	14
5.4.2	External Field Duplicate Samples	14
5.4.3	Rinsate Blank Samples	14
5.4.4	Trip Blank Samples	15
5.5	Laboratory Requirements	15
6.0	Data Management	17
6.1	QA/QC Validation Process	17
6.2	Database and Data Management	17
7.0	Well Inspection and Maintenance	19
7.1	Inspection Procedures	19
7.2	Maintenance, Repairs and Decommissioning	19
7.3	Leachate Monitoring Infrastructure	19
8.0	Data Evaluation and Reporting	20
8.1	General Data Interpretation	20
8.2	Purpose	20
8.2.1	Inward Hydraulic Gradient	21
8.2.2	Groundwater Detection Monitoring	21
8.3	Response Actions	22
8.3.1	Inward Gradient Not Maintained	22
8.3.2	Increasing Concentration Trends	23
8.4	Reporting Requirements	23
8.4.1	Quarterly GME Reporting	23
8.4.2	Evaluation	23
8.4.3	Annual Review	23
9.0	Provisional Items	25
9.1	Changes/Updates to this Plan	25
9.2	Potential Additional Groundwater Works	25
9.3	Additional Groundwater Monitoring Wells	25
9.3.1	Bore Construction and Decommissioning Licences	25
9.3.2	Buried Services Location	26

9.3.3	Groundwater Monitoring Bore IDs	26
9.3.4	Bore Surveying	26
9.3.5	Groundwater Bore Logging and Construction	26
9.3.6	Groundwater Bore Development	26
9.3.7	Abandonment/Decommissioning of Bores	27
9.4	Additional Leachate Monitoring Bores	27
9.4.1	Drilling and Installation Methodology	27
9.4.2	Leachate Monitoring Well IDs	28
9.4.3	Abandonment/Decommissioning of Leachate Bores	28
9.5	Bore Completion Reports	28
9.6	Audit Recommendations	28
10.0	References	29
Appendix A		
	Figures	A
Appendix B		
	Example Field Forms	B
Appendix C		
	Standard Operating Procedures - Groundwater Sampling	C

1.0 Introduction

AECOM Australia Pty Ltd (AECOM) was commissioned by the Roads and Maritime Services to prepare a Groundwater and Leachate Management Plan (GLMP, hereafter referred to as the Plan) to be implemented at the closed Alexandria Landfill comprising Lot 2 in Deposited Plan (DP) 1168612 located at Albert Street, St Peters NSW (hereafter referred to as the Site), incorporating an area of around 15.71 hectares (ha); refer **Figure 1** in **Appendix A**.

A large portion of the Site has historically operated as a quarry (identified as the Ralford Pit) and brickworks (identified as the St Peters Brick Works). Since quarrying activities ceased, the Site has been used as a landfill, waste handling and transfer facility. Alexandria Landfill is currently licensed (EPL 4627) by the NSW Environment Protection Authority (EPA) to transport, store, recycle, reprocess and dispose of wastes. The landfill was historically operated by City of Sydney Council and Dial-A-Dump (DADI) as a non-putrescible general solid waste landfill. The types of waste historically accepted included soil, demolition waste, green waste/timber and asbestos. This Plan provides a framework for the monitoring of groundwater at the Site through the improvement and operation of a leachate management and extraction system and a groundwater interception system. This Plan sets out the methods, procedures and actions to be implemented with regard to groundwater monitoring at the Site.

The plan is a living document and will be reviewed and updated at least annually by 30 June to ensure that adequate controls are in place to meet the standards and objectives identified in this Plan.

This plan forms part of a package of documents appended to the Alexandria Landfill Closure Management Plan (LCMP), and should be read in association with the other plans and documents appended to the LCMP

1.1 Background

The Alexandria Landfill is licensed by the NSW Environment Protection Authority (EPA) as a licensed solid waste landfill and waste storage and recycling facility and was acquired by the NSW Government in December 2014.

Roads and Maritime now plan to redevelop the Site as part of the WestConnex New M5 motorway. The Site is planned to contain the section of the freeway referred to as the St Peters Interchange. Preliminary designs for the St Peters Interchange, includes roads, tunnel portals, freeway overpasses and associated infrastructure. The remainder of the Site is planned to be redeveloped as public use likely consisting of a mixture of parkland, pathways and cycleways. Surplus land surrounding the interchange will also likely be redeveloped for commercial/light industrial land use.

The redevelopment also means that the Site will need to be closed and managed in accordance with the *Protection of the Environment Operations Act* (POEO) 1997. Leachate as well as groundwater in the surrounding bedrock and Botany Sands formations has been historically monitored as part of the EPL compliance. Based on available records, annual and/or quarterly leachate and groundwater monitoring has occurred since at least 1997.

The most recent round of groundwater and leachate sampling and analysis was undertaken by AECOM in March 2015 as part of the *Phase 2 Environmental Site Assessment, Alexandria Landfill, 10-16 Albert Street, St Peters NSW* (AECOM, 2015).

1.2 Objectives of Monitoring Program

Monitoring of groundwater and leachate will be conducted throughout the post-closure care of the landfill. The objectives of the monitoring include:

- Detecting potential migration of leachate beyond the extent of the landfill;
- Monitoring of short term and long term changes in hydrogeological regime overtime that could be caused by:
 - operation of the leachate extraction system(s);
 - operation of groundwater interception/extraction system(s);
 - installation of a final landfill cap;
 - dewatering and subsurface changes associated with St Peters Interchange construction;
 - changes in local stormwater and surface water hydrology;

- extreme rainfall events; and
 - off-site influences such as the Sydney Park leachate extraction system.
- Monitoring increases or decreases in concentrations of contaminants over time that caused by factors such as the biological and physical breakdown of landfill waste over time and migration of off-site contaminants into the landfill.
 - Assessing the impacts to surrounding groundwater receptors.
 - Evaluating compliance with the trade waste agreement (TWA) and EPLs.

Note that this Plan is intended to address monitoring of leachate and groundwater, and not specific landfill operations. However, the results of the monitoring will be used to provide information for improving operations, as necessary. For example, if monitoring results indicate that EPL and TWA requirements are not being met; operations at the landfill will need to be adjusted in order to meet them.

1.3 Work Health and Safety

Whilst undertaking activities to meet the requirements of this plan, appropriate health and safety measures shall be implemented in accordance with the Work Health and Safety (WHS) Regulation 2011. This includes development of task specific SWMS' to identify potential hazards associated with the task steps and use the hierarchy of controls to reduce the risk.. The SWMS should be updated as site conditions or methodologies change overtime. Potential hazards to be considered include:

- Contact with chemicals in contaminated leachate and groundwater and sample preservatives;
- Ignition of landfill gases accumulated in groundwater monitoring wells;
- Exposure to landfill gases and vapours accumulated in groundwater monitoring wells;
- Ergonomics;
- Type of sampling pumps and equipment used; and
- Site specific hazards such as construction site hazards.

2.0 Conceptual Hydrogeological Model

To provide context for the monitoring program presented in the remainder of this document, a summary of the hydrogeological conceptual model is provided below. This is based on existing information obtained from the Phase 2 ESA (AECOM, 2015).

2.1 Lithology

As described in previous sections, the Site previously contained a brick pit quarry which has been filled as an inert solid waste landfill. The intrusive investigations from the Phase 2 ESA (AECOM, 2015) encountered fill to depths from 1.3 m bgs (BH349) in the northern portion of the Site to 41 m bgs (BH343) in deepest portion of the former quarry pit. The depth of the fill in the southeast portion of the Site, outside the former brick pit quarry ranged between 1.5 m bgs (BH407) to 9 m bgs (BH368), with an average depth of 5 m bgs.

Natural soils located in the eastern half of the Site are part of the Botany Sands unconsolidated alluvial formation. The alluvial sediments consist of layers of fine sand, clayey sand with shells, peaty sands, medium plasticity sandy clays and high plasticity clays. The Phase 2 ESA (AECOM, 2015) encountered natural soils underlying the fill at an average thickness of 7.5 m.

The north western half of the Site is mapped as Class 2 ASS and the south eastern half is mapped as Class 3 ASS under the NSW Risk Map Sheets classification scheme.

The Site is underlain by Ashfield Shale of the Wianamatta Group. AECOM completed geotechnical investigations within and surrounding the Site to inform the WestConnex project (AECOM, 2015b). The works included coring 13 boreholes (WXC BH045 to WXC BH60) to a maximum depth of 51 m bgs (-44.26 m AHD). The general geological profile encountered beneath the site was laminite underlain by siltstone and then sandstone. The base of the quarry pit was mainly siltstone and laminate, with the exception of part of the southwest portion of the pit which was directly underlain by sandstone.

2.2 Hydrogeology

Groundwater gauging of groundwater monitoring wells and sumps was undertaken as part of the Phase 2 ESA in March 2015 (AECOM, 2015). The range of groundwater heights measured and adjusted to metres Australian Height Datum (AHD) are summarised below.

- Landfill screened wells: -4.865 (MW311) to -15.59 m AHD (MW314)
- Botany sands screened wells: 1.14 (MW310) to -1.53 m AHD (MW02s)
- Bedrock screened wells: -1.37 (MW1) to -10.2 m AHD (MW02d).

The inferred groundwater flow direction for the groundwater in the botany sands and landfill was towards the main leachate sump (LP1) in the southwest portion of the Site and flowing from all directions. It appeared that groundwater from the bedrock on the north, northeast, west and south west sides of the Site were flowing towards LP1 and connected to leachate within the landfill.

Deeper groundwater was present in MW02D in the eastern and down-gradient side of the Site. It was unclear due to the limited number of monitoring wells screened in bedrock, whether groundwater was flowing towards or away from the landfill on the eastern side of the landfill.

In May 2015, at the time of writing this plan, an assessment of the hydraulic interactions between the leachate in the Alexandria Landfill and the surrounding groundwater in the Wianamatta Shale, Botany Sands and the surface water in the Alexandria Canal was being undertaken. The findings of the assessment should be used to update the conceptual hydrogeological model.

2.3 Groundwater and leachate contamination

The Site has operated as an inert solid waste landfill since the late 1980s and as such the main source of contamination within the Site is the landfill materials which have been deposited, containing chemical and asbestos waste and distributed heterogeneously throughout the landfill. The landfill also historically accepted green waste which generates methane and other landfill gases during decomposition.

Potential off-site sources of contamination exist on all sides of the Site and include a former metal smelter, petrol station, dry cleaners, former manufacturing facilities, uncontrolled fill, and adjacent former landfills beneath Sydney Park.

The contaminants of concern identified in groundwater in the Phase 2 ESA (AECOM, 2015) exceeding either the adopted ecological or human health based assessment criteria are listed in **Table 1**.

Table 1 Groundwater and leachate contamination assessed in March 2015 (AECOM, 2015)

Contaminant	Units	Concentration Range in Groundwater Unit			Exceeded Assessment Criteria	
		Leachate	Botany Sands	Bedrock	Ecological*	Human Health*
Dissolved Metals						
Arsenic	µg/L	5 to 30	<1 to 26	<1	No	Yes ⁷ botany sands and leachate
Boron	mg/L	1.6	0.19	0.07 to 0.36	No	Yes ¹ leachate
Chromium	µg/L	3 to 10	<1 to 2	<LOR	Yes ¹ leachate	No
Cobalt	µg/L	<1 to 10	<1	4	Yes ¹ leachate and bedrock	No
Copper	µg/L	<1 to 12	<1 to 1	4 to 29	Yes ¹ bedrock	No
Nickel	µg/L	6 to 156	<1 to 10	27 to 203	Yes ^{1,3} leachate and bedrock	Yes leachate ⁶ and bedrock ⁴
Lead	µg/L	<1 to 3	<1 to 6	<LOR	Yes ¹ botany sands	No
Zinc	mg/L	0.11 to 0.088	0.005 to 0.015	0.031 to 0.094	Yes ¹ leachate and bedrock	No
Manganese	mg/L	0.676 to 3.63	0.257	0.098	Yes ^{2,3} in all units	Yes ⁶ all units
Organic compounds						
TRH >C10-C16	mg/L	<0.1 to 2.87	< LOR	<LOR	n/a	Yes ⁹ leachate
TRH >C16-C34	mg/L	<0.1 to 13	<LOR	<LOR	n/a	Yes ⁹ leachate
Benzene	mg/L	<1 to 8	<LOR	<LOR	No	Yes ⁹ leachate
Ammonia	mg/L	55.9 to 404	0.58 to 7.81	0.15 to 1.7	Yes ¹ in all units	n/a
Nitrate	mg/L	<0.01 to 11.9	<0.01 to 0.09	0.03 to 0.23	n/a	Yes ⁶ leachate
Inorganics						
Sodium	mg/L	893 to 2820	64 to 975	357 to 1730	n/a	Yes ⁶ all units
Chloride	mg/L	1090 to 5610	39 to 1360	253 to 1190	n/a	Yes ⁶ all units
Fluoride	mg/L	0.3 to 0.7	0.1 to 0.9	0.3 to 1.2	Yes ³ bedrock	No

Contaminant	Units	Concentration Range in Groundwater Unit			Exceeded Assessment Criteria	
		Leachate	Botany Sands	Bedrock	Ecological*	Human Health*
Total dissolved solids	mg/L	2030 to 6450	722 to 3580	3360 to 11200	n/a	Yes ⁶ all units

Notes: * Ecological criteria: 1. ANZECC (2000) 95% trigger values for marine ecosystems; 2. low to medium reliability values and 3. agriculture, parks and gardens trigger values. ** Human Health (primary/recreational contact): 4. NHMRC ADWG (2013); 5. WHO (2011); 6. ANZECC (2000) primary contact or 7. US EPA (2015) RSL tapwater; 8. WHO (2008); 9. CRC Care (2011) HSL D (Sand, 2-<4m)⁹

2.4 Impacts to human and ecological receptors

The groundwater and leachate-specific potential transport mechanisms and exposure pathways for contaminants as identified in the Phase 2 ESA (AECOM, 2015) conceptual site model (CSM) are summarised below:

- Groundwater exposure via primary recreation contact: select metals (arsenic, cadmium and zinc), total dissolved solids and sodium concentrations in groundwater exceeded the recreational criteria (ANZECC, 2000; ADWG NHMRC 2013). Human receptors, most likely construction and operational workers, could come in contact with extracted groundwater if appropriate control measures or PPE are not used. Extraction of groundwater for domestic use, including irrigation, is banned in the area; therefore groundwater is unlikely to be used as drinking water.
- Groundwater migration to ecological receptors: there is potential for groundwater to migrate to Alexandra Canal and the underlying bedrock aquifer. Therefore this pathway is considered complete.
- Discharge of groundwater to sewer: treated leachate is discharged to sewer in Albert Street. Exceedences of the TWA could occur and therefore the pathway is complete during these incidences.
- On-site migration of contamination from off-site sources via groundwater from adjacent contaminated sites including Sydney Park landfills, contaminated fill from the property at 5 and 5A Canal Road, and surrounding industrial Sites. This pathway is likely complete.

3.0 Monitoring Locations

3.1 Existing monitoring wells

The existing groundwater and leachate monitoring wells and sumps, as of May 2015 are listed in **Table 2** below. The location of the monitoring wells is shown on **Figure 5** in **Appendix A**.

Table 2 Existing groundwater and leachate monitoring wells

ID	Registration Number	Year Installed	TOC Height (m AHD)	Easting	Northing	Screened interval (m bgs)	Screened lithology
LP1	-	Post 1996	-	-	-	-	landfill
BS1	-	2001/2002	-	-	-	-	botany sands
BS2	-	2007/2008	-	-	-	-	botany sands
MW1	GW109821	1997	9.59	331825.13	6245907.47	29 to 35	bedrock
MW2s	GW109822	1997	3.33	331800.64	6245593.96	5 to 8	botany sands
MW2d	GW109823	2000	3.47	331801.32	6245593.95	23 to 29	bedrock
MW3	GW109824	2005	-	331393.00	6245635.00	13.4 to 18.4	bedrock
MW4c	GW109825	2005	11.92	331667.80	6245865.39	16 to 22	bedrock
MW304	-	2015	-4.5	331447.71	6245723.42	10.5 to 13.5	landfill
MW305	-	2015	5.38	331645.14	6245685.87	34 to 37	landfill
MW306	-	2015	8.4	331718.97	6245728.16	32 to 41	landfill
MW307	-	2015	9.05	331641.67	6245805.27	18 to 21	landfill
MW308	-	2015	9.47	331794.8	6245862.6	30.5 to 33.5	landfill
MW309	-	2015	5.51	331910.72	6245705.83	6.3 to 9.3	botany sands
MW310	-	2015	5.47	331910.14	6245705.03	4.7 to 5.1	botany sands
MW311	-	2015	8.1	331823.77	6245779.56	10 to 13	landfill
MW312	-	2015	7.77	331769.86	6245583.4	10.7 to 15.1	botany sands
MW313	-	2015	-5.89	331437.62	6245568.02	6.45 to 9.45	landfill
MW314	-	2015	-11.95	331508.64	6245605.23	19.6 to 22.6	landfill
MW315	-	2015	4.34	331582.27	6245491.41	3.3 to 5.3	botany sands

3.2 Proposed monitoring locations

The proposed monitoring locations include those listed in **Table 2** above and the proposed additional wells listed in **Table 3** below. The additional groundwater monitoring wells screened in bedrock will be installed down-gradient of the landfill to provide greater certainty of the inward flow gradient in bedrock.

Table 3 Proposed additional groundwater monitoring wells

ID	Location	Approximate Easting	Approximate Northing	Approximate Screened Interval (m bgs)	Screened lithology
MW5	adjacent to MW315	331582.00	6245491.00	Below depth of landfill pit base ~37 to 40	Bedrock
MW6	eastern corner of the Site	332003.00	64245663.00	Below depth of landfill pit base ~ 40 to 43	Bedrock
MW7	off-site south east of MW2D	331871.00	6245511.00	Below depth of landfill pit base ~40 to 43	Bedrock

4.0 Groundwater/Leachate Level Monitoring

Groundwater levels in wells and leachate levels in leachate bores will be measured on a regular basis so that hydraulic gradients and leachate/groundwater flow directions can be evaluated. The leachate levels are also used to evaluate the effectiveness of leachate extraction operations.

In addition to measuring groundwater/leachate levels manually, data loggers will be installed in selected leachate and groundwater monitoring bores.

4.1 Leachate Levels

A continuous data logger will be installed in LP1 to continuously measure the leachate level, which will be checked daily until the upgraded leachate extraction and treatment system has been operating for one year. The leachate level is to remain at below -16 m AHD to maintain an inward groundwater gradient towards LP1.

Once the extraction system has stabilised following construction, leachate level gauging will be reduced from daily to weekly.

Leachate levels will be measured at monitoring bores that provide useful level data. It is anticipated that some of the current monitoring locations are likely to be decommissioned as part of the capping and construction works and replacement leachate and groundwater monitoring bores will be installed in due course.

Leachate levels will be recorded as the depth to leachate measured from the surveyed reference point (dip point) using an electronic water level meter. A water level meter designed for use with leachate will be sourced and stored on Site. This meter is designed to overcome some of the difficulties in measuring leachate levels, such as the presence of foam in the bores. The measured depth to leachate, and other observations, will be recorded on appropriate field forms (example provided in **Appendix B**).

The purpose of this monitoring is to evaluate hydraulic gradients between leachate and surrounding groundwater. Leachate monitoring requirements associated with operation of the leachate extraction system (for example, pumping rates, levels at extraction wells, etc.) are specified in the Leachate Extraction Management Plan.

4.2 Leachate Extraction Rates

At the same time that leachate levels are measured, a reading will be taken from the flowmeter at the end of the leachate extraction piping network, prior to discharge into one of the leachate treatment ponds. Specific information to be recorded from the flowmeter includes:

- Date and time of measurement
- Instantaneous flow rate (kL/hr)
- Total flow recorded by flowmeter (F_{tot}, in kL)
- Resettable forward flow, flow since previous reset (RF_{tot}, in kL)
- Resettable total flow (RT_{tot}, in kL)

Once the readings are taken, the resettable measurements need to be re-set to zero. The flowmeter readings will be recorded on appropriate field forms (example provided in **Appendix B**).

4.3 Groundwater Levels

Groundwater levels will be measured at all groundwater monitoring bores on a regular basis:

- At wells in the vicinity of the Alexandria Landfill, where changes associated with the proposed infrastructure and/or leachate management operations would be observed, groundwater levels will be gauged at the same frequency as the leachate monitoring bores (see **Section 4.1**); that is, weekly until the leachate extraction system has stabilised, and monthly thereafter.
- At wells farther from the landfill, groundwater levels will be measured monthly.

The gauging frequency at each well is provided in **Table 4** in **Section 5.1**. Locations of all groundwater monitoring wells are shown on **Figure 5** in **Appendix A**.

Groundwater levels will be recorded as the standing water level (that is, depth to water) measured from the surveyed reference point (typically the top of casing) using an electronic water level meter. The measured standing water level, and other observations, will be recorded on appropriate field forms (example provided in **Appendix B**).

4.4 Data Loggers

Data loggers will be installed in a number of leachate and groundwater bores. Data loggers in leachate bores measure and record water levels (pressure); data loggers in groundwater bores measure and record both water levels and electrical conductivity. The data loggers are vented, so that pressures are measured relative to atmospheric pressure (i.e. barometric pressure effects are compensated). All data are recorded at 1-hr intervals.

Data from the data loggers will be downloaded on a monthly basis. The download frequency may be reduced to quarterly, based on professional judgement, if the risk of data loss is low. Currently, the risk of data loss is relatively high, due to programming and instrumentation problems, and the intensity of on-site improvement works. Once these issues are fully resolved, the download frequency may be reduced.

Data loggers may be downloaded using the Rugged Reader field reader, or any standard laptop computer with appropriate software (e.g., Win-Situ). The data loggers should then be programmed to continue recording on an hourly basis. At the time of re-programming, the standing water level in the well must be measured, and the reference elevation of the instrument checked and re-set if necessary.

5.0 Sampling and Analysis

Samples of groundwater and leachate will be collected on a regular basis for laboratory analysis. The objectives of this monitoring include:

- Detecting additional migration of leachate beyond the limits of the landfills;
- Observing changes in the existing leachate impacts to groundwater outside the landfill, including responses due to leachate extraction activities and proposed construction works; and
- Providing further characterisation of existing conditions, as needed (for example, further characterisation of groundwater in the Alexandria Landfill).

This section presents the sampling and analysis program to meet these objectives. Evaluation and reporting of the data are discussed in **Section 6.0**.

5.1 Sampling Locations and Frequencies

The main objective of this monitoring program is to detect potential migration of leachate from the landfill. The landfill leachate extraction system is intended to operate in a way that prevents significant migration of leachate beyond the limits of the landfill. Groundwater and leachate sampling and analysis will be used to monitor this aspect of the landfill operations.

To meet the objective of detecting potential future migration of leachate to groundwater outside the landfill, wells around the perimeter of the landfill (including down-gradient) will be sampled on a quarterly and annual basis. Wells screened in both the leachate, bedrock and the botany sands will be monitored to assess leachate migration. The botany sands and bedrock will also be monitored to assess on-site migration of contamination and the quality of water extracted from the botany sands aquifer.

Ongoing monitoring is also needed to observe changes in the existing leachate-impacted groundwater, specifically whether conditions are improving due to leachate extraction and/or the proposed construction activities (for example, dewatering), and whether there is continued migration of leachate impacts in groundwater. The data from many of the wells being sampled quarterly will also be used to meet this objective. The groundwater sampling frequency and analytical suites will be reviewed on an annual basis in the annual monitoring report and this plan updated accordingly.

Table 4 Initial Landfill Closure Groundwater and Leachate Monitoring Schedule

Monitoring well	Gauging	Sampling	
		Frequency	Analysis
Leachate extraction monitoring			
LP1	Continuous water level data logging and volume extraction	MW314 to be sampled instead of LP1 obtain representative leachate samples	MW314 to be sampled instead of LP1 to obtain representative leachate samples
Leachate monitoring			
MW304	Monthly	Annually	Suite A
MW305	Monthly	-	-
MW306	Monthly	-	-
MW307	Monthly	-	-
MW311	Monthly	-	-
MW313	Monthly	-	-
MW314	Monthly	Quarterly	Suite A
		Annually	Suite B
MW308	Monthly	Quarterly	Suite A

Monitoring well	Gauging	Sampling	
		Frequency	Analysis
		Annually	Suite B
Groundwater extraction monitoring			
BS1	Continuous water level data logging and volume extraction	Quarterly	Suite B
BS2	Continuous water level data logging and volume extraction	Quarterly	Suite B
Groundwater Monitoring - Botany Sands			
MW309	Monthly	Annually	Suite B
MW310	Monthly	-	-
MW312	Monthly	Quarterly	Suite A
		Annually	Suite B
MW315	Monthly	Annually	Suite B
Groundwater Monitoring - Bedrock			
MW1	Monthly	Quarterly	Suite A
		Annually	Suite B
MW2D	Monthly	Quarterly	Suite A
		Annually	Suite B
MW3 (to be replaced in general vicinity if not able to be located)	Monthly	Quarterly	Suite A
		Annually	Suite B
MW4c	Monthly	Quarterly	Suite A
		Annually	Suite B
MW5 (to be installed adjacent to MW315)	Monthly	Annually	Suite B
MW6 (to be installed in eastern corner of the Site)	Monthly	Annually	Suite B
MW7 (to be installed off-site south east of MW2D)	Monthly	Annually	Suite B

5.2 Monitoring Parameters and Methods

The monitoring parameters and analytical suite for groundwater and leachate is provided in **Table 5**. The suites meet the minimum requirements in the NSW EPA (2015a) *Draft Environmental Guidelines for Solid Waste Landfills*.

Table 5 Groundwater and Leachate Monitoring Parameters

Parameter/Analytical Suite	Units	Sampling Method
Gauging		
Standing water level in all leachate risers and groundwater monitoring wells	m AHD	<i>In situ</i> by calibrated interface meter probe
Volumes		
Leachate and Groundwater Extraction Volumes	m ³	From flow meters or pumping records of the amount of leachate transferred from the landfill and groundwater extracted from interception bores
Suite A		
Electrical Conductivity	µS/cm	Low flow purge
pH	pH	
Redox Potential	mV	
Dissolved Oxygen	mg/L	
Temperature	°C	
Ammonia as N	mg/L	Low flow purge
Major cations and anions (calcium, magnesium, potassium, sodium, chloride, fluoride and sulfate)	mg/L	Low flow purge
Methane	mg/L	Low flow purge
Alkalinity (bicarbonate and carbonate)	mg/L	Low flow purge
Total dissolved solids (TDS)	mg/L	Low flow purge
Purging parameters:		Low flow purge
Flow rate	mL/min	
Water level (drawdown).	m BTOC	
Suite B		
Dissolved metals (field filtered – 0.45 µm) (aluminium, arsenic, barium, cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel and zinc)	mg/L	Low flow purge
Total dissolved solids (TDS)	mg/L	Low flow purge
Total suspended solids (TSS)	mg/L	Low flow purge
Major cations and anions (calcium, magnesium, potassium, sodium, chloride, fluoride and sulfate)	mg/L	Low flow purge
Alkalinity (bicarbonate and carbonate)	mg/L	Low flow purge
Methane	mg/L	Low flow purge
Dissolved organic matter (total organic carbon[TOC], biochemical oxygen demand [BOD], chemical oxygen demand [COD])	mg/L	Low flow purge
Ammonia and nutrients (nitrate, nitrite and phosphorous)	mg/L	Low flow purge

Parameter/Analytical Suite	Units	Sampling Method
Organic contaminants: <ul style="list-style-type: none"> - Total Recoverable Hydrocarbons (TRH) - Monocyclic Aromatic Hydrocarbons (benzene, ethylbenzene, toluene and xylenes); - Organochlorine and Organophosphate Pesticides (OCPs and OPPs); and - Polycyclic Aromatic Hydrocarbons (PAHs) - Phenols; - 	mg/L	Low flow purge
<ul style="list-style-type: none"> - Electrical Conductivity - pH - Redox Potential - Dissolved Oxygen - Temperature 	<ul style="list-style-type: none"> µS/cm pH mV mg/L °C 	Low flow purge
Purging parameters: <ul style="list-style-type: none"> - Flow rate, and - Water level (drawdown). 	<ul style="list-style-type: none"> mL/min m BTOC 	Low flow purge

These analytes have different sample holding times which must be taken into consideration in order to provide valid analytical results (EPA, 2009). With the exception of pH (which is too short to be practicable and hence is measured in the field), the shortest holding time is 24 hours for nitrate, which requires samples to be delivered to the laboratory at the end of each day of sampling.

5.2.1 Additional Analytical Parameters

The groundwater and leachate analytical suite(s) may periodically vary for individual wells or sampling events for various reasons such as Auditor recommendations or field observations.

Prior to variation of the groundwater or leachate analytical suites, Roads and Maritime and the Environmental Auditor are to be notified in writing of the recommended changes, including:

- The rationale for changes in the parameter list;
- The changes or additions proposed;
- The location(s) for the proposed sampling; and
- The frequency of the additional analysis.

5.3 Methods and Procedures

Groundwater and leachate sampling shall be undertaken in accordance with:

- NSW EPA (2015a) *Draft Environmental Guidelines for Solid Waste Landfills*;
- National Environment Protection Council (NEPC) *National Environment Protection (Assessment of Site Contamination) Measure, As Amended 2013 (NEPM)* (2013) guidelines on reporting (contained in Schedule B(2)); and
- The standard operating procedures for groundwater sampling developed for the project and provided in **Appendix C**.

5.3.1 Leachate

Leachate samples will be collected from the monitoring wells screened in the landfill as listed in **Table 4** in **Section 5.1**. It is noted that leachate will be sampled from the monitoring well MW314 which in close proximity to the main leachate sump (LP1) where the highest ammonia concentrations were detected. MW308 located at the northeast extent of the landfill will also be sampled for leachate annually. All other monitoring wells screened in the landfill will be gauged monthly.

Due to the poor quality of leachate and relatively high risk of cross-contamination with other samples, where leachate samples are to be collected, they are to be collected at the end of that groundwater sampling event to the extent feasible.

Leachate samples are to be collected using low flow sampling techniques (specifically the Micropurge™ system). Sampling shall be undertaken as per the procedures documented in **Appendix C**, which is a site-specific operating procedure for groundwater sampling.

5.3.2 Groundwater

Groundwater samples are to be collected using low flow sampling techniques (specifically the Micropurge™ system). Sampling shall be undertaken as per the procedures documented in **Appendix C**, which is a site-specific operating procedure for groundwater sampling.

5.4 QA/QC Sample Requirements

The requirements for QA/QC samples are provided below and also in **Appendix C**.

5.4.1 Field Duplicate Samples

Field duplicate samples are required to be taken at a minimum frequency of one duplicate sample per every 20 primary samples and should be labelled as follows:

- QWXX_DD/MM/YY

Where:

- XX is the field duplicate (or external field duplicate) sample number starting at 01 at the beginning of each sampling event; and
- DD/MM/YY is the sample date.

QA/QC samples are to be recorded in a sample register, including the type of sample and the parent sample, if applicable. The analytical suite for field duplicate samples is identical to the analytical suite required for the primary sample (i.e. groundwater or leachate). Samples are to be submitted by the sampling team to the primary laboratory.

5.4.2 External Field Duplicate Samples

External field duplicate samples are required to be taken at a minimum frequency of one sample per every 20 primary samples. They should be labelled in the same way as field duplicate samples (refer **Section 5.3.1**), and recorded in the sample register.

The analytical suite for external field duplicate samples is identical to the analytical suite required for the primary sample (i.e. groundwater or leachate). Samples are to be submitted by the sampling team directly to the secondary (QA/QC) laboratory.

5.4.3 Rinsate Blank Samples

Throughout the GME, it is recommended that the effectiveness of decontamination protocols for all non-disposable equipment in contact with groundwater be monitored through a rinsate sample. Rinsate samples are required to be taken at a minimum frequency of one (1) sample per each day of sampling.

No additional efforts to decontaminate equipment shall be made prior to the collection of a rinsate blank sample (i.e. the decontamination effort prior to the collection of a rinsate blank sample must be the same as what would normally be undertaken). Specific procedures are included in **Appendix C**.

Rinsate blank samples should be labelled as described in **Section 5.3.1**, and recorded in the sample register.

The analytical suite for rinsate blank samples is identical to the analytical suite required for the groundwater samples. Samples are to be submitted by the sampling team to the primary laboratory.

5.4.4 Trip Blank Samples

If collected samples are to be analysed for volatile organic compounds (VOCs) then a trip blank sample is to be submitted to the laboratory in each esky containing VOC samples.

Trip blank samples consist of deionised water contained within the same type of sample bottle as VOC samples. These samples should be prepared by the primary laboratory prior to the commencement of the GME.

Trip blank samples are to be analysed for the same VOCs as the analytical program and should be labelled as described in **Section 5.3.1**, and recorded in the sample register.

5.5 Laboratory Requirements

Both laboratories (i.e. primary and QA/QC laboratories) must be accredited by the National Association of Testing Authorities (NATA) Australia.

Because there may be multiple analytical methods for specific parameters, and these methods may yield different results, it is important that consistent methods are used for regular monitoring. The analytical methods to be used under this Plan are listed in **Table 6** below.

Table 6 Laboratory Water Analytical Methods

Analytical Methods	Method
Dissolved Metals by ICP/AES:	USEPA 6010 ICP/AES
TPH (C6-C9) plus TRH (C6-C10)	USEPA 5030/8260 P&T/GC/MS
TPH (C10-C36) plus TRH (>C10-C40)	USEPA 3510/8015 GC/FID
BTEXN	USEPA 5030/8260 GC/MS
PAHs (20 analytes)	USEPA 3510/8270 GC/MS
Phenols (12 analytes)	USEPA 3510/8270 GC/MS
pH	APHA 21st ed. 4500 H+ B.
Conductivity	APHA 21st ed., 2510 B.
TDS	APHA 21st ed., 2510 B
Alkalinity by PC Titrator	APHA 21st ed., 2320 B
Sulfate (Turbidimetric) as SO ₄ ²⁻	APHA 21st ed., 4500-SO ₄
Chloride by Discrete Analyser	APHA 21st ed., 4500 Cl - G
Major Cations - Dissolved	APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020;
Fluoride by PC Titrator	APHA 21st ed., 4500 F--C
Ammonia as N	I APHA 21st ed., 4500-NH ₃ G
Nitrite as N	APHA 21st ed., 4500-NO ₂ - B.
Nitrate as N	APHA 21st ed., 4500-NO ₃ - F
Nitrite and Nitrate as N (NO _x)	APHA 21st ed., 4500-NO ₃ - F
Reactive Phosphorus as P-	APHA 21st ed., 4500-P F
Ionic Balance by PCT DA and Turbi SO ₄	APHA 21st Ed. 1030F.
Methane (C ₁ to C ₄ gases)	US EPA, Technical Guidance for the Natural Attenuation Indicators: Methane, Ethane, and Ethene, US EPA - Region 1 EPA New England, July 2001
Total Organic Carbon	APHA 21st ed. 5310 B

Analytical Methods	Method
Chemical Oxygen Demand	APHA 21st ed. 5220 B
Biochemical Oxygen Demand	APHA 21st ed. 5210 B

Equivalent methods may be considered. All methods must be compliant with National Environment Protection Measure (Assessment of Site Contamination) 1999 as amended 2013 (NEPM 2013), Schedule B(3) – Appendix 2.

The typical standard turnaround time for laboratory analysis and reporting is 5 to 7 working days. Analytical data will be provided by the laboratories as hard-copy reports (which may be transmitted by email in PDF format) and as electronic data deliverables (EDDs) in a prescribed format.

6.0 Data Management

6.1 QA/QC Validation Process

The primary objectives of the QA/QC validation process are to ensure that data of known quality are reported, and to identify if the data can be used to fulfil the overall project objectives.

Data validation guidelines based upon data validation guidance documents published by the NSW EPA, the National Environment Protection Council (NEPC), and the United States Environmental Protection Agency (USEPA) should be adopted.

The process involves the checking of analytical procedure compliance and an assessment of the accuracy and precision of the analytical data from a range of quality control measurements, generated from both the sampling and analytical programs, including:

- Field duplicates (1 per 20 primary samples analysed);
- External field duplicates (1 per 20 primary samples analysed);
- Rinsate blanks (1 per day);
- Trip blanks and trip spikes (as appropriate) (1 per batch);
- Internal laboratory duplicates;
- Laboratory control samples;
- Surrogates;
- Method blanks;
- Matrix spikes; and
- Matrix spike duplicates (where applicable).

Additionally, a 10% verification should be undertaken of the electronic data provided each monitoring round. This can be achieved by producing a printout of that round's data and comparing against the laboratory analytical certificates which have been reviewed by the laboratory's approved NATA signatories, which the laboratory electronic data may not be.

If an error between the electronic data and the laboratory analytical certificates is detected, then a full 100% validation of the data must be undertaken.

Verification should be undertaken of all hand-entered field parameter data provided at the end of each sampling round to identify and correct transcription errors.

6.2 Database and Data Management

Data management activities include data collection and subsequent handling, tracking, and control. The groundwater and leachate data collected under this plan is stored and managed in a relational database (e.g., ESDat) constructed to support the overall project. The project database is maintained on a secure network server that is backed up regularly. Access to the database is controlled using features of the ESDat system.

Data related to field measurements and sample collection will be recorded on standardized, reviewed and approved field forms (see **Appendix B**). Completed field forms are to be scanned into electronic copies and stored with the electronic project files. Field records will be reviewed for accuracy and completeness. Specific field data to be uploaded into the database include (but not limited to):

- Well/bore construction information
- Standing leachate and groundwater levels (depth to water measurements)
- Leachate extraction flowmeter readings
- Field parameters measured during sampling

The following procedures are to be used for uploading field data:

- a) Field data are manually transcribed from the field forms into standard ESDat upload templates.
- b) All transcribed data is independently checked against the original field forms for accuracy. Any data incorrectly transcribed is to be corrected.
- c) Once the data have been uploaded and checked, the data are reviewed by a qualified professional for possible measurement errors and consistency with previous records. Additional corrections to the data may be made based on this review.

Survey data from contracted surveyors will be received in both a map-based format (CAD/GIS) and electronically as a spreadsheet or similar format. Horizontal coordinates will be provided in the Map Grid Australia (MGA) coordinate system; elevations referenced to the Australian Height Datum (AHD). Survey data will be electronically uploaded directly into the ESDat database (no manual data handling).

Raw electronic data (e.g., datalogger records) will be retained in the standardised format created by the software.

Analytical data will be received from the laboratories as hard-copy reports (which may be transmitted by email in PDF format) and as electronic data deliverables (EDDs) in a prescribed format. The EDDs may be formatted for direct uploading into a database. Independent of the formal data validation process (see **Section 6.1**), all laboratory data will be reviewed by a qualified professional for general data quality, consistency with previous records, and internal consistency (for example, calculation of ion charge balances). Where potential errors are identified, attempts should be made to obtain corrected data, for example, by contacting the lab for further evaluation/clarification.

The project data in the database constitutes the single source of primary data for the project. Data to be used for evaluations and interpretation will be exported from the database. Data tables presented in reports will generally be generated directly from the database. Maps and figures prepared for the project will be based on data obtained from the database (survey coordinates, reduced water levels, etc.).

7.0 Well Inspection and Maintenance

On a quarterly basis, the condition of all groundwater monitoring bores will be assessed so that repairs can be performed and wells can continue to be serviceable. It is likely that this inspection will take place at the time of groundwater sampling, but this is not required. Well repairs or maintenance will be conducted where inspections indicate these are needed for continued appropriate use of the well.

7.1 Inspection Procedures

On a minimum quarterly basis (typically in conjunction with each groundwater monitoring event), each groundwater monitoring well is to be inspected for damage and its ability to provide representative samples. A well inspection will consist of:

- A visual inspection of any damage or wear to the concrete pad;
- A visual inspection of any damage or wear to the protective steel casing;
- A visual inspection of any damage or wear to the PVC riser pipe;
- A visual inspection of the cap – type and condition of cap (i.e. effectiveness of seal), etc.;
- Condition of padlock (in place and secure);
- Observations that may indicate surface water entry into the casing, such as the presence of standing water, water lines on the casing, etc.;
- Measurement of the well total depth;
- Assessment of any damage to the subsurface PVC pipe and screen through lowering the sampling equipment:
 - If there is difficulty in lowering equipment like the micropurge pump this may indicate bent piping at depth;
 - Traces of rootlets and or sludge on the pump (particularly around the pump inlet) upon bringing back to surface may indicate blockage of the screen by biofouling.

Observations damage from the inspection will be recorded on gauging and sampling field sheets. If no damage or wear is observed it will be noted on the field sheets that the well is in good condition.

Damages and subsequent repairs or recommendation for replacement will be reported in the annual report.

7.2 Maintenance, Repairs and Decommissioning

Appropriate maintenance and repairs will be performed on the bores, as a result of the inspections. Where items are missing or easily repaired (e.g. missing caps, gatic screws, bore ID labels, etc), these repairs will be completed. Where more substantial works may be required (e.g. camera survey to assess well condition, raising or lowering the gatic, etc.), recommendations will be provided to Roads and Maritime for approval prior to implementation.

Depending on well conditions and project needs, it may be appropriate to recommend decommissioning with or without replacement. Such recommendations will also be provided to the Roads and Maritime for approval prior to implementation. Approval may also be required from the Environmental Auditor.

7.3 Leachate Monitoring Infrastructure

In the future, a similar inspection and maintenance program should be undertaken for the leachate monitoring bores. At the time of completing this report, the design of leachate system (**Appendix K** of the LCMP) was yet to be finalised and the existing leachate system was in operation. Leachate monitoring infrastructure is anticipated to be installed following construction of the system.

8.0 Data Evaluation and Reporting

This section describes the evaluation of the data collected under this Plan. Specific reporting requirements are outlined.

8.1 General Data Interpretation

The data collected under this Plan, including leachate and water level data as well as chemical data, is to be reviewed on an on-going basis by a suitably experienced hydrogeologist familiar with the site conditions. The information collected under this Plan affects the operations at the landfills themselves, and as such, the data needs to be reviewed and feedback or recommendations incorporated into the landfill operations. It is not appropriate to collect the data under this Plan and only review it on an annual basis as part of the Annual Review process. Based on the professional judgement of the hydrogeologist, specific types of regular evaluations may include (but not limited to):

- Measured standing levels (depth to water/leachate) should be used to calculate reduced water/leachate levels (hydraulic head/elevation).
- Leachate levels should be reviewed as they are collected to evaluate the effectiveness of the leachate extraction system. Where leachate level trends over time indicate that leachate levels may be rising, landfill operations should be notified so that the leachate extraction system can be adjusted appropriately. Leachate levels should generally not be increasing (except where due to settlement).
- Similarly, leachate extraction rates should be reviewed. Any unusual increases or decreases in extraction rates should be discussed with personnel responsible for managing the leachate extraction system for an appropriate explanation and understanding.
- Because the effectiveness of landfill gas collection is directly related to leachate levels in the waste, there should be ongoing communications between landfill gas management and leachate extraction efforts.
- Groundwater levels should be reviewed on a regular basis to look for effects of leachate extraction operations.
- Groundwater elevation contour maps and/or groundwater/leachate elevation contours should be prepared on a regular basis to evaluate groundwater flow directions and groundwater/leachate gradients.
- Chemical data should be evaluated relative to previous data and relative to the existing conceptual model. Trends in chemical concentrations over time should be evaluated.
- If the data suggest changes are needed to the conceptual hydrogeologic model, appropriate actions should be taken, specifically review of the appropriateness of the existing monitoring program.

8.2 Purpose

One of the primary purposes of the monitoring conducted under this Plan is to evaluate that:

- Leachate does not migrate beyond the site boundary in quantities which would present a risk to the safety of the local community or a hazard to the environment;
- Leachate extraction is maximised until leachate levels within the site are lowered to the extent that an inward hydraulic gradient is achieved and maintained; and
- That leachate and groundwater are managed and monitored in accordance with the requirements of the existing EPLs and TWA.

The primary controls on the migration of leachate are the leachate extraction system (extraction bores, pumps, controls and piping), as described in detail in the Alexandria LCMP (AECOM, 2015). The leachate extraction system will be operated in such a way as to create an inward hydraulic gradient between the landfill and the surrounding groundwater. This will reduce the potential for leachate to migrate away from the landfill. Secondly, quarterly groundwater monitoring will be conducted around the down hydraulic gradient perimeter of the landfill so that future migration of leachate can be detected and appropriate actions taken. Specific procedures to evaluate this are provided below.

8.2.1 Inward Hydraulic Gradient

Leachate and groundwater levels will be measured on a regular basis (at the frequencies specified in **Section 4.0**) and will be used to calculate reduced leachate and groundwater levels/elevations. A groundwater/leachate elevation contour map (potentiometric map) will be prepared using these data; and leachate flowlines will be generated based on the contour map. The flowlines will be examined to evaluate whether leachate is likely to flow into the landfill (inward gradient) or outward to the surrounding shallow groundwater.

The objective is to maintain an inward hydraulic gradient with the gradient-based flowlines indicating leachate does not leave the landfill to the surrounding shallow groundwater. It should be recognised that there are likely to be periods of time and areas of the landfill where for short periods of time the inward gradient may not be maintained, due to factors such as pump repairs, construction works, power outages, etc. These short-term disruptions should have limited impact on long-term leachate control.

This flowline approach has been adopted because it integrates data in two dimensions (rather than one-dimensional analyses such as the calculation of gradients between specific pairs of bores). In addition, the flowline approach allows the use of data from any available locations, rather than relying on specific fixed datapoints.

The following methodology will be used to evaluate gradients:

- a) The average head (groundwater and leachate) will be calculated over all the previous month's gauging rounds (either four weeks or five weeks). Average levels are to be used, because short-term fluctuations are likely to occur, but are not likely to affect long-term leachate migration. When gauging is taking place monthly, the same evaluation will take place, but on a quarterly basis. Thus, the averages are calculated over three months.
- b) Using the average head calculated at each leachate monitoring bore and each groundwater bore, a contour map of the groundwater/leachate surface will be generated using the GIS-based interpolation algorithm.
- c) The flowlines will be examined to evaluate whether they terminate inside the landfill (inward gradient maintained) or whether they leave the landfill and terminate in the surrounding groundwater.

Actions to be taken if the gradient is not maintained are presented in **Section 7.3**.

8.2.2 Groundwater Detection Monitoring

Samples collected from the botany sands and bedrock screened groundwater monitoring wells will be analysed for parameters indicative of landfill leachate (TDS, chloride, ammonia, organic carbon, etc). The collected data will be evaluated for the presence of increasing trends in leachate parameter concentrations over time. The objective is to have stable or decreasing concentrations over time, not increasing trends. Note that most the bores around the down-gradient and up-gradient (towards Sydney Park) perimeter currently show the presence of leachate-related parameters. Increasing trends could indicate ongoing or new migration of leachate from the landfill.

The specific groundwater sampling program is outlined in **Section 5** above. The following procedures will be used to evaluate the data from the sampling:

- a) The trend evaluation will be conducted at wells representative of migration beyond the limits of the landfills, specifically MW1, MW2D, MW3, MW5, MW6 and MW7. The purpose of the quarterly sampling is to detect potential migration of leachate from the landfills. The trend analysis is the method to be used to identify potential migration.
- b) Trend analyses will be conducted using the following parameters at each well:
 - Alkalinity (bicarbonate)
 - Ammonia
 - Chloride
 - Total organic carbon
 - Electrical conductivity or TDS
 - Methane

These parameters are selected because they are primary indicators of landfill leachate, without significant interferences. For example, iron may be associated with landfill leachate, but it may also be naturally occurring due to background redox conditions. Therefore, iron (and other parameters subject to interferences) was not selected for this evaluation.

- c) For each parameter at each well, the concentration measured at the current quarter will be compared to the results from the four previous quarters. If the current concentration is more than 50% higher than the maximum of the previous four quarters, the well/parameter will be flagged as potentially indicating new migration of leachate. (A value of 50% was chosen because RPDs for field duplicates within 30% are considered acceptable, so variation within this range could be due to normal fluctuations.)
- d) If four of the six parameters at any well are flagged as possible problems, it will be interpreted that there may be migration of leachate from the landfill, and further actions will be taken (see **Section 7.3**).
- e) In addition to evaluating a single high value, a statistical trend analysis will also be performed to identify more subtle changes over a longer term. For each parameter in each well, the Mann-Kendall trend statistic will be calculated using the current data and the previous seven quarters (for a total of eight results over eight quarters). If the Mann-Kendall statistic shows an increasing trend at the 90% confidence level ($\alpha=0.10$) for four of the six parameters, it will be interpreted that there may be migration of leachate from the landfill, and further actions will be taken.

Actions to be taken if an increasing trend is observed are presented in **Section 7.3**.

8.3 Response Actions

If the compliance indicators are not met (data suggesting an outward gradient and/or increasing concentration trends), the Roads and Maritime will be advised, and additional evaluations and/or actions will be taken.

If either of the indicators is not met, as an initial step, further data evaluation by a qualified hydrogeologist should be conducted to confirm the findings. The specific evaluations to be performed are at the discretion of the hydrogeologist based on professional judgement. However, some examples are listed here:

- All data should be reviewed for data quality, so that non-representative data (e.g., water levels that are likely to be measurement errors) are considered and/or omitted from the analysis.
- Because the inward hydraulic gradient is calculated based on average water/leachate levels, levels for individual dates should also be reviewed.
- Chemical data should be reviewed for quality problems (charge balance errors, potential cross-contamination, laboratory errors, etc.).
- Consistency across all analytical parameters should also be evaluated; that is, do all analytical results suggest there has been further migration of leachate from the landfills.

If further data evaluation suggests the need for changes or adjustments to the data, the evaluation should be updated as appropriate.

8.3.1 Inward Gradient Not Maintained

If an inward gradient is not being maintained, then additional actions will be taken to increase leachate extraction:

- a) The operations of the existing pumps and bores in the area where the gradient is not inward will be reviewed. It may be that pumps need repair or maintenance to improve leachate extraction, or that extraction bores should be re-developed/de-silted.
- b) If all pumps and bores in the area of concern are operating at optimum capacity, consideration will be given to other operational changes that might enhance extraction rates, for example, different types of pumps and/or control systems.
- c) If no further improvements can be made with the existing infrastructure, and an inward gradient cannot be achieved, consideration will be given to installing additional bores and pumps to increase leachate extraction. The scope of works for any such recommended changes will be provided to the City of Casey and the Auditor for review prior to implementation.

8.3.2 Increasing Concentration Trends

If quarterly groundwater sampling indicates increasing trends in leachate parameters, the following actions will be taken to limit further migration and to confirm the findings of the trend analysis:

- a) The actions noted above for responding to an outward gradient will be implemented in the area of concern, including optimising performance of the existing system and expanding the system as appropriate.
- b) The groundwater well(s) in which the increasing trend is observed will be re-sampled for all parameters to verify the previous results.
- c) The conceptual hydrogeological model will be reviewed/updated to provide an understanding of the possible causes of new migration.
- d) If increased leachate extraction efforts do not reverse the trend, and the increasing trend continues over two consecutive quarters, additional actions will be taken to increase capture of leachate. Actions may include installation of additional bores and pumps, within and/or outside the landfill(s), and/or other response actions. The scope of works for any such recommendations will be provided to Roads and Maritime and the Auditor for review prior to implementation.

8.4 Reporting Requirements

There are overall reporting requirements associated with landfill operations. It is likely the groundwater and leachate monitoring data will be incorporated into overall landfill reporting on occasion and as appropriate. These types of requirements are outlined in the Alexandria LCMP.

Reporting requirements specific to leachate and groundwater are provided below.

8.4.1 Quarterly GME Reporting

At the completion of groundwater/leachate sampling on a quarterly basis, a data report will be prepared, which will include:

- A brief description of the sampling conducted
- Tabulated data of all sampling results for the quarter
- Description of the data validation process and any QA/QC issues identified
- A map showing sample locations

This report will be completed within 28 days of receipt of the analytical data from the laboratory, and will be submitted to the following agency (or equivalent):

NSW Environment Protection Authority
Metropolitan Branch
PO Box A290
Sydney South, NSW 1232

8.4.2 Evaluation

On a quarterly basis, the evaluation of compliance (as described in **Section 7.2**) will be documented in a letter or technical memorandum to the Roads and Maritime. The evaluation and reporting will be completed within six weeks of receipt of the quarterly analytical data from the laboratory.

8.4.3 Annual Review

On an annual basis, by 30 January each year, a comprehensive Annual Groundwater and Leachate Monitoring Report will be submitted to the NSW EPA, Murrumbidgee Council, City of Sydney Council and the Site Auditor. The purpose of the report is to convey the monitoring results and actions taken to the interested parties, to provide a current description of leachate impacts to groundwater, and to re-examine and update the monitoring program as appropriate. The Annual Report will include:

- To facilitate review by the Auditor, a tabulated listing of monitoring and other requirements (such as Audit recommendations), actions taken to comply with the requirements, and reference to supporting information in the Annual Review
- A table and a map describing the groundwater and leachate monitoring infrastructure, including locations, elevations, and construction information

- A description of the monitoring conducted under this Plan, and deviations from the Plan
- Tabulated data for all monitoring results, including groundwater and leachate levels and field and laboratory analytical results
- Description of the data validation process and any QA/QC issues identified, and a discussion of calculated ion charge balances
- The results of evaluating compliance, and actions taken in response to non-compliance
- Descriptions of other data evaluations used to interpret site conditions, such as Piper trilinear diagrams, graphs of trends over time, statistical trend analyses, leachate indicator plots (L/N cation ratios (Mulvey and Brisbane, 1996))
- A description of the conceptual hydrogeological model, and any changes/updates, for example:
 - Climate information (temperature, precipitation, evaporation)
 - Stratigraphic units
 - Groundwater and/or leachate elevation contour maps and discussion of groundwater flow directions and leachate gradients
 - Changes in groundwater/leachate levels over time
 - Interpretation of the extent of leachate impacts in groundwater
 - Changes in groundwater/leachate chemistry over time
- Discussion of other works related to groundwater conducted during the monitoring period (for example, as a result of Audit recommendations)
- An evaluation of the potential environmental risk associated with leachate-impacted groundwater, and impacts on beneficial uses of groundwater
- Recommendations, as appropriate, for adjustments to this groundwater and leachate monitoring program or other suggested works.

Future annual reports may also include other types of information, depending on the specific activities undertaken during the annual monitoring period. For example, each annual Audit may have specific recommendations to be implemented during the year and presented in the annual report.

9.0 Provisional Items

This section of the Plan provides procedures for making changes to the Plan, and methods for other groundwater works that are likely to be conducted in the future, but are not currently part of the Plan (for example, installation of additional wells).

9.1 Changes/Updates to this Plan

This Plan provides a specific program for ongoing groundwater and leachate monitoring. As conditions change and knowledge evolves, it is likely that the program specified in this plan will also evolve. The Annual Review (See **Section 7**) requires re-evaluation of monitoring program on an annual basis, and allows for adjustments as needed. This Plan will be reviewed at least annually by 30 June and updated as needed.

Changes to the monitoring program outlined in this Plan will be documented in a written addendum to this Plan. The addendum should discuss the rationale for the proposed changes, including a statement of objectives. It is likely that **Table 4** of this Plan will require updating, as well as other tables and figures as needed. The revision of the plan will require approval of the Site Auditor.

9.2 Potential Additional Groundwater Works

This monitoring plan is intended to provide approaches and procedures for most groundwater works likely to take place at the site. Procedures for some of the most likely works are presented in the following sections.

For groundwater works that may be needed for which a specific program or procedures are not provided in this plan, a brief technical memorandum will be prepared outlining the work to be performed. The purpose of the technical memorandum is to provide clear communication about the works to be performed and allow review and feedback from stakeholders (Roads and Maritime, Auditor, hydrogeologist, field team, etc.) as needed. The technical memorandum will include the following items:

- The objective(s) of the work to be performed
- The specific scope of works to meet the objective(s)
- Map(s) and/or table(s) providing information about the locations of the works
- Specific procedures to be used to implement the scope (for example, drilling or sampling methods, equipment to be used, measurements to be obtained, etc.)
- QA/QC samples and/or procedures
- Means of handling any waste (drill cuttings, purge water) generated during the works, as applicable
- Decontamination procedures, as applicable

9.3 Additional Groundwater Monitoring Wells

Periodically, new monitoring wells (either leachate or groundwater) will be required due to:

- Unrepairable damage to existing bores;
- Recommendations by the Auditor to fill in data gaps in the existing bore network; and/or
- To undertake further investigation works.

Whilst the specific methodology required for the installation and construction of monitoring wells will depend on the exact purpose of the drilling program, common items that should be addressed are outlined below.

9.3.1 Bore Construction and Decommissioning Licences

Prior to the installation of any drilling works for a new groundwater well, a bore construction licence must be obtained from NSW Office of Water (NOW). This process generally takes approximately 10 working days and should be applied for well in advance of drilling works.

Prior to drilling works, a copy of the bore construction licence must be delivered to the drilling contractor.

A bore decommissioning license must also be obtained prior to the decommissioning of any licensed groundwater monitoring bore prior to the commencement of works.

9.3.2 Buried Services Location

Prior to the commencement of all drilling works outside the landfill waste mass, a Dial Before You Dig search should be undertaken to determine the location of services in relation to the proposed position of any monitoring bore.

Additionally, prior to the commencement of drilling works for any monitoring bore, the proposed bore location should be electronically scanned for the presence of buried services by an appropriately qualified and experienced Underground Service Locator.

9.3.3 Groundwater Monitoring Bore IDs

Groundwater monitoring bores are to be designated based on location and aquifer screened.

Groundwater bores have designations in the format MB00X. All groundwater monitoring bores are to be designated by a "MB" prefix indicating monitoring bores. The project database and/or well infrastructure table are to be consulted prior to drilling, and the numerical designation for the new well(s) is to be the next consecutive number not previously used (00).

Additionally, bores with an "R" suffix indicate that the bore has replaced a previous bore at that location.

Identification tags should be manufactured for permanent labelling of groundwater monitoring bores.

9.3.4 Bore Surveying

After installation, all groundwater and leachate monitoring bores are to be surveyed to Map Grid Australia (MGA) coordinates, with elevation measured to the Australian Height Datum (AHD).

All surveying works are to be undertaken by an appropriately licensed surveyor to the following accuracy:

- MGA coordinates are to be measured to an accuracy of ± 0.01 m.
- Elevation is to be measured to an accuracy of ± 0.001 m.

9.3.5 Groundwater Bore Logging and Construction

All groundwater bores shall be constructed to a standard not less than as described in *Minimum Construction Requirements for Water Bores in Australia* (3rd Edition, Land and Water Biodiversity Committee, February 2012).

The drilling must be supervised by an appropriately qualified geologist or geological engineer to log the borehole and to design and supervise the construction of the monitoring well.

All geological and well construction details must be recorded on an appropriate field log form (refer **Appendix B**) and should include (but not necessarily be limited to) the following information:

- Project details (project number, name etc)
- Drilling subcontractor details (subcontractor name, driller, etc)
- Drilling method
- Field staff present;
- Bore ID and location;
- Soil and rock descriptions (colour, texture/grain-size, sorting, density, moisture, etc);
- Encountered and stabilised water levels;
- Well construction details

After the completion of drilling works, the field logs should be transcribed into formal borelogs for inclusion into a bore completion report (refer **Section 9.5**).

9.3.6 Groundwater Bore Development

Following installation, all groundwater monitoring bores are to be developed to the minimum standard as outlined within *Minimum Construction Requirements for Water Bores in Australia* (3rd Edition, Land and Water Biodiversity Committee, February 2012).

9.3.7 Abandonment/Decommissioning of Bores

Following abandonment of a monitoring bore (due to unrepairable damage or if otherwise no longer needed) then that bore should be formally decommissioned.

All groundwater monitoring bores are to be decommissioned in accordance with *Decommissioning of Bores (Abandonment)* within *Minimum Construction Requirements for Water Bores in Australia* (3rd Edition, Land and Water Biodiversity Committee, February 2012).

9.4 Additional Leachate Monitoring Bores

In general, requirements for leachate bores are similar to that for groundwater bores (e.g. geologic logging, surveying, etc.); with the exception that bore licenses are not required. However, if additional leachate monitoring bores are to be installed, care must be taken in their construction to protect the integrity of existing landfill infrastructure, including the landfill cap.

At the completion of construction and capping works, the Alexandria Landfill waste mass will be capped with the following layers:

- A nominal 500mm thick top soil re-vegetation layer, local thickening can be provided for taller vegetation (if required);
- A 300mm thick low permeability material layer with permeability 10^{-6} m/s - 10^{-8} m/s;
- A 300mm thick earth cover, comprising crushed sandstone or selected material; and
- Gas collection system located within the waste material substrate.

Any future drilling and installation of leachate monitoring wells shall be conducted in such a way as to prevent damage to the integrity of the geomembrane and geotextile layers while minimising the impact to the other materials above the waste mass.

During the drilling planning process, the location and proposed construction details of all wells shall be approved by the site manager prior to being pegged out by a licensed surveyor.

Although the method for drilling a given leachate monitoring well through the cap does not differ between a landfill gas bore, leachate or dual purpose well, construction details such as (but not limited to) screen interval, drill hole diameter and gravel pack grain size may change.

9.4.1 Drilling and Installation Methodology

The following method of installation shall be followed for all wells drilled through the landfill cap at the Alexandria Landfill.

- The depth of the geomembrane shall be determined through survey records and the layers of soil and subgrade above removed with care by hand tools until the geomembrane is exposed.
- The geomembrane shall be cut away to a diameter slightly greater than the proposed drill hole diameter prior to drilling. Margin for error shall be allowed due to the difficulty of manoeuvring the drilling rig into place.
- A crushed rock pad shall be built to support the weight of the drilling rig with the exact dimensions and thickness of the pad to be dependent on the weight and size of rig used and agreed to by the site manager.
- The well shall be drilled through the cap and into the waste using a sonic drilling technique while advancing outer well stabilisation casing. Care must be taken by the drillers and the supervising geologist/engineer that the LLDPE liner does not tear.
- Record the stratigraphy of the materials encountered during drilling such as the thickness of cap beneath the geomembrane, different zones/types of waste and the natural material under the waste for a fully penetrating well.
- Record the encountered leachate level and rebounded/stabilised leachate level within each well.
- Once the well has been constructed within the drill hole and the gravel pack filled to approximately 1.0 m below the top of waste level, hydrated bentonite shall be placed and compacted into the well annulus up to the level immediately below the surrounding LLDPE geomembrane.

- When the upper bentonite surface is deemed suitable for placement of geomembrane (smooth, not overly wet but dry to touch) an LLDPE boot and collar shall be welded to the existing geomembrane leaving no gaps using approved extrusion welding apparatus. All materials shall be made from the same LLDPE resin type as the existing geomembrane liner material. The boot shall be adhered to the well using DENSO tape or an equivalent non-permanent air tight seal approved by the site manager.
- At this stage the finished works shall be signed off by the site manager or authorised representative of the site manager.
- All material excavated from above the LLDPE geomembrane shall be reinstated to the same conditions as it was found pre-drilling activity and the drilling pad removed.
- Waste material brought to the surface during drilling, shall be removed by the drilling contractor and disposed of offsite.

All records kept (receipts for fusion welding, bore construction and stratigraphy logs etc) shall be bound and presented to the site manager.

9.4.2 Leachate Monitoring Well IDs

Leachate monitoring wells are to be designated sequentially in order of date of installation. Leachate monitoring wells are designated by a "LB" prefix.

Identification tags should be manufactured for permanent labelling of leachate monitoring bores on site.

9.4.3 Abandonment/Decommissioning of Leachate Bores

For leachate bores that are no longer useable or needed, the bore should be decommissioned by pouring an appropriate cement-bentonite grout mix into the bore to seal it.

9.5 Bore Completion Reports

A bore completion report is required to be prepared after the completion of drilling works, whether for groundwater or leachate monitoring bores.

The drilling contractor is required to prepare a similar document to fulfil bore construction licence conditions. However, a separate bore completion report will be prepared for the Roads and Maritime's records.

The bore completion report should include (but not be limited to) the following sections:

- Drilling and well installation methodologies;
- Well development methodology;
- Completed boring logs;
- Surveying results (location, elevation);
- Well decommissioning (if undertaken);
- Summary of observed geology;
- Updated table of well infrastructure
- Location plan of new well locations.

The bore completion report will be completed within 30 days of the completion of drilling activities.

9.6 Audit Recommendations

It is expected that there will be regular Environmental Audits conducted for groundwater at the site (see **Section 7**). Details of Environmental Audit activities proposed during closure phase are provided in Section 11.2 of the Alexandria LCMP.

10.0 References

AECOM, 2014a *Phase 1 Environmental Site Assessment, Alexandria Landfill Acquisition Area, St Peters, NSW* (Phase 1 ESA)

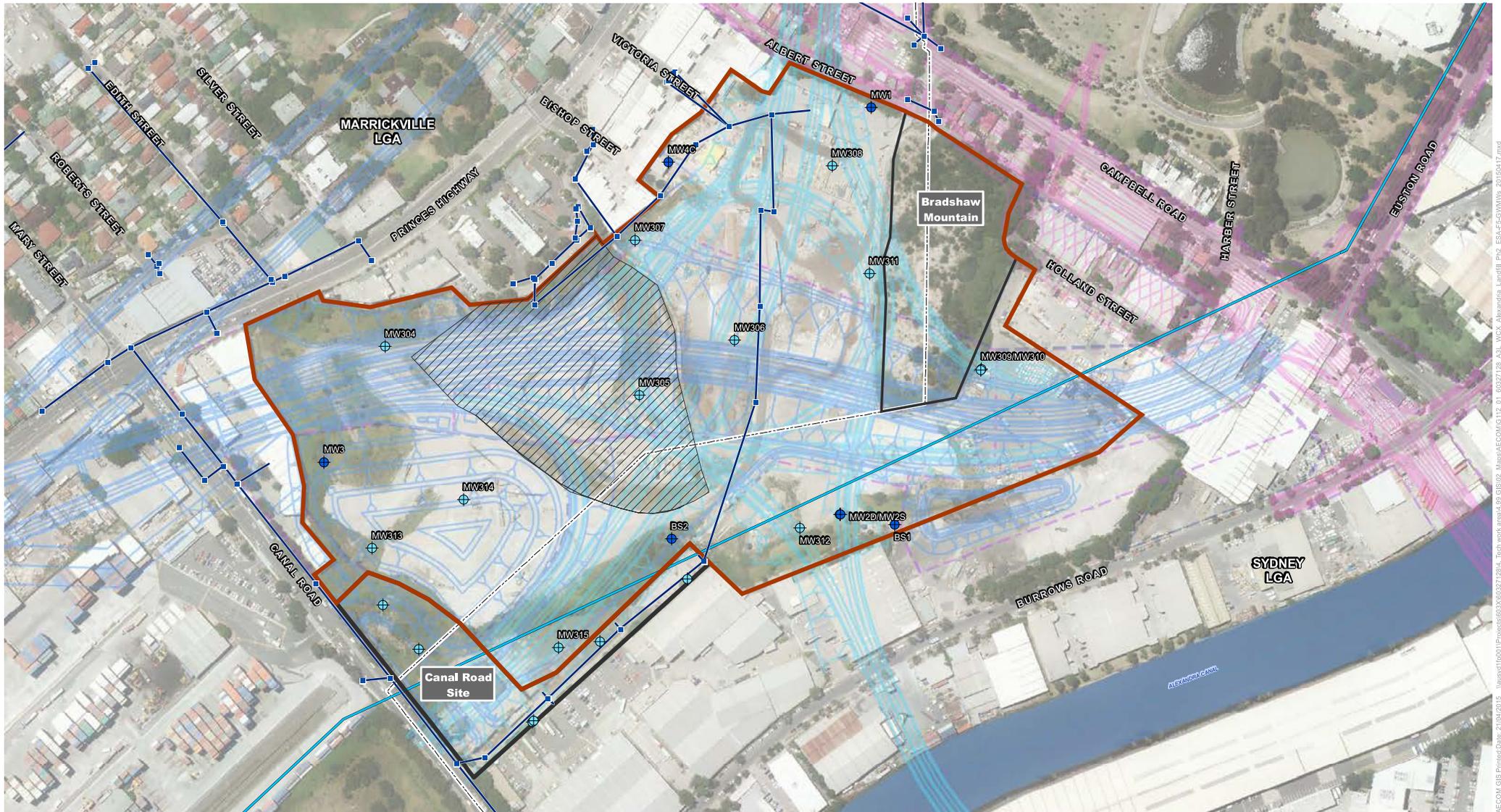
AECOM, 2015. *Phase 2 Environmental Site Assessment, Alexandria Landfill, 10-16 Albert Street, St Peters, NSW*.

Land and Water Biodiversity Committee, 2012. *Minimum Construction Requirements for Water Bores in Australia* (3rd Edition,) February.

Appendix A

Figures

Appendix A Figures

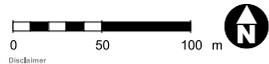


- KEY**
- Groundwater Monitoring Well (AECOM, 2015)
 - Existing Groundwater Monitoring Well
 - Alexandria Landfill Site Boundary
 - Landfill Premises
 - Local Government Area
 - Stage 2 - New M5 Tunnels
 - Stage 2 - Local Roads
 - Saint Peters Interchange
 - Desalination Pipeline
 - Stormwater

CONFIDENTIAL GIS MAP

WestConnex
Building for the future

AECOM



Map produced by AECOM on behalf of WestConnex Development Authority.
Map data copyright 2014 WestConnex Delivery Authority, NSW. Spatial data used under licence from Land and Property Management Authority, NSW © 2014.
AECOM/WDA makes no representations or warranties of any kind, about the accuracy, reliability, completeness, suitability or fitness for purpose in relation to the map content.



SCALE: 1:3,000
A3
COORDINATE SYSTEM: GDA 1994 MGA Zone 56

SHEET: 1 of 1
TITLE: WestConnex Motorway
FIGURE 5: Groundwater Monitoring Well Locations
Alexandria Landfill Phase 2 ESA

PROJECT: WESTCONNEX STAGE 2 TA			
CLIENT: WESTCONNEX DELIVERY AUTHORITY			
DRAWN: DN	PROJECT #: 60327128	MAP #:	Project:
CHECK:	DATE: 17/04/2015	G112 01 60327128	

AECOM GIS Printed Date: 21/04/2015 \\aeg\g112\01\60327128_01_60327128_A3L_WCA_Alexandria_Landfill_Ph2_ESA-FG\WMA_20150417.mxd

Appendix B

Example Field Forms

16;#Australia New Zealand|a541b326-6e42-45fc-a7d5-d797f3cb72ce

Site Contamination Analysis- Ground Water Sampling

Q4AN(EV)-336-FM15

Project Name:				Well No:					
Project Number:				Well Type: <input type="checkbox"/> Monitor <input type="checkbox"/> Extractor <input type="checkbox"/> Other					
Recorded By:				Well Material: <input type="checkbox"/> PVC <input type="checkbox"/> SS <input type="checkbox"/> Other					
Date:				Sample by:					
Well Purging									
Purge Volume				Purge Method					
Well Diameter (D in mm): <input type="checkbox"/> 50 <input type="checkbox"/> 100 <input type="checkbox"/> Other				<input type="checkbox"/> Bailer – Type: <input type="checkbox"/> PVC <input type="checkbox"/> SS <input type="checkbox"/> Teflon <input type="checkbox"/> Other					
Total Depth of Well (TD in m BTOC):				<input type="checkbox"/> Pump – Type: <input type="checkbox"/> Submersible <input type="checkbox"/> Bladder <input type="checkbox"/> Other					
Water Level Depth WL in m BTOC):				Pump Intake Setting					
Number of well volumes to be purged (# VOLS) <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 10 <input type="checkbox"/> Other				Depth (m BTOC)					
				Screen Interval (m BTOC) – Top : Bottom:					
Purge Volume Calculation									
$\left(\frac{\text{TD (m)} - \text{WL (m)}}{2} \right)^2 \times \text{\#VOLS} \times 0.00314 = \text{Calculated Purge Volume (L)}$									
PURGE TIME _____ PURGE RATE _____ ACTUAL PURGE VOLUME _____									
Start: _____ Stop: _____ Elapsed: _____ Initial: _____ Final: _____									
Field Parameter Measurements									
Min since purge began	Volume Purged (L)	DO (mg/L)	Cond. (µS/cm)	pH	Redox (mV)	Temp (°C)	SWL (mBTOC)	Other	
Observations during purging (well condition, turbidity, colour, odour, sheen): - _____ _____									
Discharge water disposal: <input type="checkbox"/> Drums <input type="checkbox"/> Sanitary sewer <input type="checkbox"/> Storm sewer <input type="checkbox"/> Surface <input type="checkbox"/> Other									

Well Sampling					
Sampling Method <input type="checkbox"/> Same as purge method <input type="checkbox"/> Bailer – Type: <input type="checkbox"/> PVC <input type="checkbox"/> SS <input type="checkbox"/> Teflon <input type="checkbox"/> Other <input type="checkbox"/> Pump – Type: <input type="checkbox"/> PVC <input type="checkbox"/> SS <input type="checkbox"/> Teflon <input type="checkbox"/> Other					
Sample Distribution Sample Series:					
Sample No.	Vol/Cont.	Analysis	Preservatives	Lab	Comments
Quality Control Samples					
Duplicate Samples		Blank Samples		Other Samples	
Original No	Duplicate No	Type	Sample No	Type	Sample No

16;#Australia New Zealand|a541b326-6e42-45fc-a7d5-d797f3cb72ce

Groundwater Monitoring Well Construction Detail Form

Q4AN(EV)-336-FM27

Project Details

Client			Well ID
Project Number			
Site Location			Date Installed
Well Location	Coords - Easting	Northing	Inspector
Method			Contractor

Delete or add monitoring well detail where appropriate.

		Depth in metre below ground surface (m bgs)	Elevation (m) Datum
Measuring Point for surveying & Water Levels	Top of Steel Guard Pipe	_____	_____
	Top of Riser Pipe	_____	_____
	Ground Surface	0.0	_____
Cement, Bentonite, Bentonite Slurry, Grout	Riser Pipe	_____	_____
	Bottom of Steel Guard Pipe	_____	_____
% Cement			
% Bentonite			
	Top of Bentonite	_____	_____
	Bentonite Seal Thickness	_____	_____
	Top of Sand	_____	_____
	Top of Screen	_____	_____
	▼ Stabilised Water Level	_____	_____
	Screen:		
	Length	_____	_____
	Inside Diameter (ID)	_____	_____
	Slot Size	_____	_____
	Type of Material	_____	_____
	Type / Size of sand	_____	_____
	Sand Pack Thickness	_____	_____
	Bottom of Screen	_____	_____
	Bottom of Tail Pipe	_____	_____
	Length	_____	_____
	Bottom of Borehole	_____	_____
Borehole Diameter		_____	_____

Describe Measuring Point	Approved	Signature	Date
--------------------------	----------	-----------	------

16;#Australia New Zealand|a541b326-6e42-45fc-a7d5-d797f3cb72ce

Site Contamination Analysis Well Development Form

Q4AN(EV)-336-FM11

Project Name:			Project Number:			Well No:			
Recorded / Developed By:			Well Type: <input type="checkbox"/> Monitor <input type="checkbox"/> Extractor <input type="checkbox"/> Other						
Date:			Well Material: <input type="checkbox"/> PVC <input type="checkbox"/> SS <input type="checkbox"/> Other						
Well Purgng									
Well Details				Development Method					
Well Diameter (D in mm): <input type="checkbox"/> 50 <input type="checkbox"/> 100 <input type="checkbox"/> Other:				Bailer – Type: <input type="checkbox"/> PVC <input type="checkbox"/> SS <input type="checkbox"/> Teflon <input type="checkbox"/> Other:					
Total Depth of Well (TD in m BTOC):				Pump – Type: <input type="checkbox"/> Submersible <input type="checkbox"/> Bladder <input type="checkbox"/> Other:					
Water Level Depth (WL in m BTOC):				Pump Intake Setting (if pump used)					
Number of bore volumes to be purged (# VOLS) <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 10 <input type="checkbox"/> Other				Depth pump set (m BTOC):					
				Screen Interval (m BTOC) Top : Bottom:					
Anticipated Approximate Purge Volume Calculation									
$\left(\frac{\text{TD} - \text{WL}}{D} \right) \times \left(\frac{D}{2} \right)^2 \times 0.00314 = \text{Purge Volume (L)} \times \text{BV} \times \text{\# VOLS} =$									
TD	WL	D	1 BV (L)	BV	# VOLS				
Start			Stop			Elapsed		Initial depth to water:	
Final depth to water:						Time:		Time:	
Time:									
Field Parameter Measurements <input type="checkbox"/> Required <input type="checkbox"/> Not required									
Actual Time	Elapsed minutes	Purge Vol (L)	DO (mg/L)	EC. (µS/cm)	pH	Redox (mV)	Temp (°C)	SWL (m BTOC)	Pump setting (rate)
Groundwater equilibrium reached at			± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	(3 consecutive measurements)	
Observations at start of development (turbidity, colour, odour, sheen):									

Observations at end of development (turbidity, colour, odour, sheen):									

Volume of water actually purged during development: _____ L									
Discharge water disposal: <input type="checkbox"/> Drums <input type="checkbox"/> Sanitary sewer <input type="checkbox"/> Storm sewer <input type="checkbox"/> Surface <input type="checkbox"/>									
Other: _____									
Other observations / comments:									

Appendix C

Standard Operating Procedures - Groundwater Sampling

ANZ

Groundwater Monitoring - Water Level Measurements

Q4AN(EV)-336-PR4

1.0 Purpose and Scope

This procedure defines the methods to be used for measuring the depth to groundwater, NAPL thickness and total depth of groundwater monitoring wells to the nearest 0.001m using an electronic water level meter. The depths within wells will be measured from the top of casing (typically the inner casing) at the surveyed elevation measuring point. The measuring point should be clearly marked on the well casing so that water level measurements are consistently taken from the same point.

2.0 Health and Safety

- 2.1 Health and Safety Plan and Site Specific Safe Work Method Statements (SWMS) should be prepared prior to field work in accordance with the SWMS Development Procedure and in the Project Specific Health and Safety Plan Template.
- 2.2 Any subsurface excavation requires a Dial before You Dig search and surveyed by a licensed utilities surveyor and the Underground Utilities Checklist Form must be followed.

3.0 References

- 3.1 SWMS Development Procedure S4AN-701-PR1
- 3.2 Project Specific Health and Safety Plan Template S4AN-702-TP1
- 3.3 Site Contamination Analysis Water Level Data Sheet Q4AN(EV)-336-FM9

4.0 Equipment

- Electronic water level meter/interface probe;
- equipment decontamination materials;
- plastic sheeting or bucket for resting instrument off the ground;
- water level data field form;
- well construction records;
- approved plans (e.g., Sampling Analysis and Quality Plan (SAQP), HASP);
- field project logbook/waterproof pen;
- appropriate hand tools and keys to access monitoring wells; and
- personal protective equipment (PPE) including nitrile gloves, safety glasses, safety boots, high visibility vest, hat or hard hat (as required by site management).

5.0 Procedure

- 5.1 Preparation
 - Review well records to determine well construction characteristics, including the location of the measuring point and the total depth of the well. Historic static water level measurements and survey information may also be reviewed.
 - Identify the necessary procedures and equipment to access the wellhead prior to entering the site.
 - Check that the appropriate equipment is used based on well construction details (e.g., well diameter, anticipated depth to water, anticipated presence of NAPL, total well depth, etc.). The specific equipment to be used should be inspected before use. Equipment should be checked to

ensure it is in proper working order and the measurement increment marks are legible. The type of power supply (e.g., type of batteries) should be determined so that an appropriate back-up supply can be obtained prior to mobilisation.

- Calibrate water level meter following manufacturer's instructions, if any.
- Decontaminate all equipment placed in the monitoring well prior to and after use, and between well locations in accordance with project-specific requirements.

For some projects, there may be a specific order in which measurements are to be collected. For example, best practise is to make measurements from the least to most contaminated well at sites where historical sampling data is available.

- Prior to accessing the well, the wellhead should be cleared of debris and/or standing water. Once the wellhead is clear, open the well.

In some cases, it may be necessary to allow the water level to equilibrate after opening the well cover and prior to measurement. This is particularly true for wells with fully submerged screens and a well cap that is fully sealed not allowing the well to vent to changes in atmospheric pressure.

5.2 Measurement

- Determine the location of the surveyed elevation mark/measuring point at the monitoring well location.

Markings may include either a notch or other permanent mark on top of the well casing. Some projects may specify a consistent measuring point for all wells. The reference point must be specified if not marked and the project manager must be notified to arrange for the elevation of the new reference point to be surveyed.

5.2.1 Water Level Measurement

- Lower the decontaminated probe of the water level meter down into the well until the audible sound of the unit is detected or the light on an electronic sounder illuminates indicating it is in water. The water level probe should be lowered slowly into the well to avoid disruption of formation water and creation of turbulent water within the well.

The precise water level measurement should be determined (to the nearest 0.001 m) by raising and lowering the tape into and out of the water to converge on the exact measurement. Obtain the reading from the marked cable where it crosses the surveyed measuring point. If the cable is not marked to the nearest 0.001 m, a manual rule may be used to interpolate a reading between marked measurements.

- Record the water level measurement as well as the location identification number, measuring point (surveyed elevation point), date, time, and weather conditions in the field logbook and/or field form.

5.2.2 NAPL Thickness/Level Measurement

- Sample the headspace in the wellhead immediately after the well is opened for organic vapors using either a photoionization detector (PID) or an organic vapour analyser, and record the measurements.
- Lower an interface probe into the well to determine the existence of any immiscible layer(s), LNAPL and/or DNAPL, and record the measurements.
- Confirm the presence or absence of an immiscible phase by slowly lowering a clear bailer to the appropriate depth, then visually observing the results after sample recovery.

If the well contains an immiscible phase, it may be desirable to sample this phase separately. It may not be meaningful to conduct water sample analysis of water obtained from a well containing LNAPL or DNAPLs.

5.2.3 Total Well Depth Measurement

- Lower the probe (turn down signal as appropriate) slowly to the bottom of the well.

For deep wells or wells with a soft or silty base, the depth may be difficult to determine. It may be helpful to lower the probe until there is slack in the tape, and gently pull up until it feels as if there is a weight at the end of the tape.

- Obtain the depth reading (to the nearest 0.001 m) from the cable where it crosses the surveyed measuring point. If the cable is not marked to the nearest 0.001 m, a manual rule may be used to interpolate between marked measurements.
- Record the total well depth in the field logbook and field form.

5.2.4 Decontamination

- Following the measurement, the meter shall be decontaminated in accordance with appropriate project-specific requirements and equipment use and care requirements.

If the probe was in contact with separate-phase liquids, the potential for cross-contamination is greater, so appropriate care should be taken during decontamination, as specified in project-specific requirements.

It is important to avoid placing the measuring tape and probe directly on the ground surface (to minimize potential cross-contamination) or allowing the cable to become kinked (which affects the accuracy of the measured depths). Clean plastic sheeting should be placed on the ground surface for placing equipment.

5.3 Special conditions

It may be difficult to lower the water level meter probe into wells containing pumps or other equipment. There may not be sufficient space within the well for the water level meter probe, or the water level meter cable may become bound up in the tubing, cables, or other equipment in the well rendering it impossible to remove. It is preferable to remove down-hole equipment when feasible. Another option is to insert a guide tube of slotted PVC into the well through which to lower the probe. This guide tube should be of a diameter sufficient to allow the probe to pass, but small enough to fit past well obstructions.

If removal of the equipment or installation of a guide tube is not feasible and there is a reasonable chance of getting the water level meter probe and cable caught in the well and not being able to remove it, it may be preferable to avoid collecting water level data and discuss this issue with the Project Manager.

5.4 Quality assurance / quality control

Field personnel shall follow site-specific quality assurance guidelines. Where measured depths are not consistent with well records or previously measurements, the depths should be re-measured, verified, and documented in the field records.

Field duplicates of the depth-to-water measurements will be obtained if required by and at the frequency specified in project-specific requirements. To collect a field duplicate measurement, the water level probe will be fully withdrawn from the well after making a measurement, then re-lowered to obtain a second measurement of the depth to water. No more than a few minutes should elapse between the two measurements. Field duplicates will not be obtained if water levels are changing rapidly, for example, during pumping tests.

Manufacturer's instructions, if any, for calibrating or maintaining the accuracy of the instrument shall be followed.

ANZ

Groundwater Monitoring Well Installation and Development

Q4AN(EV)-336-PR5

1.0 Purpose

This procedure provides guidance for installing groundwater monitoring wells and subsequent well development.

Monitoring wells are installed to monitor the depth to groundwater, to measure aquifer properties and to obtain samples of groundwater for chemical analysis.

Monitoring well development and/or redevelopment is necessary for several reasons:

- to improve/restore hydraulic conductivity of the surrounding formations as they have likely been disturbed during the drilling process, or may have become partially plugged with silt
- to remove drilling fluids (water, mud), when used, from the borehole and surrounding formations
- to remove residual fines from well filter materials and reduce turbidity of groundwater, therefore, reducing the chance of chemical alteration of groundwater samples caused by suspended sediments.

Monitoring wells need to be constructed to a high standard to ensure ongoing and reliable data is obtained over the life of the well. A monitoring well should be constructed in accordance with the document *Minimum Construction requirements for water bores in Australia* (National Uniform Drillers Licensing Committee 2011).

Deviations from this procedure to accommodate other regulatory requirements should be reviewed in advance of the field program, should be explained in the sampling and analysis plan (SAP), and must be documented in the field project notebook when they occur.

2.0 Scope

The scope of this procedure covers the installation of groundwater monitoring wells (monitoring bores) and subsequent well development following the drilling of a borehole. For the drilling of boreholes reference should be made to the project SAP.

This procedure is applicable to installation of single monitoring wells within a borehole. The construction and installation of nested, multilevel or other special well designs is not covered within this procedure. This procedure applies to both overburden and bedrock monitoring wells.

3.0 Health and Safety

- 3.1 Health and Safety Plan and Site Specific Safe Work Method Statements (SWMS) should be prepared prior to field work in accordance with the SWMS Development Procedure and in the Project Specific Health and Safety Plan Template.
- 3.2 Any subsurface excavation requires a Dial before You Dig search and surveyed by a licensed utilities surveyor and the Underground Utilities Checklist Form must be followed.

4.0 References

- 4.1 SWMS Development Procedure S4AN-701-PR1
- 4.2 Project Specific Health and Safety Plan Template S4AN-702-TP1
- 4.3 Groundwater Monitoring Well Construction Detail form Q4AN(ENV)-336-FM27
- 4.4 Soil Bore Log Q4AN(EV)-336-FM20
- 4.5 Site Contamination Analysis Well Development Form Q4AN(EV)-336-FM11

5.0 Equipment

5.1 Well Construction

Well construction materials are usually provided by the drilling subcontractor and most often consist of the following commercially available materials. The length of the screen and the size of the screen slots should be specified in the project work plan and be considerate of the Conceptual Site Model (CSM) and specifically the geology into which the well is being installed.

Common well construction and completion materials		
Flush-threaded well screen with a minimum 50 mm inside diameter (PVC or stainless steel).	Riser pipe (PVC or stainless steel)	Protective casings
Blank casing with a minimum 50 mm inside diameter (PVC or stainless steel)	Centralisers	Well plugs
Filter pack (often inert silica sand)	Cement	Protective casings
Bentonite (pellets, powder)		Locks

Other materials and equipment that may be required are detailed below. A number of these items will need to be provided by the consultant or arranged with the drilling contractor should the consultant not have items available.

Common well construction and completion materials and equipment – miscellaneous		
Potable water supply	Waterproof marker and paint (to label wells)	Water containment equipment (Intermediate bulk containers, buckets)
Fibreglass or steel measuring tape	Equipment decontamination materials	Environmental incident response supplies (spill kits, drip trays, silt fencing)
Water level indicator (dip meter)	Camera	Health and safety supplies
Well construction diagrams	Field notebook and pen	Traffic control signage and barriers

5.2 Well Development

Well development can be performed using a variety of methods and equipment. The specific method chosen for development of any given well is governed by the purpose of the well, well diameter and materials, depth, accessibility, geologic conditions, static water levels in the well and type of contaminants present, if any. Containment and proper disposal of contaminated well development water needs to be planned.

The following list of equipment, each with their own particular application, may be used to develop and/or purge monitoring wells. Note the equipment required for well development will depend on the preferred development technique and should be confirmed as part of the SAP. Well drillers usually can conduct well development if requested.

Well Development Method	Detail	Note
Bailer	A bailer is used to purge silt-laden water from wells after using other devices such as a surge block. In some situations, the bailer can be used to develop a well by bailing and surging.	Used for purging in situations where the depth to static water is greater than 8 m and/or where insufficient hydraulic head is available for use of other development methods. Additional equipment: Bailer rope
Surge Block	Surge blocks are commercially available for use with Waterra™-type pumping systems or may be manufactured using a rubber or teflon "plunger" attached to a rod or pipe of sufficient length to reach the bottom of the well.	For use with foot-valve type pumping systems. Additional equipment: tubing, foot valves, filters

Well Development Method	Detail	Note
Pump	In some situations, the pump alone can be used to develop the well and remove the fines by over-pumping. Pumping may not be successful in low-yielding aquifer materials or in wells with insufficient hydraulic head.	12 V submersible pumps applicable for generally 1 to 40 m depth. Centrifugal pumps applicable for less than 8 m depth. Additional equipment: power, tubing
Compressed Gas	Also known as 'Air-lifting'. Can be used to both surge and develop a monitoring well. Compressed gas can also be used for "jetting" where gas is directed at the slots in the well screen to cause turbulence (thereby disturbing fine materials in the adjacent filter pack).	Compressed gas is not limited by any depth range. May be used by the drilling contractor with addition of dispersants and detergents. Additional equipment: power source, tubing
Well development – other recommended equipment and materials		
Oil water interface probe	Field project notebook and pen.	Equipment decontamination materials
Well development records	Health and safety equipment	Water quality instrumentation: turbidity meter, pH, temperature, specific conductance meters, as required
	Plastic disposable bailers	Bailer rope

6.0 Procedure

6.1 Monitoring Well Construction

- All well construction data will be recorded on the Groundwater Monitoring Well Construction Detail Form.
- All well locations will be referenced onto the appropriate site map.
- A field notebook and/or Soil Bore Log will be used as additional means of recording data.
- In no case will the notebook or boring log alone take the place of the Groundwater Monitoring Well Construction Detail Form.

6.1.1 General Preparation

- Borehole Construction

If water or other drilling fluids have been introduced into the boring during drilling or well installation, samples of these fluids should be obtained and analysed for chemical constituents that may be of interest at the site. In addition, an attempt should be made to recover the quantity of fluid or water that was introduced, either by flushing the borehole prior to well installation and/or by overpumping the well during development (refer to well development procedure below).

- Well Material Decontamination

Well materials should be inspected by the project geologist/engineer upon delivery to check cleanliness. If the well materials appear dirty, or if local or regional regulatory guidance requires decontamination, then well material decontamination should be performed by the drilling subcontractor in accordance with the project SAP.

6.1.2 Installation - Procedure

- Depth Measurement

Once the target drilling depth has been reached, the drilling subcontractor will measure the total open depth of the borehole with a weighted, calibrated tape measure. Adjustments of borehole depth can be made at this time by drilling further or installing a small amount of sand filter material to achieve the desired depth. If drilling fluids were used during the drilling process, the borehole should be flushed at this time using potable water.

- Centralizers

In order to install a well which is centered within the borehole, it is recommended that centralizers be used. Centralizers are especially helpful for deep well installations where it may be difficult to position the well by hand. Centralizers may not be necessary on shallow water table well installations where the well completion depth is within 8 m of the ground surface.

- Well Construction

The well screen and riser pipe generally are assembled by hand as they are lowered into the borehole. Before the well screen is inserted into the borehole, the full length of the slotted portion of the well screen as well as the unslotted portion of the bottom of the screen should be measured with the measuring tape. These measurements should be recorded on the well construction diagram (Figure 1).

After the above measurement has been taken, the drilling subcontractor may begin assembling the well. As the assembled well is lowered, care should be taken to ensure that it is centered in the hole if centralizers are not used. The well should be temporarily capped before filter sand and other annular materials are installed.

- Filter Sand Installation

The drilling subcontractor should fill the annular space surrounding the screened section of the monitoring well to at least 0.5 m above the top of the screen with appropriately graded, clean sand or fine gravel. In general, the filter pack should not extend more than 1.0 m above the top of the screen to limit the thickness of the monitoring zone. If coarse filter materials are used, an additional 0.3 m thick layer of fine sand should be placed immediately above the filter pack to prevent the infiltration of sealing components (bentonite or grout) into the filter pack. As the filter pack is placed, a weighted tape should be lowered in the annular space to verify the depth to the top of the layer. Depending upon depth, some time may be required for these materials to settle. If necessary, to eliminate possible bridging or creation of voids, placement of the sand pack may require the use of a tremie pipe. Tremie pipe sandpack installations are generally suggested for deep water table wells and for wells which are screened some distance beneath the water table.

- Bentonite Seal Installation

A minimum 0.5 m thick layer of bentonite pellets or slurry seal will be installed by the drilling subcontractor immediately above the well screen filter pack in all monitoring wells. The purpose of the seal is to provide a barrier to vertical flow of water in the annular space between the borehole and the well casing. Bentonite is used because it swells significantly upon contact with water. Pellets generally can be installed in shallow boreholes by pouring them very slowly from the surface. If they are poured too quickly, they may bridge at some shallow, undesired depth. As an option, powdered bentonite may be mixed with water into a very thick slurry and a tremie pipe used to inject the seal to the desired depth.

- Annular Grout Seal Installation

The grout seal (where required) should consist of a bentonite/cement mix with a ratio of bentonite to cement of between 1:5 and 1:20. The grout ratio should be chosen based on site conditions with a higher percentage of bentonite generally used for formations with higher porosity. A mud balance should be used if a specific mud density is required at a particular site. Grout slurry should be pumped into the annular space using a side-discharging tremie pipe located about 0.5m above the sand pack. Side discharge will help preserve the integrity of the sand pack.

In situations where the monitoring well screen straddles the water table, the seal will be in the unsaturated zone and pure bentonite (pellets or powder) will not work effectively as seals without hydration. Dry bentonite may be used if sufficient time to hydrate the seal is allowed. Seal hydration requires the periodic addition of clean water. Optionally, seals in this situation may be a cement/bentonite mixture containing up to 10 percent bentonite by weight. This type of mixture shall be tremied to the desired depth in the borehole.

The borehole annulus will be grouted with seal materials to within 1 m of the ground surface. Drill cuttings, even those known not to be contaminated, will not be used as backfill material.

- Well Completion

The drilling subcontractor will cut the top of the well to the desired height and install a vented (if possible) locking cap. The upper portion of the well casing can optionally be drilled to allow venting. Well casings are usually cut to be a certain height above ground surface (typically 0.75m to 1m) or are cut to be flush with or just below the ground surface.

- Protective Casing

Where monitoring wells have been located in areas that may become overgrown or difficult to identify, there may be a need to install steel risers to enable easy identification during subsequent visits. The suitability for installation of steel risers will be site specific and judgement for the need of one should be made during the development of the SAP.

Where steel risers are used, the drilling subcontractor will install a steel guard pipe on the well as a protective casing. The borehole around the guard pipe will be dug out to an approximate 0.5 m to 0.75 m radius to a minimum depth of 0.3 m at the centre and 0.15 m at the edges. After installing the protective casing, the excavation will be filled with a concrete/sand mix. The surface of the concrete pad will be sloped so that drainage occurs away from the well.

Flush mounted covers, where considered most suitable, should be completed such that they are slightly mounded above the surrounding surface to prevent surface water from running over or ponding on top of the casing. It may be necessary to ensure these are installed in accordance with transportation authority requirements if installed in areas of high vehicular traffic.

Above-ground protective casings should also be vented or should have non-air tight caps. Road box installations should not be vented due to possible accumulation and entry of surface water into the well. Installation of protective guard pipes (or bollards) may be necessary around above-ground well completions in traffic areas. Protective casings should be lockable to prevent unauthorized access.

- Well Numbering

The project geologist/engineer will number each well casing with an indelible marker or paint to identify the well. This is particularly important with nested or paired wells to distinguish between shallow and deep wells. The well should be labelled on both the outside of the protective casing and inside beneath the protective casing lid.

- Measuring Point Identification

The measuring point is the point which will require surveying during the well elevation survey task. The project geologist/engineer will mark the measuring point from which water level measurements will be made at a specific location along the upper edge of the well casing. PVC wells can easily be notched with a pocket knife or saw. Stainless steel wells (or PVC wells) can be marked with a waterproof marker on the outside of the well casing with an arrow pointing to the measuring point location.

- Well Measurements

Upon completion, the following well measurements should be taken by the project geologist/engineer and recorded on the Groundwater Monitoring Well Construction Detail Form. Depth to static water level if water level has stabilised.

- Total length of well measured from top-of-well casing.
- Height of well casing above ground surface.
- Depth of bottom of protective casing below ground surface (may be estimated).

Well screen filter pack, bentonite seal and annular seal thicknesses and depths should also be recorded on the well construction diagram.

- Disposal of Drilling Wastes

Drill cuttings and other investigation-derived wastes such as drilling mud or well development/purge water must be properly contained and disposed. Site-specific requirements for collection and removal of these waste materials should be outlined within the project work plan. Containment of these materials should be performed by the drilling

subcontractor; however, the final disposal of drilling wastes may need to be managed by the project team.

- Well Elevation Survey

At the completion of the well installation program, all monitoring wells are usually surveyed to provide, at a minimum, the top-of-casing measuring point elevation for water level monitoring purposes. Other surveyed points which may be required by the project work plan include: ground surface elevation, top of protective casing elevation, and well coordinate position. Well elevation surveys are usually conducted by a surveying subcontractor.

6.2 Well Development

6.2.1 General Preparation

The Site Contamination Analysis Well Development Form will be completed by the site engineer conducting the development.

In addition, a field project notebook should be maintained detailing any problems or unusual conditions which may have occurred during the development process.

A number of considerations are provided below prior to developing a newly installed well:

- **Well Records Review:** Well completion diagrams should be reviewed to determine well construction characteristics. Formation characteristics should also be determined from review of available boring logs.
- **Site Preparation:** Well development, similar to groundwater sampling, should be conducted in as clean an environment as possible. This usually requires, at a minimum, placing sheet plastic on the ground to provide a clean working area for placing decontaminated well development equipment.
- **IDW Containment:** Provisions should be in place for collection and management of investigation-derived wastes (IDW), specifically well development water and miscellaneous expendable materials generated during the development process. The collection of IDW in drums or tanks may be required depending on project-specific requirements.
- **Water Level/Well Depth Measurement:** The water level and well depth should be measured with a water level indicator and written on the well development record. This information is used to calculate the volume of standing water (i.e., the well volume) within the well.
- **Equipment Decontamination:** All down-well equipment should be decontaminated prior to use in accordance with the projects SAP.
- **Removal of Drilling Fluids:** Drilling fluids such as mud or water, if used during the drilling and well installation process, should be removed during the well development procedure. It is recommended that a minimum of 1.5 times the volume of added fluid be removed from the well during development. Drilling muds should initially have been flushed from the drilling casing during the well installation procedure with water added during the flushing process. If the quantity of added fluid is not known or could not be reasonably estimated, removal of a **minimum of 10 well volumes** of water is recommended during the development procedure.

6.2.2 Well Development – Procedure

- Development Method Selection

The construction details of each well shall be used to define the most suitable method of well development. Some consideration should be given to the potential degree of contamination in each well as this will impact IDW containment and disposal requirements.

The criteria for selecting a well development method include well diameter, total well depth, static water depth, screen length, the likelihood and level of contamination, and characteristics of the geologic formation adjacent to the screened interval.

The limitations, if any, of a specific procedure are discussed within each of the following procedures.

- General Water Quality Measurements

Measure and record water temperature, pH, specific conductance, and turbidity periodically during development using the available water quality instruments. These measurements will aid in determining whether well development is proceeding efficiently, will assist in identifying when well development is complete, will help determine whether the development process is effective or not with any given well and, potentially, may identify well construction irregularities (i.e. grout in well, poor well screen slot size selection). Water quality parameters should be checked a minimum of 3 to 5 times during the development process.
- Bailer Procedure
 - When using a bailer to purge well water, select the appropriate bailer, then securely tie a length of bailer cord onto the end of the bailer.
 - Lower the bailer into the screened section of the monitoring well to the bottom of the well. Silt, if present, will generally accumulate within the lower portions of the well screen.
 - In some cases, enough silt may be accumulated in the bottom of the well to prevent the bailer from reaching the bottom. The bailer may be raised and lowered repeatedly in the bottom of the well to remove accumulated silts, until the bottom of the well is reached.
 - The bailer may then be raised and lowered repeatedly in the screened interval to further simulate the action of a surge block and pull silt through the well screen.
 - Remove the bailer from the well and empty the contents into an appropriate storage container.
 - Continue surging/bailing the well until sediment free water is obtained. If moderate to heavy siltation is still present, the surge block procedure should be repeated and followed again with bailing.
 - Check water quality parameters periodically.
- Surge Block Procedure
 - A surge block effectively develops most monitoring wells. This device first forces water within the well through the well screen and out into the formation, and then pulls water back through the screen into the well along with fine soil particles. Surge blocks may be manufactured to meet the design criteria or may be purchased as an adaptor to fit commercially available well purging systems such as the Waterra system.
 - A surge block is typically used only after silt accumulation in the bottom of the well has been removed and the produced water has started to become less turbid.
 - Insert the surge block into the well and lower it slowly to the level of static water. Start the surge action slowly and gently above the well screen using the water column to transmit the surge action to the screened interval. A slow initial surging, using plunger strokes of approximately 1m, will allow material which is blocking the screen to separate and become suspended.
 - After 5 to 10 plunger strokes, remove the surge block and purge the well using a pump or bailer. The returned water should be heavily laden with suspended silt and clay particles. Discharge the purged water into the appropriate storage container.
 - Repeat the process. As development continues, slowly increase the depth of surging to the bottom of the well screen. For monitoring wells with long screens (greater than 3m) surging should be undertaken along the entire screen length in short intervals (0.5m to 1m) at a time. Continue this cycle of surging and purging until the water yielded by the well is free of visible suspended material.
 - Check water quality parameters periodically.

- Pump Procedure
 - Well development using only a pump is most effective in monitoring wells that will yield water continuously. When using a submersible pump or surface pump, set the intake of the pump or intake line in the centre of the screened interval of the monitoring well.
 - Pump a minimum of three well volumes of water from the well and raise and lower the pump line through the screened interval to remove any silt/laden water.
 - Continue pumping water from the well until sediment-free water is obtained. This method may be combined with the manual surge block method if well yield is not rapid enough to extract silt from the surrounding formations.
 - Check water quality parameters periodically.
- Compressed Gas Procedure
 - Caution must be exercised in highly permeable formations not to inject gas into the formation. Drilling subcontractors will often provide the necessary materials as well as perform this method, if requested. When using a compressor, an oil-less compressor should be used, or an oil trap/filter should be placed on the air discharge line which enters the well.
 - Lower the gas line into the well, setting it near the bottom of the screened interval. Install the discharge control equipment (i.e., tee fitting) at the well head.
 - Set the gas flow rate to allow continuous discharge of water from the well.
 - At intervals during gas-lifting, especially when the discharge begins to contain less suspended material, shut off the air flow and allow the water in the well to backflush through the screened interval to disturb any bridging that may have occurred. Re-establish the gas flow when the water level in the well has returned to the pre-development level.
 - Continue gas-lifting and/or jetting until the discharged water is free from suspended material.
 - Check water quality parameters periodically.

ANZ

Groundwater Monitoring and Sampling with Low Flow Pump

Q4AN(EV)-336-PR6

1.0 Purpose and Scope

This procedure provides guidance on the use of collection of low flow groundwater sampling methods to collect representative groundwater samples. The low flow sampling technique is designed to minimise the hydraulic stress on the aquifer during purging and sampling.

Low flow groundwater sampling entails the use of an adjustable rate pump to purge then sample groundwater specifically in the screened interval of a well to minimise the drawdown of the water level in the well. Samples are collected after parameters stabilise, indicating groundwater purging is complete and sampling will be representative of the aquifer intersected by the well.

Typically less purge water is required than in volume-based purge methods, thereby generating less waste to be physically managed and disposed of.

If performed carefully, sample turbidity is reduced, and the potential for mixing of water and volatilisation ('degassing') of dissolved chemicals is also reduced compared to more turbulent methods.

Limitations include requirements for specific training and use of powered equipment requiring additional set-up and with additional scope for failure.

Other sampling methods may be preferred for very low recharge wells, and for collection of non-aqueous liquids (e.g. to visually assess product thickness).

The following procedures are standard and typically may be varied depending on site conditions, equipment, client preferences, and/or other limitations. The actual procedure employed at each well should be documented in the field and reported.

2.0 Health and Safety

- 2.1 Health and Safety Plan and Site Specific Safe Work Method Statements (SWMS) should be prepared prior to field work in accordance with the SWMS Development Procedure and in the Project Specific Health and Safety Plan Template.
- 2.2 Any subsurface excavation requires a Dial before You Dig search and surveyed by a licensed utilities surveyor and the Underground Utilities Checklist Form must be followed.

3.0 References

- 3.1 SWMS Development Procedure S4AN-701-PR1
- 3.2 Project Specific Health and Safety Plan Template S4AN-702-TP1
- 3.3 Water Quality Meter Calibration Form Q4AN(EV)-336-FM23
- 3.4 Safe Work Method Statement – Accessed via the SWMS tool on myAECOM.
- 3.5 ASTM (2002). Low-Flow Purging and Sampling for Wells and Devices Used for Ground-Water Quality Investigations, ASTM D 6771-02.
- 3.6 Puls, R.W. and Barcelona, M. J. (1996). Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures. United States Environmental Protection Agency Ground Water Issue. EPA/540/S-95/504.

4.0 Equipment

Equipment required for low flow groundwater sampling:

- peristaltic or bladder sampling pump
- silicone tubing – 1 roll
- air tubing (¼ inch LDPE)
- interface probe
- water quality meter and calibration fluids
- flow cell or unpreserved 0.5 L plastic bottle
- measuring cups - for measuring flow rates
- hand pump – for metals samples
- buckets (about 5, some with lids)
- tape measure
- tubing cutter
- field records sheets including sample records sheets, well gauging sheet, QA/QC sample register available on myAECOM.
- sample bottles and supplies including coolers, ice, chain of custody forms, trip blank/trip spike
- Personal Protective Equipment (PPE) including nitrile gloves, safety glasses, safety boots, high visibility vest, hat or hard hat (as required by site management), respirator and ABEK1filter (new)
- approved site specific HASP including SWMS
- sampling, analysis and quality plan (SAQP)
- site plan showing wells and well construction details
- tools – including 8 mm Allen key, hammer, screwdrivers (2 x)
- DECON 90
- traffic cones
- permanent markers, mechanical pencils
- garbage bags
- paper towels

5.0 Procedure

5.1 Preparation

5.1.1 Pack all the equipment needed.

5.1.2 Confirm that the pump selected is appropriate for use with low-flow sampling techniques, the expected sample depths (reference well construction logs) and the analytes to be analysed. Suitable pumps for low-flow sampling are currently:

- peristaltic pumps (adjustable rate): Peristaltic pumps are typically suitable to a maximum depth of approximately 7-8 metres. Potential for volatilisation should be minimised through use of low purge rates, and noting and eliminating any bubble production in the discharge tubing, e.g. through smooth tubing cuts. Peristaltic pumps create a vacuum on the sampling line, which may cause loss of volatile organic compounds (VOCs).
- bladder pumps (adjustable rate). These are a technically preferred option but entail more complicated operation (hence more training), and longer set-up and take-down times, hence slower sampling. Bladder pumps may be used at depths greater than 7-8 metres, and for high volatility target analytes. Bailers are not suitable for low-flow sampling.

5.2 Setting Up at a Monitoring Well

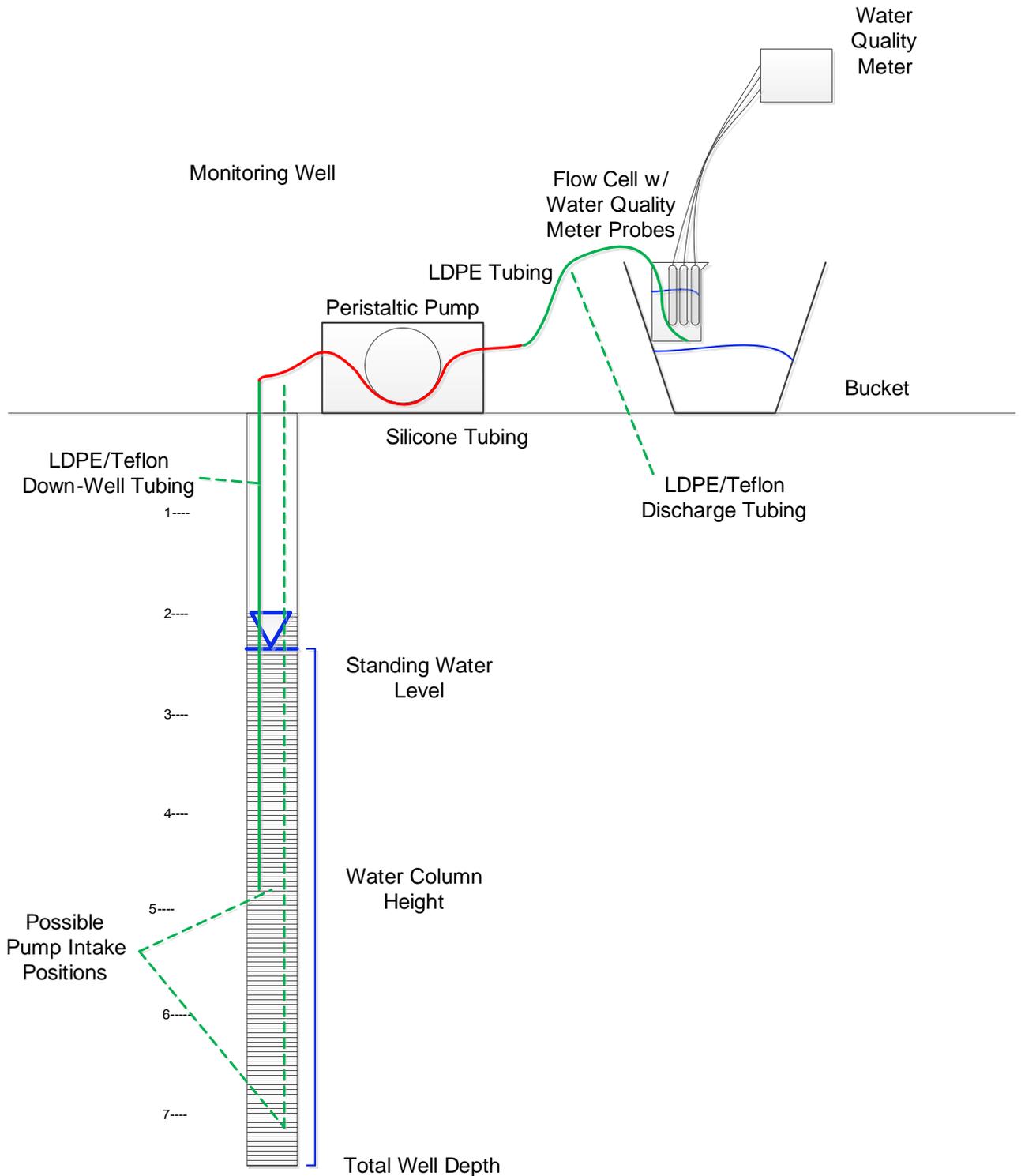
- 5.2.1 Calibrate water quality meter probe using calibration solutions.
- 5.2.2 Review SAQP and locate well to be sampled.
- 5.2.3 Prepare new sample record sheets.
- 5.2.4 Decontaminate dip-meter/interface probe and all other equipment which will be placed down monitoring well.
- 5.2.5 Open well cover and install dip-meter/interface probe in well.
- 5.2.6 Measure standing water level (SWL) below the top of casing (TOC).
- 5.2.7 Measure total depth (TD) to base of well.
- 5.2.8 Measure the well inner diameter (ID).
- 5.2.9 Measure and cut new LDPE down-well tubing to position pump intake within screen interval. Record the depth of the pump intake on the sample record sheet. Mark a point on the down-well tubing at the well casing so that the position of the pump intake can be checked during sampling.

The down-well tubing may be positioned according to site specific requirements, including:

- at the midpoint of the screen interval;
 - towards the base of the screened interval (e.g. 0.3 metres above the base of the well for DNAPL); or
 - at another point to be determined by the PM.
- 5.2.10 Fit new flexible silicone tubing to peristaltic pump head (less than 20 cm length);
 - 5.2.11 Cut another length of new LDPE tubing (approximately 40 cm in length) to run from pump discharge to flow-cell.
 - 5.2.12 Connect pump to power source.

- Equipment Schematic for low flow purging using a peristaltic pump.

Low-Flow Groundwater Sampling Equipment Set Up



5.3 Purging

5.3.1 Start the pump at its lowest speed setting and slowly increase the speed until water begins flowing into the bucket. A purge rate of 100 - 500 mL per minute is typically used for low flow sampling (use the maximum rate around this range at which drawdown is minimised or zero).

5.3.2 Fill the flow cell / container from the base allowing overflow from the top into a larger bucket. Position tubing outlet at base of flow cell/container so that newly purged water flows first past probe tips, and is not in direct contact with atmosphere.

5.3.3 Measure the flow rate from the pump – at low flow rates the flow rate can be measured with a stopwatch and graduated container (small bucket, measuring jug, cooking cups or similar) measuring the time required to fill a certain volume.

5.3.4 Take parameter readings (pH, temperature, conductivity, oxidation-reduction potential (ORP), dissolved oxygen (DO) and turbidity) at frequent intervals.

Measure SWLs frequently with the dip meter.

Monitor and record:

- well drawdown (via SWLs);
- any recharge (via SWLs);
- water quality parameters;
- turbidity, odour, sheen; and
- flow rates.

Slow the pump rate if significant drawdown or turbidity is observed.

Drawdown should generally not exceed 25 % of the distance between the top of the well screen and the pump intake (so that water in the casing pre-purging is not drawn down to the pump intake and sampled).

Copies of Groundwater Sampling and Well Gauging Record Sheets are included in Attachment 1.

5.4 Sampling

5.4.1 When to Sample after purging

Typically sampling may occur if

- 3 consecutive readings stabilise – i.e. readings within $\pm 10\%$ or within the ranges specified below (ASTM, 2002):

Table 1 ASTM Parameter Stabilisation Criteria

Parameter	Stabilisation Criteria
pH	± 0.2 pH units
Conductivity	$\pm 3\%$ of reading
DO	$\pm 10\%$ of reading or ± 0.2 mg/L whichever is greater
ORP	± 20 mV

- Recharge or laminar flow is noted (minimal or zero drawdown).
- Parameters peak, then fluctuate around a reading.
- Often it is appropriate to sample after purging approximately one well volume if the above conditions are met.

5.4.2 Sampling Technique

- Record the final set of purge water quality parameters.
- Prepare and label all sample vials and bottles.

- Put on a fresh pair of nitrile gloves.
- Remove the free end of the discharge tubing from the flow cell apparatus. Confirm that discharge is steady and laminar.
- Place the end of the discharge tubing at the mouth of the sample vials and bottles and carefully decant groundwater into each sample bottle, directing the stream down the side of the glass. Begin sampling by filling VOC vials first, followed by other analyte bottles.
 - a) Immediately cap each bottle tightly after filling.
 - b) Ensure no headspace remains in volatile VOC vials by inverting and examining for bubbles. If bubbles are present in a VOC vial, discard vial (due to potential volatilisation and/or loss of preservation) and replace with a new vial.
- Immediately place samples in a cooler with cooling media (ice, or freezer blocks).
- Remove the pump and tubing after collecting samples. Discard disposable tubing appropriately.
- Close and lock well.

5.4.3 Extremely Low recharge Conditions

Extremely low recharge conditions exist if any of the following occur:

- drawdown exceeds 25 % of the distance between the top of the well screen and the pump intake; or
- failure of parameters to stabilise within a reasonable period (e.g. less than one hour).

Should extremely low recharge conditions be encountered, consult with the PM to determine a course of action. For example:

- immediately collect a 'pre-purge grab sample' (recorded as such on the sample record sheet);
- sample using another purge method;
- purge one well volume slowly (stopping and starting the pump if needed) under minimal disturbance (laminar flow) conditions, then collect the sample. This is a slower and less efficient method, but may be appropriate for some sample programmes; or
- purge well dry then relocate, returning to collect an immediate sample at a later time. Allow sufficient time for well to recharge and stabilise. Purging dry may temporarily result in high dissolved oxygen or other chemical changes that may not represent in-situ conditions, and should be avoided if practicable.

ATTACHMENT 1 - Wetted Volume Calculation

wetted well volume (m³) = $\pi r^2 h$

For a 50 mm well, 7.49 m deep with standing water level 2.35m BTOC:

TD = 7.49 m

SWL = 2.35 m

R = 0.025 m

$$\begin{aligned}\text{wetted well volume} &\approx 3.14 \times (0.025)^2 \times (7.49 - 2.349) \\ &= 3.14 \times 0.000625 \times 5.14 \\ &= 0.01089 \text{ m}^3 \\ &= 10.9 \text{ L (round up to 11 L)}\end{aligned}$$

Appendix G

Proposed Leachate Extraction Management Plan

Appendix G Proposed Leachate Extraction Management Plan

Leachate Extraction Management Plan

Alexandria Landfill Closure Management Plan, St Peters NSW

Leachate Extraction Management Plan

Alexandria Landfill Closure Management Plan, St Peters NSW

Client: Roads and Maritime Services

ABN: 76236371088

Prepared by

AECOM Australia Pty Ltd

Level 21, 420 George Street, Sydney NSW 2000, PO Box Q410, QVB Post Office NSW 1230, Australia
T +61 2 8934 0000 F +61 2 8934 0001 www.aecom.com
ABN 20 093 846 925

21-Oct-2015

Job No.: 60327128

AECOM in Australia and New Zealand is certified to the latest version of ISO9001, ISO14001, AS/NZS4801 and OHSAS18001.

© AECOM Australia Pty Ltd (AECOM). All rights reserved.

AECOM has prepared this document for the sole use of the Client and for a specific purpose, each as expressly stated in the document. No other party should rely on this document without the prior written consent of AECOM. AECOM undertakes no duty, nor accepts any responsibility, to any third party who may rely upon or use this document. This document has been prepared based on the Client's description of its requirements and AECOM's experience, having regard to assumptions that AECOM can reasonably be expected to make in accordance with sound professional principles. AECOM may also have relied upon information provided by the Client and other third parties to prepare this document, some of which may not have been verified. Subject to the above conditions, this document may be transmitted, reproduced or disseminated only in its entirety.

Quality Information

Document	Leachate Extraction Management Plan
Ref	60327128
Date	21-Oct-2015
Prepared by	Kate Pigram
Reviewed by	Anthony Davis

Table of Contents

1.0	Introduction	1
1.1	General	1
1.2	Objectives	1
1.3	Guidelines	1
2.0	Background	2
3.0	Leachate Extraction System Operation and Maintenance	3
3.1	Extraction Optimisation	3
3.1.1	Field Optimisation	3
3.2	Leachate Extraction Performance Monitoring	3
3.2.1	Gauging	4
3.2.2	Flow Meter Readings	4
3.2.3	Other Operational Information	4
3.2.4	Non-Routine Operational Procedures	4
3.3	Maintenance of Leachate Extraction System Infrastructure	4
3.3.1	Leachate Extraction System Maintenance Summary	4
3.3.2	Visual Inspection	5
3.3.3	Pump Servicing	5
3.3.4	Infrastructure Repair	5
4.0	Leachate Extraction System Monitoring	6
4.1	Gauging	6
4.2	Data Logging	6
4.3	Leachate Sampling	6
4.4	Leachate Extraction Rates	7
4.4.1	Flow Meter Readings	7
4.4.2	Estimation of Extraction Rates	7
4.5	Monitoring Equipment	7
4.5.1	Equipment and Maintenance	7
4.5.2	Pre-Monitoring Checks	7
4.6	Data Management	7
4.6.1	Field Forms	7
4.6.2	Database Management	8
5.0	Quality Assurance	9
5.1	Construction Quality Assurance	9
5.2	Monitoring Quality Assurance	9
5.3	Work Procedures	9
5.4	Records	9
6.0	Routine Deliverables	11
6.1	Reporting	11
6.2	Environmental Audit	11
7.0	Contingency Action Plan	12
7.1	Leachate migration or surface discharge	12
7.2	Infrastructure failure	12
7.3	Leachate level exceeded	12
7.4	Failure to meet EPL or TWA requirements	13
8.0	Work Health and Safety	14

1.0 Introduction

1.1 General

AECOM Australia Pty Ltd (AECOM) was commissioned by the Roads and Maritime Services (Roads and Maritime) to prepare a Leachate Extraction Management Plan (LEMP, hereafter referred to as the Plan) to be implemented at the closed Alexandria Landfill comprising Lot 2 in Deposited Plan (DP) 1168612 located at Albert Street, St Peters NSW (hereafter referred to as the Site), incorporating an area of approximately 15.71 hectares (ha).

A large portion of the Site has historically operated as a quarry (identified as the Ralford Pit) and brickworks (identified as the St Peters Brick Works). Since quarrying activities ceased, part of the Site has been used as a landfill, waste handling and transfer facility. Alexandria Landfill is currently licensed (EPL 4627) by the NSW Environment Protection Authority (EPA) to transport, store, recycle, reprocess and dispose of wastes. It is understood that waste materials of uncertain origin were historically used to backfill the original quarry and brick pit prior to the acquisition of Alexandria Landfill by Dial A Dump Industries (DADI).

This Plan provides an indicative framework for the management of leachate extraction and associated monitoring activities undertaken at the Site.

The leachate extraction management system will be developed:

- to aid in the extraction of landfill gas (LFG) via the drawdown of leachate;
- to restrict the off-Site migration of leachate so it does not migrate beyond the site boundary in quantities which would present a risk to the safety of the local community or a hazard to the environment';
- to restrict the off-Site migration of leachate impacted groundwater by creating and maintain an inward hydraulic gradient; *and*
- to meet the leachate and groundwater management and monitoring requirements of the existing EPLs and trade waste agreement (TWA).

The plan is a living document and will be reviewed and updated at least annually by 30 June to ensure that adequate controls are in place to meet the standards and objectives identified in this Plan.

This plan forms part of a package of documents that form part of the Alexandria Landfill Closure Management Plan (LCMP), and should be read in association this plan and associated Appendices.

1.2 Objectives

The objectives of the Plan are to provide information with regard to:

- leachate extraction operation and maintenance activities;
- leachate extraction performance monitoring requirements;
- leachate extraction data management and reporting requirements; and
- contingency responses for managing unforeseen changes to the leachate extraction system.

The plan is required to ensure leachate and groundwater are managed and monitored in accordance with the requirements of the existing EPLs and TWA'

1.3 Guidelines

This plan has been prepared with reference to recommendations in the following guidance documents:

- NSW Environment Protection Authority (EPA) 2015a. *Draft Environmental Guidelines Solid Waste Landfills*. Second Edition, 2015. March.
- EPA Victoria, 2012. *Closed Landfill Guidelines* Publication number 1490, December.

2.0 Background

The Site is licensed by the NSW Environment Protection Authority (EPA) as a licensed solid waste landfill and waste storage and recycling facility and was acquired by the NSW Government in December 2014.

Roads and Maritime now plan to redevelop the Site as part of the WestConnex New M5 motorway. The Site is planned to contain the section of the motorway referred to as the St Peters interchange (SPI). The design for the St Peters interchange includes roads, tunnel portals, overpasses and associated infrastructure. The remainder of the Site is planned to be redeveloped as public use likely consisting of a mixture of parkland, pathways and cycleways. Surplus land surrounding the interchange will also likely be redeveloped for commercial/light industrial land use.

The redevelopment also means that the Alexandria Landfill will need to be closed and managed in accordance with the *Protection of the Environment Operations Act* (POEO) 1997.

3.0 Leachate Extraction System Operation and Maintenance

Information regarding the landfill cap, existing leachate management system and proposed leachate treatment plant and extraction system network is provided in the overarching Alexandria LCMP.

Generally, leachate extraction rates are to be maximised both to control leachate migration away from the Site and to optimise landfill gas (LFG) collection.

Leachate extraction operations include:

- Optimisation of leachate extraction at individual sump(s);
- Maintenance of leachate extraction system infrastructure; and
- Maintenance of landfill cap.

Additional information pertaining to these activities is provided in the Sections below.

3.1 Extraction Optimisation

Leachate levels and extraction rates at each sump(s) within the system will require regular monitoring to identify optimal performance and if necessary the application of different pumping technology to increase extraction ensuring that the required extraction rate is achieved.

The leachate extraction system will be operated and maximised in such a way as to create an inwards hydraulic gradient between the landfill and the surrounding water table to reduce the potential for leachate to migrate off-Site.

3.1.1 Field Optimisation

An appropriately trained fill technician will be available to conduct routine leachate gauging and flow rate testing to ensure that all parts of the system perform at an optimum level. The required duties of the leachate field technician are to:

- Monitor leachate levels within each of the observation wells and from extraction sump(s) where required;
- Monitor leachate discharge counter readings within each of the extraction sump(s);
- Monitor the cumulative leachate flow meters (where applicable);
- Record all measurements (levels, rates and observations) on the appropriate field record sheets;
- Compare all measurement data to that collected during the previous round and identify rises and falls in extraction and the height difference between the top of pump and the standing leachate level (SLL) at each sump;
- Inspect and ensure that the compressed air system is functioning optimally and delivering the required pressure and flow to each pump;
- Perform routine maintenance on each leachate pump including associated auxiliary equipment such as air pressure regulator, moisture release pot, float sensor solenoid operated control box and/or one way valves/taps; and
- Present a summary of leachate extraction data, repairs and recommendations in a suitable reporting format.

3.2 Leachate Extraction Performance Monitoring

Over time, it is expected that the extraction sump(s) will show a decrease in leachate production rates. Typically, reduced leachate production may be attributed to:

- Biological and/or sedimentary clogging of the sump;
- Collapse (consolidation) of the local waste mass in the immediate vicinity of the well; and/ or
- The reduction of leachate stores within the waste mass in hydraulic connection with the sump(s).

The sections below provide information on monitoring activities that are undertaken to determine leachate extraction performance.

3.2.1 Gauging

Leachate levels are to be gauged at leachate monitoring and extraction sump at a minimum of a monthly basis. However continuous monitoring is preferred as under optimal operating conditions, leachate levels in extraction sump(s) should be lowered to near the top of the pump. Higher levels may indicate the need for pump adjustments, maintenance or upgrading. Increasing leachate levels at monitoring (non-pumping) wells may be indicative of reduced extraction rates resultant from conditions detailed in **Section 4.2**.

During leachate gauging, observations are noted with regard to any other possible problems that the pump may be experiencing (i.e. continuous cycling, air / leachate leaks etc)

Further information regarding leachate gauging is provided in **Section 5.1**.

3.2.2 Flow Meter Readings

The flow meter shall record the total volume of leachate extracted from the entire extraction network. The total flow shall be read, documented and compared each day to the previous readings, and may indicate major problems with the system, should the reading be anomalous, in comparison to normal readings.

3.2.3 Other Operational Information

Other information that can be used to evaluate operational performance should also be noted, as needed, such as regulator pressure, whether leachate is observed to be pumping (for example, by opening the valve), operations of the landfill gas extraction collections, the presence of residues or sedimentation and so forth. These types of information can be used to aid in assessing pump and well performance and are invaluable in pre-empting more extensive and costly pump repair.

3.2.4 Non-Routine Operational Procedures

During routine leachate extraction sump inspections, field personnel may identify infrastructure operational issues.

Non-routine operational procedures would be identified as problems during regular leachate and/or counter readings data collection, or field observations while performing other general tasks. The non-routine responses might include unscheduled pump removals, inspections and possible repairs.

Spare pumps are available to immediately replace pumps that are removed for servicing to maintain leachate extraction at the well. Spare pumps will be on-hand to facilitate the rotation of pumps in wells, and to maintain extraction rates should a pump remain out-of-service for a prolonged period of time due to parts orders.

3.3 Maintenance of Leachate Extraction System Infrastructure

All leachate extraction system infrastructure is to be regularly inspected to determine operational status/ integrity. Inspections may be undertaken in conjunction with routine monitoring events (refer **Table 2, Section 4.0**).

3.3.1 Leachate Extraction System Maintenance Summary

The performance monitoring of the leachate extraction system is likely to be composed of several components. A summary of routine of indicative leachate extraction maintenance activities undertaken at Site is provided in the table below.

Table 1: Leachate Extraction Infrastructure Maintenance Summary

Task	Activities Required	Location	Recommended Frequency
Extraction Sump Visual Inspection	Visual inspection of piping, valves, and ancillary equipment (i.e. regulator) to pump	Extraction sump	Two to three times a week
Pump Maintenance	Removal, cleaning, and calibration (if applicable) of pump and ancillary equipment	Extraction sump	Quarterly
Compressor Maintenance	Inspection, lubricant changing, cleaning of filter media	Two compressors and back-up compressors	Weekly
Flow Meter Maintenance	Meter readings and inspection	Flow meter	Two to three times a week

3.3.2 Visual Inspection

Routine visual inspections of leachate extraction sumps and piping network will involve the following:

- general inspection for leachate and/ or air leaks;
- inspection of the regulator for leaks and determination of adequate pressures;
- opening of in-line tap for evidence of leachate pumping;
- listening for abnormal operation (air leaks and pump cycles);
- any observable anomaly which may indicate abnormal operation; and
- signs of well head damage

The area adjacent to wells will be kept clear and free from any vegetation, which could potentially prevent adequate area for inspection and/or maintenance.

3.3.3 Pump Servicing

When cycle counters, leachate levels, or other monitoring data indicate a significant reduction in leachate production at a specific well, the well is taken off line and the pump and other down well appurtenances removed and inspected for malfunctions. Pumps suspected of malfunctions or failure will require servicing.

Where feasible, the malfunctioning pump should be replaced with a spare pump (as available) during the repair process, to minimise interruption of leachate extraction.

Pump servicing will be scheduled regularly in accordance with manufacturer's requirements. Regular servicing includes the disassembly and washing of the pumps, and a pump trial at the surface, before lowering the pumps in the well.

Any pumps found not to be within the manufactures specifications for pumping volumes are inspected further and recalibrated to bring the pump to within the specified ranges.

3.3.4 Infrastructure Repair

Where damage is observed, it must be reported to relevant personnel and remedial action taken. Response to infrastructure failure/ damage must be initiated within 1 hour of detection.

The following remedial timeframes are to be adhered to where possible (or sooner):

- Emergency remedial action - within 8hrs of detection
- Temporary remedial action - within 48 hrs of detection
- Final remedial action - within 28 days of detection

4.0 Leachate Extraction System Monitoring

The purpose of leachate extraction monitoring is primarily to assess systems operations. A summary of the indicative routine leachate extraction monitoring activities proposed to be undertaken at Site is provided in the table below.

Table 2: Leachate Extraction Monitoring Summary

Task	Activities Required	Location	Recommended Monitoring Frequency
Gauging	Measurement of depth to leachate	Leachate extraction	twice per week
Data Logging	Download of in-situ logging data	To be confirmed*	monthly
Sampling	Leachate analysis	To be confirmed*	annually
Extraction Monitoring	Record of cycle counter readings	Leachate sump(s)	weekly
	Total leachate extraction volume	Flow meter	minimum weekly

*Following completion of the remediation and construction works wells will be selected for leachate monitoring

4.1 Gauging

Leachate levels at select monitoring locations shall be measured on a regular basis so that pump radius of influence, hydraulic gradient and leachate/groundwater flow directions can be evaluated. Specific requirements for this gauging are provided in the current Groundwater and Leachate Monitoring Plan **Appendix F** of the Alexandria LCMP.

Leachate levels are also used to evaluate the effectiveness of leachate extraction operations and operational status of individual pumps. Gauging for these purposes may include additional leachate wells and/or different gauging frequencies. This gauging will be conducted as needed, based on landfill operations, but a minimum frequency of twice weekly is suggested.

Leachate levels will be recorded as the depth to leachate measured from a marked reference point (dip point) using an electronic water level meter designed for use with leachate. This meter is designed to overcome some of the difficulties in measuring leachate levels, such as the presence of foam in wells. The measured depth to leachate, and other observations, will be recorded on approved field forms

4.2 Data Logging

Requirements associated with dataloggers are outlined in the current Groundwater and Leachate Monitoring Plan **Appendix F** of the Alexandria LCMP.

4.3 Leachate Sampling

Leachate sampling activities shall be undertaken taking into consideration guidance provided in Section 4.1 of the NSW Environment Protection Authority (EPA) 2015a. *Draft Environmental Guidelines Solid Waste Landfills*. Second Edition, 2015. March.

All leachate sample analysis is to be completed by a National Association of Testing Authorities (NATA) accredited laboratory.

Further information regarding leachate sampling requirements are provided in the proposed Groundwater and Leachate Monitoring Plan in **Appendix F** of the Alexandria LCMP.

4.4 Leachate Extraction Rates

4.4.1 Flow Meter Readings

Flow meter readings are taken from the flow meter at the end of the leachate extraction piping network, prior to discharge. Generally daily readings are undertaken. At a minimum, flow meter readings should be completed on a weekly basis.

Specific information to be recorded from the flow meter includes:

- Date and time of measurement
- Instantaneous flow rate (kL/hr)
- Total flow recorded by flowmeter (F_{tot} , in kL)
- Resettable flow, flow since previous reset (RF_{tot} , in kL)
- Resettable back flow (RT_{tot} , in kL)
- Once the readings are taken, the resettable measurements need to be re-set to zero.

4.4.2 Estimation of Extraction Rates

In addition to the flowmeter record of total extraction, counter readings shall be recorded on a minimum weekly basis to estimate performance the sumps. The leachate extraction rate at each well can be estimated based on pump cycle counter readings. An average daily extraction rate (in kL/day) can be calculated as follows:

$$\text{AverageDailyExtractionRate} = \frac{PV \cdot (C_C - C_P) / D}{1000}$$

Where:

- PV = pump volume per cycle (L);
- C_C = the current counter reading;
- C_P = the previous counter reading; and
- D = the number of days between readings

4.5 Monitoring Equipment

Personnel performing monitoring of the leachate extraction system shall be suitably trained and qualified to perform monitoring and shall report to the Site Manager.

All monitoring equipment shall be calibrated and conform to the manufacturer's specifications. Records of monitoring equipment calibration records are to be maintained on Site.

4.5.1 Equipment and Maintenance

The field technician will use a leachate level dip metre designed specifically for measuring leachate levels within pressurised systems that can produce foam and froth that would normally interfere with the gauging of levels.

- Leachate monitoring will be carried out using electronic leachate level instrumentation as described or a suitable replacement should the primary instrument malfunction.
- The instruments will be serviced in accordance with the manufacturer's recommendations

4.5.2 Pre-Monitoring Checks

Prior to undertaking leachate monitoring, the electronic leachate level meter shall be tested to check the sensitivity to ensure accurate depth to leachate measurement.

4.6 Data Management

4.6.1 Field Forms

Dedicated field forms are to be completed during leachate extraction monitoring activities.

4.6.2 Database Management

All completed field forms are to be stored in hard copy and electronic PDF format (scanned) in a dedicated file on site.

The leachate data collected under this Plan is stored and managed in a relational database constructed to support the overall project. The project database is maintained on a secure network server that is backed up regularly. Access to the database is controlled using features of the system.

Where data is manually entered, a verification should be undertaken of all entered field parameter data to identify and correct transcription errors.

Information that is entered into the database includes (as a minimum):

- Well identification;
- Gauging/ Sampling date;
- Standing leachate level in metres Australian Height Datum (m AHD).
- Flow rate (if measurement is required from sample tap);
- Applicable measurement units; and
- Results of sample analysis.

5.0 Quality Assurance

5.1 Construction Quality Assurance

Where new leachate wells are installed the borelogs and as-built installation details will be forwarded to Roads and Maritime. Bore logs shall provide the following information:

- Borehole identification;
- Date of drilling / installation;
- Borehole stratigraphy;
- Groundwater level (and any perched water levels);
- Design of the borehole if more than one type is being used on the Site;
- Depth of borehole (metres) and level of the bottom of the borehole in m AHD;
- The surveyed height of the top of the borehole in m AHD, and the surveyed ground level at the point if it differs; and
- Borehole location (easting and northing) in centimetres referenced to the Map Grid of Australia (MGA).

Further information regarding well installation is located in the current Groundwater and Leachate Monitoring Plan **Appendix F** of the Alexandria LCMP.

5.2 Monitoring Quality Assurance

Suitably trained and experienced personnel will undertake leachate monitoring. Monitoring equipment will be calibrated, serviced and maintained in line with the manufacturer recommendations.

The leachate level meter and the leachate flow meter will be regularly serviced and repaired by the equipment manufacturers (or certified repairer) and calibration certificates kept on file at the Site office.

The quality assurance / quality control (QA/QC) program consists of the following components (as a minimum):

- Equipment calibration;
- Duplicate monitoring (where required);
- Cross checking;
- Use of standardised field sheets;
- Field inspection audits;
- Equipment maintenance; and
- Database management.

5.3 Work Procedures

All work procedures are to be updated/ amended as required to reflect current Site operations.

5.4 Records

Records regarding the design, specification, operation, inspection, maintenance and monitoring of the leachate extraction system will be maintained on Site. Specifically, the following records will be maintained (as a minimum):

- Records of all inspections carried out on the system;
- Planned and unplanned maintenance and servicing;
- Details of any additional extraction sump or well installation; and
- Records of leachate extraction monitoring.

These records will comprise both hard copy data sheets and electronic records of system operation. All records will be made available for inspection on request.

6.0 Routine Deliverables

6.1 Reporting

Reporting requirements during the closure phase are provided in Section 10.0 of the overarching Alexandria LCMP.

6.2 Environmental Audit

Details of Environmental Audit activities proposed during closure phase are provided in Section 11.2 of the overarching Alexandria LCMP.

7.0 Contingency Action Plan

The contingency action plan will be followed in the event of:

- Anomalous monitoring data
- Operational problems or failure of the extraction system
- Uncontrolled release of leachate
- Impact on local groundwater quality

7.1 Leachate migration or surface discharge

The following actions shall be undertaken in the event that leachate impacted groundwater is identified or leachate is discharged to the land surface:

- Optimising performance of the existing leachate extraction system and expanding the system as appropriate.
- Groundwater wells in which leachate impact appears to be present will be re-sampled for all parameters to verify the previous results.
- Where a leachate release is confirmed, the conceptual hydrogeological model will be reviewed/updated to provide an understanding of the possible causes of new release(s) to aid in determining appropriate of short and long term actions.
- If increased leachate extraction efforts do not mitigate the reported leachate impact to groundwater and an increasing trend continues over two consecutive quarters, additional actions will be taken to capture released leachate. These actions may include the upgrade of the existing extraction sumps and pumps. A scope of works for any such recommendations will be provided to NSW EPA for review prior to implementation.

7.2 Infrastructure failure

Where repair to leachate extraction infrastructure is required, this is to be done at the earliest possible convenience to prevent:

- any disruption to site leachate extraction rates and discharge requirements;
- any adverse environmental impacts; and
- any uncontrolled off-site discharge of leachate.

Response to infrastructure failure/ damage must be initiated within 1 hour of detection.

Where infrastructure failure/ damage is observed, the following remedial timeframes are to be adhered to (or sooner):

- Emergency repair - within 8hrs of detection
- Temporary repair - within 48 hrs of detection
- Final repair - within 28 days of failure

7.3 Leachate level exceeded

If the leachate level exceeds the height of -16 m AHD and/or less than 0.5 m to the standing groundwater level at the main leachate extraction sump the following actions shall be undertaken:

- The operations of the existing pumps will be reviewed. It may be that pumps need repair or maintenance to improve leachate extraction, or that extraction sump(s) should be de-silted.
- If all pumps and extraction systems in the area of concern are operating at optimum capacity, consideration will be given to other operational changes that might enhance extraction rates, for example, different types of pumps and/or control systems.

- If no further improvements can be made with the existing infrastructure, and an inward gradient cannot be achieved, consideration will be given to installing additional extraction pumps and or sumps to increase leachate extraction. A scope of works for any such recommendations will be provided to NSW EPA for review prior to implementation.

For further information regarding hydraulic gradient calculations refer to the current Groundwater and Leachate Monitoring Plan in **Appendix F** of the Alexandria LCMP (AECOM, 2015).

7.4 Failure to meet EPL or TWA requirements

The following actions will be undertaken in the event that requirements for EPL 4627 and EPL 12594 are not met:

- The licensee must make notification of environmental harm (as defined in the EPL **Appendix C**) by telephoning the Environmental Line Service on 131 555;
- The licensee must provide written details of the notification to the EPA within 7 days of the date on which the incident occurred;

The following actions will be undertaken in the event that requirements of EPL 4627 are specifically not met:

- The licensee must advise the EPA of the actions it will take to dispose of leachate in compliance with the conditions of the licence in the event that it no longer has an agreement with Sydney Water to dispose of treated leachate to sewer. This advice must be provided to the EPA in writing within 7 days of the licensee no longer having access;
- The licensee must notify the EPA as soon as practicable and in any case within 48 hours after it becomes aware that the leachate levels in the riser goes above – 16 m AHD and/or less than 0.5 m to the standing groundwater level; and
- The licensee must provide to the EPA each quarter, copies of a written log used to record the leachate levels in the sump.

The licensee or its employees must notify all relevant authorities of incidents causing or threatening material harm to the environment immediately after the person becomes aware of the incident in accordance with the requirements of Part 5.7 of the POEO Act.

The following actions will be undertaken in the event that the requirements of the TWA are not met:

- Fees apply dependent on the characterisation of contaminants (ammonia as N, suspended solids, total dissolved solids, barium and iron) as per Schedule 3 of the TWA (**Appendix C**); and
- In the event of a dangerous or unintended discharge (as defined in Schedule 6 of the TWA, refer **Appendix C**) to sewer that poses of may post a danger to the environment, the Sewer or workers at a sewage treatment plant the Customer must immediately notify the following Sydney Water contacts:
 - Malabar STP control room: (02) 9934 8319;
 - Business Customer Services (Daceyville Office): (02) 9694 6500;
 - Business Customer Services (City and East): 0408 256 470; and
 - Business Customer Services (Alternate Contact): 0418 221 516.

For further information regarding the requirements of the existing EPLs and TWA for the Site, refer to **Appendix C** of the overarching Alexandria LCMP.

8.0 Work Health and Safety

Whilst undertaking activities to meet the requirements of this plan, appropriate health and safety measures shall be implemented in accordance with the Work Health and Safety (WHS) Regulation 2011. This includes development of task specific SWMS' to identify potential hazards associated with the task steps and use the hierarchy of controls to reduce the risk. The SWMS should be updated as site conditions or methodologies change overtime. Potential hazards to be considered include:

- Contact with chemicals in contaminated leachate and groundwater and sample preservatives;
- Ignition of landfill gases accumulated in groundwater monitoring wells;
- Exposure to landfill gases and vapours accumulated in groundwater monitoring wells;
- Ergonomics;
- Type of sampling pumps and equipment used; and
- Site specific hazards such as construction site hazards.

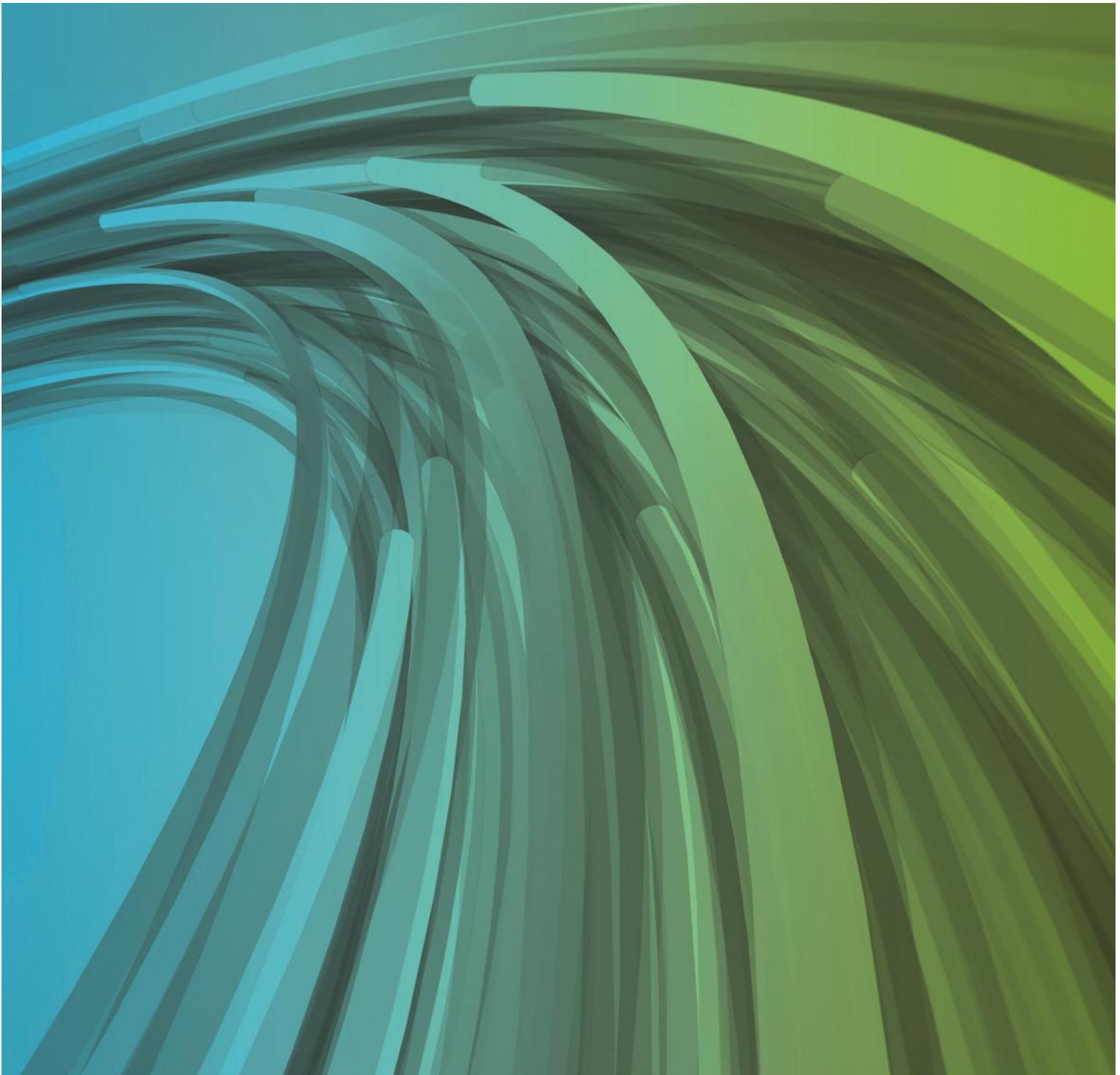
Appendix H

Proposed Landfill Gas Extraction Management Plan

Appendix H Proposed Landfill Gas Extraction Management Plan

Landfill Gas Management Plan

Alexandria Landfill Closure Management Plan, St Peters NSW



Landfill Gas Management Plan

Alexandria Landfill Closure Management Plan, St Peters NSW

Client: Roads and Maritime Services

ABN: 76 236371088

Prepared by

AECOM Australia Pty Ltd

Level 21, 420 George Street, Sydney NSW 2000, PO Box Q410, QVB Post Office NSW 1230, Australia
T +61 2 8934 0000 F +61 2 8934 0001 www.aecom.com
ABN 20 093 846 925

21-Oct-2015

Job No.: 60327128

AECOM in Australia and New Zealand is certified to the latest version of ISO9001, ISO14001, AS/NZS4801 and OHSAS18001.

© AECOM Australia Pty Ltd (AECOM). All rights reserved.

AECOM has prepared this document for the sole use of the Client and for a specific purpose, each as expressly stated in the document. No other party should rely on this document without the prior written consent of AECOM. AECOM undertakes no duty, nor accepts any responsibility, to any third party who may rely upon or use this document. This document has been prepared based on the Client's description of its requirements and AECOM's experience, having regard to assumptions that AECOM can reasonably be expected to make in accordance with sound professional principles. AECOM may also have relied upon information provided by the Client and other third parties to prepare this document, some of which may not have been verified. Subject to the above conditions, this document may be transmitted, reproduced or disseminated only in its entirety.

Quality Information

Document	Landfill Gas Management Plan
	60327128
Ref	h:\draft landfill closure plan\eis landfill closure\for lodgement\appendix h proposed landfill gas extraction management plan\60327128_lgmp_20151020.docx
Date	21-Oct-2015
Prepared by	Kate Pigram
Reviewed by	Anthony Davis

Table of Contents

1.0	Introduction	1
1.1	General	1
1.2	Objectives	1
2.0	Background	2
3.0	Relevant Guidelines	3
4.0	Landfill Gas Management System	4
4.1	Considerations	4
4.2	Existing Landfill Gas Management	5
4.3	Proposed Landfill Gas Management System Design	5
4.4	Passive Flare System	5
4.5	Bio-filtration System	6
5.0	Landfill Gas Monitoring	7
5.1	Source monitoring	8
5.2	Subsurface migration monitoring	9
5.3	Surface emissions monitoring	9
5.4	Gas accumulation monitoring	10
5.5	Gas extraction system	10
5.6	Flare monitoring (if implemented)	11
5.7	Bio-filter monitoring (if implemented)	12
5.8	Field Balancing	13
5.9	Landfill Subsurface Hot Spot & Fire	13
5.10	Settlement Survey	14
5.11	Meteorological Data	14
5.12	Monitoring Equipment	14
5.12.1	Landfill Gas Analysers	14
5.12.2	Pressure Meter	15
5.12.3	Temperature Probe	15
5.12.4	Flame Ionisation Detector	16
5.13	Monitoring Techniques	16
5.13.1	Equipment and Maintenance	16
5.13.2	Pre-Monitoring Checks	16
5.13.3	Records	16
5.13.4	Monitoring Procedures	16
5.14	Data Management and Reporting Procedures	17
5.14.1	Recording and Maintenance of Data	17
5.14.2	Routine Deliverables	17
5.14.3	Reporting to the EPA	17
5.14.4	Recording Complaints	17
5.15	Quality Assurance	18
5.15.1	Construction Quality Assurance	18
5.15.2	Monitoring Quality Assurance	18
5.15.3	Work Procedures	18
5.15.4	Records	18
6.0	Work Health and Safety	20
7.0	Contingency Action Plan	21
7.1	Proposed Remedial Actions	21
7.2	Adopted Off-Site Landfill Gas Compliance Limits	21
7.2.1	Landfill gas monitoring	21
7.3	Emergency Maintenance	23
7.3.1	Flares (if implemented)	23
7.3.2	General Infrastructure	23
7.3.3	Air Ingress	23
7.3.4	Leaks	24
7.4	Landfill Fire	24

Appendix A		
Figures		A
Appendix B		
Existing Data		B

1.0 Introduction

1.1 General

AECOM Australia Pty Ltd (AECOM) was commissioned by Roads and Maritime Services (Roads and Maritime) to prepare a Landfill Gas Extraction Management Plan (the Plan) to be implemented at the closed Alexandria Landfill comprising Lot 2 in Deposited Plan (DP) 1168612 located at Albert Street, St Peters NSW, incorporating an area of approximately 15.71 hectares (ha).

A large portion of the Site has historically operated as a quarry (identified as the Ralford Pit) and brickworks (identified as the St Peters Brick Works). Since quarrying activities ceased, part of the Site has been used as a landfill, waste handling and transfer facility. Alexandria Landfill is currently licensed (EPL 4627) by the NSW Environment Protection Authority (EPA) to transport, store, recycle, reprocess and dispose of wastes. The landfill was historically operated by City of Sydney Council and Dial-A-Dump (DADI) as a non-putrescible general solid waste landfill. The types of waste historically accepted included soil, demolition waste, green waste/timber and asbestos.

This Plan provides a framework for the management of landfill gas (LFG) at the Site through the improvement and operation of an LFG management and control system. This Plan sets out the methods, procedures and actions to be implemented with regard to landfill gas (LFG) management at the Site.

The plan is a living document and will be reviewed and updated at least annually by 30 June to ensure that adequate controls are in place to meet the standards and objectives identified in this Plan.

This plan forms part of a package of documents appended to the Alexandria Landfill Closure Management Plan (LCMP), and should be read in association with the other plans and documents appended to the LCMP.

1.2 Objectives

The objectives of the Plan, as established within the following primary guidance document: United Kingdom Environment Agency (2004) *LFTGN03 Guidance on the Management of LFG (LFTGN03)*, are intended to:

- Identify and assess site specific risks associated with LFG;
- Identify management and operational control measures to address the risks;
- Determine performance criteria for the control measures;
- Determine design objectives for the implementation of control measures through a LFG management and control system;
- Determine installation criteria, site specific methods and construction quality assurance (CQA) procedures for establishing the LFG management and control system;
- Determine procedures and responsibilities for installation, operation, maintenance and monitoring of the LFG management and control system;
- Demonstrate that the performance of the LFG management and control system meets the agreed requirements and criteria; and
- Determine the procedures for managing changes to the LFG management and control system.

2.0 Background

The landfill was historically a quarry (identified as the Ralford Pit) and brickworks (identified as the St Peters Brick Works). The quarry has subsequently used as landfill and a waste recycling and transfer facility. The landfill is currently licensed (EPL 4627) by the NSW Environment Protection Authority (EPA) to transport, store, recycle, reprocess and dispose of wastes. The landfill was historically operated by City of Sydney Council and then Dial-A-Dump (DADI) as a non-putrescible general solid waste landfill. The types of waste historically accepted included soil, demolition waste, green waste/timber and asbestos. The Alexandria landfill was acquired by the NSW Government in December 2014.

Roads and Maritime now plan to redevelop the Site as part of the WestConnex New M5. The Site is planned to contain the section of the freeway referred to as the St Peters Interchange. The design for the St Peters interchange, includes roads, tunnel portals, overpasses and associated infrastructure. The remainder of the Site is planned to be redeveloped as public use likely consisting of a mixture of parkland, pathways and cycleways. Surplus land surrounding the interchange will also likely be redeveloped for commercial/light industrial land use.

The redevelopment also means that the Alexandria Landfill will need to be closed and managed in accordance with the *Protection of the Environment Operations Act* (POEO), 1997.

Landfill gas issues have historically been an issue along the north-western boundary where gas emissions and odours have been recorded along the interface between refuse and natural weathered shale. In 2007 it was requested by the NSW Department of Environment and Climate Change (DECC) (now NSW EPA) that Alexandria Landfill provide landfill gas mitigation designs for the perimeter of the facility which requires a number of different methodologies based on the nature of the geological materials forming the site boundary (Wianamatta Shale and Botany Sands), saturated geology, fracture zone (leachate, groundwater levels), the depth of refuse placed at certain area and the depth of waste expected to be placed to complete the site to final design levels. Douglas Partners (2008) proposed two design systems as well as numerous landfill gas mitigation methods with reference to *Environment Guidelines: Solid Waste Landfills* (NSW EPA, 1996), a plan for construction as well as potential ongoing monitoring program. It is understood that one gas interception trench was installed near the leachate treatment plant on the north-western boundary.

AECOM completed a Phase 2 Environmental Site Assessment (ESA) which involved the installation and sampling of landfill gas monitoring wells. Based on the concentrations of methane and landfill gas flow rates measured, the Site was classified as Characteristic Gas Situation 4 (moderate to high risk) based on the Modified Wilson and Card Classification (MWCC) (NSW EPA, 2012). Other landfill gases including carbon dioxide and carbon monoxide were detected at high concentrations. Concentrations of hydrogen sulfide significantly exceeded the adopted site assessment criteria. Detected concentrations of landfill gases at the locations analysed were found to be greater than the NSW EPA (1996) guideline value at the Site boundary. The Phase 2 ESA concluded that the further delineation and monitoring of landfill gas was required around the boundary of the Site and that appropriate gas mitigation measures would be required to be detailed in the remediation action plan (RAP) and LCMP for the Site.

3.0 Relevant Guidelines

The following guidelines are applicable to the assessment, management and/or monitoring of landfill gas in NSW and have been referred to in the development of this plan:

- NSW EPA (2015) *Draft Environmental Guidelines Solid waste landfills, second edition, March 2015*
- NSW EPA (2012) *Guidelines for the Assessment and Management of Sites Impacted by Hazardous Ground Gases.*
- NSW EPA (1998) *Draft Environmental Guidelines for Industrial Waste Landfilling.* NSW Environment Protection Authority, Sydney
- NSW EPA (1996) *Environmental Guidelines: Solid Waste Landfills.* NSW Environment Protection Authority, Sydney

The below guidelines have also been referred to where applicable:

- EPA Victoria (2014) *Best Practice Environmental Management, Siting, Design, Operation and Rehabilitation of Landfills.*
- NSW DECCW (2010) *Handbook for the Design, Construction, Operation, Monitoring and Maintenance of a Passive Landfill Gas Drainage and Biofiltration System.* NSW Department of Environment, Climate Change and Water, Sydney.
- CIRIA (1995), R152 – *Risk assessment for methane and other gases from the ground, Construction Industry Research and Information Association, London, UK.*
- Environment Agency (2004) *Guidance on the management of landfill gas (LFTGN03).*
- Environment Agency (2004). *Guidance on monitoring landfill gas surface emissions (LFTGN07).*
- UK Environment Agency (2003), *Guidance on Monitoring of Landfill Leachate, Groundwater and Surface Water.* Environment Agency, Bristol, UK.

4.0 Landfill Gas Management System

4.1 Considerations

The below considerations have been made in the development of this management plan.

- Baseline bulk landfill and trace ground gas data was obtained as part of the Phase 2 ESA. The concentration of methane gas in the landfill waste source analysed was up to 74.2% and a maximum flow rate measured was 7.2 L/hr. The concentrations of trace components (VOCs) were less than concentrations listed as typical of landfill gas in LFTGN03 with the exception of hydrogen sulphide which was detected at concentrations of up to 1194 ppm. The existing bulk landfill and trace gas data is tabulated in Table B1 and Table B2 Appendix B.
- Future development of the Site as motorway interchange and open space land use. Landfill gases could accumulate in subsurface voids and infrastructure and in above ground buildings/structures if no control measures were implemented.
- The Site is located in a populated area and directly bordered by industrial, commercial, open space and residential land uses. The data from the Phase 2 ESA (AECOM, 2015) shows that there is potential for landfill gases to migrate off-site into neighbouring land, based on the initial subsurface gas monitoring undertaken as part of the Phase 2 ESA (2015).
- The potential for lateral gas migration off-site may increase after the installation of the final capping as vertical migration is inhibited. As such sufficient mitigation measures and monitoring around the boundary must allow for a potential increase in lateral landfill gas flow and concentrations post-closure.
- The draft NSW EPA (2015) guidelines state wherever feasible active gas recovery should be used and passive venting to the atmosphere of untreated gas should be avoided, as methane gas is a potent greenhouse gas. The hierarchy of preferred landfill gas management in the EPA Victoria (2014) guidelines are listed in **Table 1** below.

Table 1 EPA Victoria hierarchy of landfill gas management and treatment technologies

Technology	Typical minimum landfill gas generation rate required
1. Combined heat and power generation (most preferred)	>1000 m ³ /hr
2. Substitute fuel	>1000 m ³ /hr
3. Power generation	> 100 m ³ /hr
4. Intermittent use and off-time flaring	>250 m ³ /hr
5. Flare	<100 m ³ /hr
6. Treatment and discharge	<100 m ³ /hr
7. Discharge untreated (least preferred)	<100 m ³ /hr

- The projected landfill gas generation rate has not been calculated, however an initial estimate using US EPA Land GEM version 3.02 indicates the generation rate is likely to be less than 250 m³/hr. Hydrogen sulfide concentrations are also potentially high (>25 ppm) and therefore not likely to be suitable for power generation. As such, presently the two most feasible options are:
 - capture via a drainage network and then either passive or active (vacuum) transfer to a flare; or
 - capture via a drainage network with biofilters and either passive or active (vacuum) transfer to a biofilter.

4.2 Existing Landfill Gas Management

The *Alexandria Landfill Site-Recycling and Landfill Premises Revised Surface Water and Leachate Management Plan* (SWLMP), November 2011 (ICCG, 2012) identified a subsurface gas mitigation trench installed in the north-western area of the landfill. No 'as built' records are available for the trench; however the *Report on Landfill Gas Mitigation Measures Alexandria Landfill, St Peters, 23 January 2008* (Douglas Partners, 2008) did provide design plans. Based on the initial landfill gas subsurface monitoring undertaken for the Phase 2 ESA (AECOM, 2015), the system is inadequate to manage the risk to the surrounding and Site receptors.

The system will be replaced by the proposed landfill gas extraction system described in **Section 4.3** below.

4.3 Proposed Landfill Gas Management System Design

The preferred landfill gas management system will comprise:

- A radial subsurface gas drainage system connecting to a main trunk system and gas collection system. The subsurface drains will be concentrated in areas of identified potential gas accumulation and at the boundary where off-site migration is likely.
- Gas drains will be likely constructed from 100 mm outside diameter (OD) slotted high density polyethylene (HDPE) within an engineered fill substrate. The engineered substrate will be placed over the compacted landfill waste surface. Capping layers as described in the LCMP will be placed over the gas drainage network.
- Vertical gas collection wells targeting areas where additional gas mitigation is required are proposed.
- A network of subsurface landfill gas wells to monitor the effectiveness of the mitigation systems and comply with EPL conditions.
- Subject to detected landfill gas concentrations, the gas extraction system may be an active (forced) or passive gas extraction system. Active extraction systems remove gas under vacuum, which is subsequently pumped to a central collection/emission point for energy recovery or flaring. Passive gas drainage systems transfer gas by atmospheric pressure differentials. Gas can subsequently be directed for treatment to a microbiological gas system (bio-filter) or to a passive flare.

The details of the final gas management system will be refined following confirmation of gas concentrations across the Site.

Details of the indicative gas management system layout at various locations are shown in the following design drawings (refer **Appendix A**):

- M5-AJV-SKT-700-320-DR-7801 – Leachate Treatment and Gas Collection Passive System General Arrangement
- M5-AJV-SKT-700-320-DR-7802 – Landfill Gas Collection System
- M5-LDS-SKT-700-320-DR-7803 – Alexandria Landfill Closure Plans Extent of Capping
- M5-LDS-SKT-700-320-DR-7804 - Alexandria Landfill Closure Plans Typical Capping Layer Details Sheet 1 (Cut Detail Type 1 – Steeper than 3H:1V)
- M5-LDS-SKT-700-320-DR-7805 - Alexandria Landfill Closure Plans Typical Capping Layer Details Sheet 3 (Cut Batter in Waste Slope of 3H:1V)
- M5-LDS-SKT-700-320-DR-7806 - Alexandria Landfill Closure Plans Typical Cross Sections MDA1-Sheet 1
- M5-LDS-SKT-700-320-DR-7811 - Alexandria Landfill Closure Plans – Environmental Monitoring Locations

4.4 Passive Flare System

The draft NSW EPA (2015) guidelines require the operations of gas combustion plants to meet the following requirements:

- The discharge points should be designed to promote good dispersion;
- Condensed liquid should be managed as leachate; and
- Air pollutants should be sampled and analysed in accordance with the NSW DEC (2007) guidelines.

A detailed operational and maintenance plan and program will be developed by the manufacturer once the flare system is designed and implemented when commissioned. Standard monitoring requirements are described in **Section 5.6**, which will be the minimum requirements.

4.5 Bio-filtration System

A detailed design and operational and maintenance plan and program will be developed if a biofiltration system is chosen as the preferred landfill gas treatment system.

5.0 Landfill Gas Monitoring

The LFG extraction system monitoring methodology and strategy shall be designed to comply with the draft NSW EPA (2015) guidelines and *Protection of the Environment Operations (Clean Air) Regulation 2010*.

Table 2 provides an overview of the monitoring to be completed post-closure. It is noted that the frequency in the table is based on the established system. During the commissioning stage the monitoring will be more frequent until the operators of the system are satisfied that a relative equilibrium has been achieved.

Table 2 Landfill gas monitoring summary

Section	Monitoring Type	Monitoring Points	Frequency ¹	Purpose
5.1	Source monitoring (within landfill)	Monitoring and/or collection wells	Six monthly	Balancing the landfill gas extraction system
5.2	Subsurface migration monitoring	Perimeter monitoring wells	Six monthly	To check concentrations of methane at the landfill boundary are less than EPA NSW (2015) criteria of 1.25% (v/v).
5.3	Surface emission monitoring	Surface transects Flux (if required)	Annual	Check integrity of the capping layer. Where emissions of 500 ppm methane detected flux monitoring to be completed.
5.4	Gas accumulation monitoring	All enclosed structures within 250 m of landfill	Annual	To check concentrations of methane in enclosed structure within 250m of the landfill are less than EPA NSW (2015) criteria of 1.25% (v/v).
5.5	Gas extraction system	Manifolds	Six monthly	Monitor composition of gases prior to destruction in the flare or bio filter and use data to balance the system.
5.6	Flares (if implemented)	Flare	Weekly Quarterly	Check operations and emissions meet Protection of the Environment Operations (Clean Air) Regulation 2010
5.7	Bio- filter (if implemented)	Bio filter	Quarterly	Check operations and emissions
5.8	Field Balancing	Monitoring and/or collection wells, manifolds and flare	Weekly	Optimise the LFG operation of the system safely
5.9	Subsurface hotspot and fire	Monitoring wells and extraction system	Six monthly	Detect subsurface fires
5.10	Survey	Cap surface	Annual	Monitor settling
5.11	Meteorological	Sydney Airport Weather Station	Daily	Data used to inform above monitoring

The landfill gas monitoring methodologies are described in **Section 5.1 to 5.7** below.

5.1 Source monitoring

The purpose of source monitoring is to obtain landfill gas data from below the cap to balance the gas collection extraction system and safely achieve the highest viable extraction rate.

The source monitoring requires monitoring of collection wells and monitoring wells (screened in landfill waste). The monitoring wells are to be installed separately (not connected) to the collection/extraction system.

An experienced LFG technician will be required to conduct routine LFG monitoring and balancing to ensure that the extraction system performs at an optimum level to minimise any potential for LFG migration away from the Site. The LFG technician will use an infrared LFG analyser designed specifically for LFG. The preferred LFG analyser is the Geotechnical Instruments GEM 2000 Plus model (or equivalent) due to its ability to monitor LFG, hydrogen compensation to enable more accurate carbon monoxide readings, temperature, and flow rate measuring capability. However, similar units such as the GEM 2000, GA 2000 and GA 94 (or equivalent) can also be used.

The parameters to be monitored in source and collection wells are listed in **Table 3** below.

Table 3 Source monitoring parameters

Monitoring Parameter	Units
Methane	% v/v
Carbon Dioxide	% v/v
Oxygen	%v/v
Carbon Monoxide	ppm
Hydrogen sulfide	ppm
Temperature	°C
Differential Pressure	mB or Pa
Atmospheric pressure	mB
Flow rate	L/min
Meteorological conditions	n/a

The details of the existing landfill gas monitoring wells installed in landfill waste by AECOM (2015) are listed in **Table 4** below. The locations of the wells are shown on **Figure 6** in **Appendix A**.

Table 4 Existing source monitoring wells

Well ID	Installed	Easting	Northing	Top of casing (m AHD)	Screened Interval (m bgs)
LG300	2015	331681.71	6245543.62	4.52	1 to 2
LG301	2015	331446.48	6245723.49	-4.32	1 to 3
LG302	2015	331646.2	6245685.3	5.51	0.5 to 3
LG303	2015	331664.26	6245750.32	8.92	1 to 3
LG304	2015	331768.74	6245582.81	7.82	1 to 3
LG305	2015	331720.15	6245728.64	8.44	1 to 3
LG306	2015	331642.68	6245805.96	9.17	1.1 to 3.1
LG307	2015	331671.08	6245863.95	11.92	0.5 to 3
LG308	2015	331832.59	6245894.89	9.01	0.9 to 2.9
LG309	2015	331909.52	6245704.08	5.58	1 to 3

Well ID	Installed	Easting	Northing	Top of casing (m AHD)	Screened Interval (m bgs)
LG310	2015	331824.2	6245780.8	8.07	0.8 to 2.8
LG311	2015	331620.91	6245561.79	-4.45	1 to 3
LG312	2015	331439.37	6245569.93	-5.96	1.0 to 3.0
LG313	2015	331583.1	6245492.0	3.58	1.0 to 3.0

5.2 Subsurface migration monitoring

Subsurface monitoring of LFG monitoring wells around the boundary is required to monitor potential off-site lateral migration of landfill gases. The recommended monitoring bore spacing around the perimeter of the landfill in LFTGN03 is:

- 50 m where low permeability strata is present; and
- 20 metres where uniform matrix dominated permeability strata or fracture flow dominated strata are present.

The above are based on a mixture of the presence of sand and fill in shallow soils around the boundary of the site and the fractured bedrock quarry walls of the landfill.

Based on the perimeter of approximately 2100 metres there is a requirement of 40 to 100 subsurface monitoring wells to be installed.

The wells should be installed close to the perimeter and outside of the waste mass.

The monitoring parameters are listed in **Table 5** below.

Table 5 Subsurface migration monitoring parameters

Monitoring Parameter	Units
Methane	% v/v
Carbon Dioxide	% v/v
Oxygen	%v/v
Carbon Monoxide	ppm
Hydrogen sulfide	ppm
Temperature	°C
Differential Pressure	mB or Pa
Atmospheric pressure	mB
Flow rate	L/min
Meteorological conditions	n/a

5.3 Surface emissions monitoring

The draft NSW EPA (2015) requires that surface emission monitoring is undertaken on a monthly frequency. Since the landfill will be closed and capped, the surface emission monitoring will be undertaken on completion of the cap installation and then monthly for six months. If there are no exceedences of the criteria then the frequency will be annually.

A program of monthly landfill cap surface monitoring is implemented at Site to identify any fissures or cracks within the landfill cap which may result in LFG emissions. The following survey protocol is adopted:

- Prior to mobilisation to the Site for completion of the monitoring event, the assigned technician completes a background check of the monitoring apparatus at a location nearby but not directly connected to the Site to determine background conditions.
- The landfill gas analyser is connected by tubing to a funnel and pipe assembly, which allows the monitor to be placed in relative contact with the landfill cap surface without the need to bend over. Additionally, this set up minimises any potential interferences with sample collection by weather conditions during completion of emissions monitoring.

- Methane should be tested in the atmosphere 5 cm above the landfill cap. Testing should be conducted in a grid pattern across the landfill surface at 25 m spacings. Where surface cracking or damage to the cap is observed, these areas should also be monitored and the location recorded.
- The monitoring should be performed on calm days (winds below 10 km/h) and preferably during periods of relatively low and stable atmospheric pressure (e.g. less than 101.3 kPa).
- Each location is monitored for a minimum of one minute, or until the reading is relatively stable. Additional measurement locations are added, at the discretion of the surveyor, based on observations noted during the monitoring operations.
- All measurements will be recorded either on a field form or through data logging as available.
- Monitoring data will be reviewed/analysed in a spatial context, after collection, to determine the need for additional follow-up monitoring to tighten the monitoring grid in areas that may appear to have hotspots of fugitive gases leaking through the landfill cap.
- Weather conditions at the time of the monitoring event will be observed and recorded including; temperature, cloud cover, barometric conditions (rise/fall) and wind conditions. The monitoring event will not be performed less than two days following a rainfall event.

Levels of gas measuring 500 ppm or higher on the cap's surface will be identified with a marker intended to remain in-place until:

- The area of cap affected is repaired/remediated is made; or/and
- Flux monitoring to quantify emission rates is undertaken; or/and
- Adjustment to the extraction system.

Table 6 Surface emission monitoring

Monitoring Parameter	Units
Methane	% v/v

5.4 Gas accumulation monitoring

Landfill gas accumulation monitoring is required to demonstrate that gas is not accumulating in enclosed spaces within 250 m of the landfill. There are hundreds of enclosed spaces within 250m of the Alexandria Landfill, as such a review will be undertaken of appropriate and representative spaces to monitor based on. Properties with basements and underground services pits should be targeted as a priority.

Where underground pits are monitored tubing should be attached to the landfill gas analyser and the tubing lowered to the base of the pit and the peak reading recorded.

Table 7 LFG Extraction Parameters

Monitoring Parameter	Units
Methane	% v/v

5.5 Gas extraction system

Table 8 LFG Extraction Parameters Manifolds

Monitoring Parameter	Units
Methane	% v/v
Carbon Dioxide	% v/v
Oxygen	% v/v
Carbon Monoxide	ppm
Hydrogen sulphide	ppm

Monitoring Parameter	Units
Trace gases VOCs and naphthalene	$\mu\text{g}/\text{m}^3$
Inert gases	% v/v
Differential Pressure	mB or Pa
Atmospheric pressure	mB
Meteorological conditions	n/a

5.6 Flare monitoring (if implemented)

The draft NSW EPA (2015) guidelines require the operations of gas combustion plants to meet the following requirements:

- Flares must be enclosed and be at ground level;
- Flares must meet the operating requirements in the Protection of the Environment Operations (Clean Air) Regulation 2010:
 - *gas residence time - >0.6 s*
 - *combustion temperature - >760 °C*
 - *destruction efficiency- >98%*
 - *flame present at all times while air impurities are required to be treated*
 - *regular monitoring of temperature (°C) and volumetric flow rate (in m^3/s)*
- Emissions from any internal reciprocating combustion engine fuelled on landfill gas must not exceed the following concentration limits in the Protection of the Environment Operations (Clean Air) Regulation 2010:
 - *hydrogen sulfide – $5 \text{ mg}/\text{m}^3$*
 - *nitrogen dioxide (NO_2) or nitric oxide (NO) or both, as NO_2 equivalent – $350 \text{ mg}/\text{m}^3$*
 - *sulfuric acid mist (H_2SO_4) or sulfur trioxide (SO_3) or both – $100 \text{ mg}/\text{m}^3$*
 - *volatile organic compounds as n-propane equivalent as SO_3 equivalent – $40 \text{ mg}/\text{m}^3$*
- An air quality impact assessment is required to be conducted prior to commencement of operations to demonstrate air quality at ground level will not exceed the criteria specified in *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales* (NSW DEC, 2007).

LFG flare emissions monitoring (source testing) will likely be carried out on at least an annual basis, for methane (CH_4) destruction efficiency to ensure this is within the manufacturers stated tolerances. The exact monitoring requirements will be confirmed on the final design of the system if adopted.

Typical monitoring parameters are listed **Table 9** below.

Table 9 Flare Monitoring Parameters

Monitoring Parameter	Units
Gas residence time	s
Combustion temperature	°C
Destruction efficiency	%
Flame present at all times while air impurities are required to be treated	-
Regular monitoring of temperature	°C
Volumetric flow rate	m^3/s

5.7 Bio-filter monitoring (if implemented)

According to the draft NSW EPA (2015) guidelines, the operations of biofilter plants must meet the following requirements:

- Quarterly monitoring of the bio-filter for:
 - composition and flow of landfill gas from the passive drainage system to the biofilter, including the landfill gas loading rate in litres/m²/hour and the methane loading rate in g/m²/hour;
 - emissions/flux from the surface of the biofilter (methane and carbon dioxide);
 - methane oxidation achieved as a percentage of the methane loading of the biofilter; and
 - the moisture content of the upper layers of the material and the depth of the drainage water in the bottom layers (including the gas distribution layer).
- Visual inspections should be made regularly to assess the condition, moisture content and degree of settlement of the biofilter media; and
- The biofilter systems must be appropriately maintained, including periodic adjustment of moisture content and reworking or replacement of the methane oxidation material, as required by the results of the monitoring program.

A detailed operational and maintenance plan and program will be developed once the biofiltration system is designed and implemented when commissioned. A summary of the monitoring parameters is provided in Table 10 below.

Table 10 Bio filter Monitoring Parameters

Monitoring Parameter	Units
CH ₄ , CO ₂ , O ₂	% v/v
H ₂ S	ppm
Landfill gas loading rate	litres/m ² /hour
Methane loading rate	g/m ² /hour
Emissions/flux from the surface of the biofilter (CH ₄ and CO ₂)	% v/v mB or Pa
Methane oxidation achieved as a percentage of the methane loading of the biofilter	%
Moisture content of the upper layers of the material and the depth of the drainage water in the bottom layers (including the gas distribution layer).	%

5.8 Field Balancing

If a vacuum extraction system is implemented, regular field balancing would be required. This is because LFG systems are sensitive and LFG concentrations, flow rates and pressure are sensitive to changes and typically require days to stabilise after adjustment. The strategy for the well field balancing program is to regularly monitor and adjust vacuums to ensure that LFG quality is maximised, oxygen concentrations are minimal and flow rates are as high as practicable with the goal of reducing the potential for off-Site migration.

It is very important to balance active LFG control systems to avoid applying excessive vacuum as this may result in the introduction of oxygen into the solid waste mass, which increases the risk of fire by spontaneous combustion. Landfill fires may pose a potential risk to public health and safety due to gas and particulate release associated with the fire. This is particularly important as due to the sites location in a built up area and the future development.

Data from the source, extraction system and treatment system will be used to balance the overall LFG system. Specific procedures will be required to be developed once the design is finalised and prior to commissioning. Considerations to include:

- Frequency of adjustments: due to the sensitivity of the extraction system, changes to wells are typically done in slow increments. Wells that are opened from closed positions typically take weeks to reach 100% open.
- Balancing of the LFG well field should occur weekly or as required based upon monitoring undertaken. Weekly balancing allows the LFG to equilibrate based on the most recent well field adjustments. The LFG flares are to be inspected and monitored for LFG quality (methane percent, oxygen percent and landfill gas flow rate), suction pressure and flow rate daily until stable conditions occur at which time the frequency level will be reconsidered. When the LFG well field extraction rate is at equilibrium the frequency of monitoring will typically be extended out to monthly and in line with LFTG03 out to 6 monthly in the late after care phase.
- It is preferred that the LFG technician maximise the extraction system based on methane versus oxygen quality. This relates to applying more vacuum on wells that have the higher methane quality. Although higher flowing wells may be present with lower methane quality, it is more likely that an increase in LFG extraction from these will result in air (oxygen) intrusion and therefore increase the risk potential of a landfill fire occurring within the landfill mass.
- Methane levels that are observed to be greater than 30% are considered strong wells and are candidates for increased extraction. Wells that contain observable levels of oxygen greater than 2% indicate that either the well has an air leak or air is entering through the landfill cap or there is an air leak in the LFG extraction line. Oxygen levels greater than 2% also cause an environment where a subsurface fire can occur and are therefore immediately addressed with emphasis to eliminate the presence of oxygen greater than 2%.
- Positive pressure readings indicate LFG is likely to expand out of the source area and are eligible to have vacuum increased, if methane quality (>30%) and oxygen (<2%). Wells that have methane levels below 30% are typically reduced in vacuum so that vacuum can be re-applied to other wells that have high methane quality and wells above 30% methane have higher vacuum levels applied.
- The objective is to adjust the suction on a well so that the gas flow and concentration are sustainable. This happens when the extraction rate is equivalent to the rate at which the gas is being generated by the microbes (i.e. 'balanced'). Too much suction and the gas quality drops, not enough suction and there may be reduced efficiency of collection.

5.9 Landfill Subsurface Hot Spot & Fire

Methods for detecting subsurface fires has largely been adopted from the United Kingdom (UK) Government Environment Agency document: *Guidance on the management of landfill gas* (LFTGN03).

Temperature is an important factor influencing the rate of LFG production as well as indicating landfill subsurface fires. Initial aerobic phases of waste degradation in waste placement cells of less than 5 years are expected to have waste temperatures as high as 80 – 90°C. LFG temperatures are expected to stabilise at 35 – 45°C once methanogenesis is well established.

Generally a subsurface fire can be confirmed by a combination of the following conditions:

- Substantial settlement over a short period of time.

- Smoke or smouldering odour emanating from the LFG collection system or landfill.
- Levels of carbon monoxide (CO) in excess of 1000 parts per million (ppm).
- Combustion residue in LFG extraction wells and/or extraction lines.
- Increase in LFG temperatures in the extraction system (above 60°C).
- Waste mass temperatures in excess of 77°C.

The California Integrated Waste Management Board has been used as an additional resource on managing the potential for subsurface fires. The California Integrated Waste Management Board provides guidelines on using CO as a key performance indicator of landfill fire.

An assessment of a potential subsurface fire can be made using the following confirmation techniques using CO:

- CO in excess of 1,000 ppm is a positive indication of an active underground landfill fire.
- Levels of CO between 100 and 1,000 ppm are viewed as suspicious, requiring further air and temperature monitoring.
- Levels between 50 and 100 ppm indicates that active combustion is not present.

CO is to be regularly monitored (weekly) using the LFG analyser GEM2000Plus for assistance in assessing the potential for a subsurface fire.

Where CO levels are reported to be >1,000ppm, a sample of gas is taken from the extraction well using the pump of an appropriate LFG monitoring instrument. The sample is transferred into a tedlar bag and submitted to a National Association of Testing Authorities (NATA) accredited laboratory for Gas Chromatography-Mass Spectrometry (GC/MS) analysis.

A sample is analysed using (GC/MS) to produce a result that is much more reliable than the instrument. This is undertaken to provide additional insight into potential conditions that may be of concern.

5.10 Settlement Survey

The landfill cap is surveyed by a registered survey to metres Australian Height Datum (m AHD) annually to determine settlement levels. This shall be completed annually until settlement is less than 50mm per year.

5.11 Meteorological Data

Meteorological monitoring is carried out at the Sydney Airport (Station 066037) approximately 3 km south of the Site. Data is collected monthly, and will be used where necessary to assist in the management of LFG. Collated measurements include barometric pressure, temperature, wind speed, rainfall and general weather conditions.

5.12 Monitoring Equipment

Personnel performing monitoring of the LFG extraction system shall be suitably trained and qualified to perform monitoring. All monitoring equipment shall be calibrated and conform to the manufacturer's specifications. The LFG technician shall ensure the monitoring equipment is being calibrated on a regular basis and the records of such are kept on-Site.

Monitoring equipment routinely used at Site includes:

- LFG analysers;
- FID;
- Pressure meter; and
- Temperature probe.

5.12.1 Landfill Gas Analysers

Typical LFG analysers used on-Site vary and can include either the GA 2000, GEM 2000, GEM 2000 Plus or GA 94.

The GA 2000 range of gas analysers has capability that includes measurement of the following:

- Gases including methane, carbon dioxide, oxygen, carbon monoxide and hydrogen sulphide;
- Borehole pressure and barometric pressure; and
- Optional measurement of LFG flow from borehole and of LFG temperature in borehole.

The GEM 2000 range of LFG extraction monitors is specifically for use on landfills to monitor LFG extraction systems, flares and migration control systems. The capability of the GEM 2000 range includes the following:

- Measurement and recording of peak gases including methane, carbon dioxide, oxygen, carbon monoxide, hydrogen sulphide and hydrogen compensated carbon monoxide ;
- Measurement of static and differential borehole pressure and barometric pressure;
- Measurement of LFG flow and calculation of LFG flow in m³/h ;
- Optional measurement of temperature of LFG in borehole; and
- Calculation of calorific value (kJ).

The GEM 2000PLUS range of LFG extraction monitors is specifically for use on landfills to monitor LFG extraction systems, flares and migration control systems where carbon monoxide is also measured. The capability of the GEM 2000Plus range includes the following:

- Measurement and recording of peak gases including methane, carbon dioxide, oxygen, carbon monoxide, hydrogen sulphide and hydrogen compensated carbon monoxide;
- Measurement of static and differential borehole pressure and barometric pressure;
- Measurement of LFG flow and calculation of LFG flow in m³/h ;
- Optional measurement of temperature of LFG in borehole;
- Calculation of calorific value (kJ); and
- Contains an external hydrogen sulphide scrubbing filter to allow for accurate measuring of carbon monoxide (CO). Hydrogen sulphide is commonly known to contaminate the CO sensor and cause false positive CO readings without the appropriate hydrogen sulphide scrubber.

The GA 94 Infra-Red Gas Analyser has been designed to:

- Measure and store data for concentrations of methane, carbon dioxide and oxygen;
- Measure and store data for barometric pressure and the relative pressure in LFG extraction systems;
- Measure and store data for LFG temperature (via a temperature probe or manual entry); and
- Store information for monitoring well water/leachate level.

The GEM 2000Plus LFG analyser is predominantly used on-site for all LFG monitoring. The GEM 2000Plus is calibrated before each use daily by the LFG technician and is regularly (6 months) calibrated by the in accordance with manufacturers specification.

Temperatures can be measured with the GEM 2000Plus; however the Logitech QM1604 is currently being used. The Logitech QM 1604 features a measurement range from -50 to 750 °C and a hold function to lock the reading on the display.

While these are the monitoring units currently used at the site, it is noted that alternate meters that achieve similar measurements can be used as required.

5.12.2 Pressure Meter

The Test 510 differential pressure meter is suitable for pressure measurements in the range 0 to 100 kPa. Measurements compensate for temperature and air density for accurate readings. The instrument is capable of flow velocity measurement with a Pitot tube.

5.12.3 Temperature Probe

The Logitech QM1604 temperature probe features measurement range from -50 to 750 °C and a hold function to lock the reading on the display.

5.12.4 Flame Ionisation Detector

A FID is used to measure small concentrations of methane which is common in landfill gas. The FID must be routinely calibrated and inspected according to the manufacturer's recommendations to ensure that the instrument is working accurately.

The FID is used to measure the presence of fugitive landfill gas emissions through the landfill cap surface. The FID is required to verify the integrity of the landfill cap surface and to identify areas of the cap that require maintenance to prevent fugitive landfill gas emissions and surface water from entering the waste column.

5.13 Monitoring Techniques

5.13.1 Equipment and Maintenance

LFG monitoring will be carried out using LFG analysers as described in **Section 5.6.1**, and include either the GA 2000, GEM 2000, GEM 2000 Plus or GA 94. The instruments will be serviced in accordance with the manufacturer's recommendations

5.13.2 Pre-Monitoring Checks

Prior to undertaking LFG monitoring, the following checks will be carried out:

- In-line hydrophobic filters will be checked and replaced if necessary;
- The hydrogen sulphide pre-filters will be made available and ensured that the media is fresh to begin the sampling operation;
- Battery life will be checked to ensure there is sufficient charge to carry out the monitoring; and
- The calibration status of the instrument will be checked. If necessary, calibration of the instrument will be performed and the date and time recorded.

5.13.3 Records

A record will be made of the following and will be kept on Site:

- Name of LFG technician
- Date of monitoring
- Atmospheric pressure
- Instrument type and serial number
- On-Site weather conditions
- Observations including vegetation die-back, leachate leakages, surface water ponding, damage to security fencing, or accumulations of wind-blown litter
- Damage to borehole head works, caps or taps
- For internal LFG monitoring, the position of the valve between open and closed will be recorded

5.13.4 Monitoring Procedures

The methodology for LFG monitoring shall include the following (as a minimum):

- The sample tube will be attached to the sample tap.
- The tap will be opened and the analyser pump will be switched on.
- When stable readings are achieved, the data will be recorded on the logger.
- Borehole pressure readings will be taken at LFG extraction wells.
- The sample tap will be closed, the tube will be removed, and the analyser pump will be allowed to run, in order to purge into the atmosphere any residual LFG before monitoring of the next location.
- If water level data is required, the borehole cap will be removed and a dip tape will be used to measure the water level relative to the cover level or other agreed upon datum point.
- The borehole cap will be replaced.

All LFG associated monitoring will be carried out in general accordance with the methods and procedures identified in LFTGN03.

5.14 Data Management and Reporting Procedures

5.14.1 Recording and Maintenance of Data

Following each LFG monitoring exercise, a copy of the LFG monitoring results will be kept on Site. Field data is transferred electronically for input into a dedicated database system.

The LFG data collected under this Plan is stored and managed in a relational database constructed to support the overall project. The project database is maintained on a secure network server that is backed up regularly. Access to the database is controlled using features of the system.

Where data is manually entered, a 100% verification should be undertaken of all entered field parameter data to identify and correct transcription errors

LFG monitoring results entered into the database includes:

- Borehole identification
- Date
- Measure parameter concentrations
- Barometric pressure
- Units

5.14.2 Routine Deliverables

The data collected from the LFG monitoring program is provided to Council as indicated below.

Table 11: Reporting Matrix

Report Title	Content	Frequency
Status Report	Results LFG monitoring activities. Provision of information pertaining to any additional works/ monitoring undertaken at Site.	Monthly
LFG Monitoring Results	Results of daily LFG monitoring activities	Monthly*
LFG Flare Outage	Provision of information pertaining to flare shut down	Within 24hrs of outage

Notes: * Weekly reporting will commence following any exceedences of LFG levels - Council will be informed within 24hours , the frequency of reporting may vary subject to direction from Council.

5.14.3 Reporting to the EPA

Reporting to EPA with regards to LFG is as follows:

- The EPA is notified as soon as practicable (within 24 hours where possible) following a flare outage.
- Results of LFG monitoring will be submitted to the EPA at intervals agreed upon with the EPA.

Details of reporting procedures to be carried out in the event that compliance levels are exceeded are included in the Action Plan outlined in Section 7.

5.14.4 Recording Complaints

All complaints regarding LFG will be recorded in the complaints file to be submitted to and maintained by Council. The file will include the following details:

- complaints received including address of complainant;
- nature of the problem including date, time, duration, prevailing weather conditions and cause of the problem; and
- details on the corrective action taken, and any subsequent changes to monitoring and operational procedures.

For further information regarding Site complaint procedures, refer to the current Site Environmental Management Plan.

5.15 Quality Assurance

5.15.1 Construction Quality Assurance

Where new LFG wells are installed, the borehole logs and as-built installation details are forwarded to the EPA and shall aim to provide the following information:

- Borehole identification
- Date of drilling / installation
- Geological strata descriptions
- Groundwater level (and any perched water levels)
- Design of the borehole if more than one type is being used on the Site
- Depth of borehole and level of the bottom of the borehole in m AHD
- The surveyed height of the top of the borehole in m AHD, and the surveyed ground level at the point if it differs
- Grid reference location of the borehole

5.15.2 Monitoring Quality Assurance

Suitably trained and experienced personnel will undertake LFG monitoring. The LFG monitoring equipment will be calibrated, serviced and maintained in line with the manufacturer recommendations. LFG analysers will be regularly serviced and repaired by the equipment manufacturer's certified repair vendor and calibration certificates kept on file at on location at the Site office.

The quality assurance / quality control (QA/QC) program consists of the following components (as a minimum):

- Equipment calibration
- Duplicate monitoring
- Cross checking
- Field inspection audits
- Equipment maintenance

The following additional information is noted with regard to QA/QC:

- Laboratory analysis of gas samples will be undertaken by a NATA accredited laboratory and will be utilised when necessary to identify gas source(s) or to validate results.
- The area adjacent to LFG extraction wells is kept clear and free from any vegetation, to allow for regular access for sampling or maintenance.

5.15.3 Work Procedures

All work procedures are to be updated/ amended as required to reflect current Site operations.

5.15.4 Records

Records regarding the design, specification, operation, inspection, maintenance and monitoring of the LFG extraction system will be maintained on-Site. Specifically, the following records will be maintained (as a minimum):

- Records of all inspections carried out on the system
- Planned and unplanned maintenance and servicing
- Details of any additional extraction well installation
- Records of LFG monitoring

- Telemetry records

These records will comprise both hard copy data sheets and electronic records of system operation. All records will be made available for inspection on request.

An installation log will also be maintained in the Site office and will be used to record all visits, significant alterations to the LFG field extraction regime, and unusual occurrences.

6.0 Work Health and Safety

Whilst undertaking activities to meet the requirements of this plan, appropriate health and safety measures shall be implemented in accordance with the Work Health and Safety (WHS) Regulation 2011. This includes development of task specific SWMS' to identify potential hazards associated with the task steps and use the hierarchy of controls to reduce the risk. The SWMS should be updated as site conditions or methodologies change overtime. Potential hazards to be considered include:

- Uncontrolled ignition of landfill gases accumulated in voids and gas mitigation systems;
- Exposure to landfill gases and vapours;
- Ergonomics;
- Type of equipment used; and
- Other site specific hazards such as plant and machinery, trips/slips/falls, dust, weather, hazardous materials and substances.

7.0 Contingency Action Plan

The contingency action plan will be followed in the event of the following:

- Abnormal changes in monitoring data and/ or exceedances of compliance limits
- Operational problems or failure of the control system
- Reported events (e.g. odour complaints)
- Migration and release of LFG
- Landfill Fire

7.1 Proposed Remedial Actions

One or a combination of the following actions would be considered if any of the conditions identified in **Section 7.0** are noted:

- An assessment of the possible causes of the increase in LFG levels, for example:
 - Perched leachate levels, which can minimise LFG extraction;
 - Fluctuations in leachate and/or groundwater levels; and
 - Rapid, large change in atmospheric pressure.
- The previous monitoring results for the Site will be checked.
- Audits will be completed to determine gas flows/water levels or any other problems that could affect LFG collection efficiency.
- The LFG extraction system will be adjusted, where appropriate, to increase the extraction of LFG adjacent to the affected area.
- If LFG levels are showing no signs of stabilising the following actions would be considered:
 - Sampling of LFG gases for laboratory analysis to verify source.
 - Reducing of perched leachate levels if detected on-Site via optimisation of the leachate extraction system.
 - Application of additional cover material (if surface emissions are detected).
 - Installation of additional extraction wells

Routine LFG monitoring will resume once methane levels had stabilised.

7.2 Adopted Off-Site Landfill Gas Compliance Limits

The assessment and compliance limits applying to the monitoring LFG emissions from the Site are broadly in accordance (in so far as is practicable) with the adopted guidance document (LFTGN03).

The trigger level for methane is one per cent percent above agreed background concentrations. As no background concentration was established prior to waste deposition at the Site, this is assumed to be 0% as per the adopted guidance.

With respect to carbon dioxide, the adopted trigger level is 1.5 per cent above background concentrations. Similar to the case of methane, as no background concentration was established prior to waste deposition at the Site, this is assumed to be 0 % as per the adopted guidance.

7.2.1 Landfill gas monitoring

The presence of methane within boundary LFG monitoring wells at concentrations greater than the adopted trigger level may be an indication that LFG is migrating off-Site. In this situation, response actions as detailed in the air monitoring plan would require implementation. In select situations, these response actions require an investigation of on-Site LFG extraction system performance. An extract sourced from the air monitoring plan is provided below for guidance.

Table 12: Primary and Secondary Probe Trigger Level Response

Trigger Level of Methane	Trigger Level of Carbon Dioxide	Response
Stabilised concentration less than 1% v/v (20 % LEL) above background	Stabilised concentration less than 1.5% v/v above background	No response.
Stabilised concentration greater than 1 % v/v (20 % LEL) above background	Stabilised concentration greater than 1.5 % v/v above background	<p>Roads and Maritime or appointed contractor to notify NSW EPA within 48 hours.</p> <p>Within 14 days of this notification, Roads and Maritime or appointed contractor must submit a plan to the EPA for further investigation and/or remediation of the elevated gas levels. The draft NSW EPA 92015) guidelines state that depending on the circumstances, the plan may include one or more of the following measures:</p> <ul style="list-style-type: none"> - an increase in monitoring frequency and/or the installation of additional monitoring wells - volumetric/gas flow determinations to assess the significance of gas generation rates and the potential scale of off-site gas migration - gas accumulation monitoring in enclosed structures located nearby - a revised landfill gas risk assessment, addressing the source, potential gas migration pathways and potential receptors - notifications to potentially affected persons - installation of landfill gas controls at the source and/or receptors. <p>Subject well is to be re-sampled within 24 hours and twice weekly as LFG well as the two closest LFG wells.</p> <p>Flow rate of the subject LFG well is recorded.</p> <p>If readings continue at this concentration range, monitoring frequency of subject wells increased to daily until concentrations are below 1% v/v.</p> <p>Re-balancing of gas field is conducted within one week of completion of rebalancing and reported.</p>
Stabilised concentration greater than 5 % v/v (100 % LEL) above background	Stabilised concentration greater than 1.5 % v/v above background	<p>All of the above responses.</p> <p>If readings continue to exceed 1% v/v for five continuous days, a gas sample from the subject well will be collected for laboratory analysis.</p> <p>Soil gas sampling (searcher bar / spike test) may be conducted to attempt to determine the extent of gas migration.</p> <p>An audit of gas field is conducted to identify any operational issues or parameters that may affect the above.</p> <p>Update report on response submitted to NSW EPA within one week of completion of audit</p>

Additional measures may be undertaken to determine potential causes of LFG detections within wells. These include an investigation into potential geological pathways (e.g. faults, sand lenses) that may enhance lateral migration of LFG, together with possible actions that may eliminate or decrease the migration of LFG along these pathways. Identification of potential pathways (geological or otherwise) may isolate additional sources of methane separate from the site. Further actions may include a LFG risk assessment and consideration of more extensive controls like LFG extraction systems continue to fail, more extensive measures such as a subsurface cut-off wall.

7.3 Emergency Maintenance

7.3.1 Flares (if implemented)

Response to flare shut down must be initiated within 1 hour of detection.

Should emergency maintenance be required on the flares, the maintenance technician is immediately notified and is responsible for all unscheduled shutdowns and unplanned maintenance. A back-up generator is located on-site and can be placed into operation in the event of a power failure. This ensures that the LFG flares have appropriate power to operate 24 hours a day. A qualified electrician should be utilised to assist with electrical system failures or troubleshooting, as required.

7.3.2 General Infrastructure

Emergency maintenance to all components of the LFG extraction system including LFG extraction lines, condensation traps and extraction wells are to be performed by an appropriately qualified technician.

Spare parts such as piping, caps, valves, and equipment are kept on-Site should emergency maintenance be required. All emergency maintenance that threatens the operations of the LFG migration control system shall be attended to at the highest priority to ensure that the control systems function as designed. Response to infrastructure failure/ damage must be initiated within 1 hour of detection.

Where infrastructure failure/ damage is observed, the following remedial timeframes are to be adhered to ensure that the integrity and operating efficiency of the LFG extraction system is not impaired:

- Emergency repair - within 8hrs of detection
- Temporary repair - within 48 hrs of detection
- Final repair - within 28 days of failure

The LFG operations and maintenance technicians working on behalf of the Site Manager shall perform all repairs as required to ensure normal operations of the LFG system. Any repairs that require specialist training or specific manufacturer repair will be performed by suitably trained manufacturer mechanics.

Due to occupational health and safety reasons, only suitably qualified electricians shall perform electrical works on the LFG system or any other infrastructure.

7.3.3 Air Ingress

Air ingress into the LFG system can be caused by a number of different failure scenarios, such as damage to a well head caused by settlement or vandalism, or failure of a manifold component.

Air ingress can cause problems associated with the generation and balancing of gases within the landfill mass. These problems can result in disruption to LFG quality delivered to the control system. In the worst case scenario, air ingress can promote conditions conducive to subsurface fires.

In the event of such damage being observed, immediate action would be taken to make temporary repairs using sealing tape, pending more permanent repairs, which would be undertaken following isolation of the well head or manifold. Remedial timeframes detailed in **Section 7.3.2** are to be adopted in the event that repair is needed.

If air ingress from surface cracking is suspected, then additional cover application will be considered and implemented. Well boots may also be installed if air intrusion between the well pipe and annular seal is suspected.

7.3.4 Leaks

The integrity of the LFG system will be subject to routine monitoring and any identified problems affecting the operation of the system will be remedied to ensure continued effective control of LFG.

As with air ingress, the priority would be to undertake temporary repairs immediately using sealing tape is possible pending more permanent replacement or resealing of components where leaks are identified. Remedial timeframes detailed in **Section 7.3.2** are to be adopted in the event that repair is needed.

7.4 Landfill Fire

Once a landfill fire begins, it can be extremely difficult to extinguish. If a landfill fire is detected at Site, LFG wells within an appropriate distance of the suspected fire area will be immediately closed off to eliminate vacuum in the affected waste mass. The affected area will be isolated and an investigation will be initiated to confirm the fire and the appropriate remediation action. Fire suppression can be achieved by:

- Switching wells off in surrounding areas;
- Shutting off nearby leachate pumps to allow leachate to pool in the area of the fire;
- Dousing with leachate or water;
- Grout injection; and
- Adding dry ice or another suitable chemical down extraction wells to displace the oxygen and smother the fire.

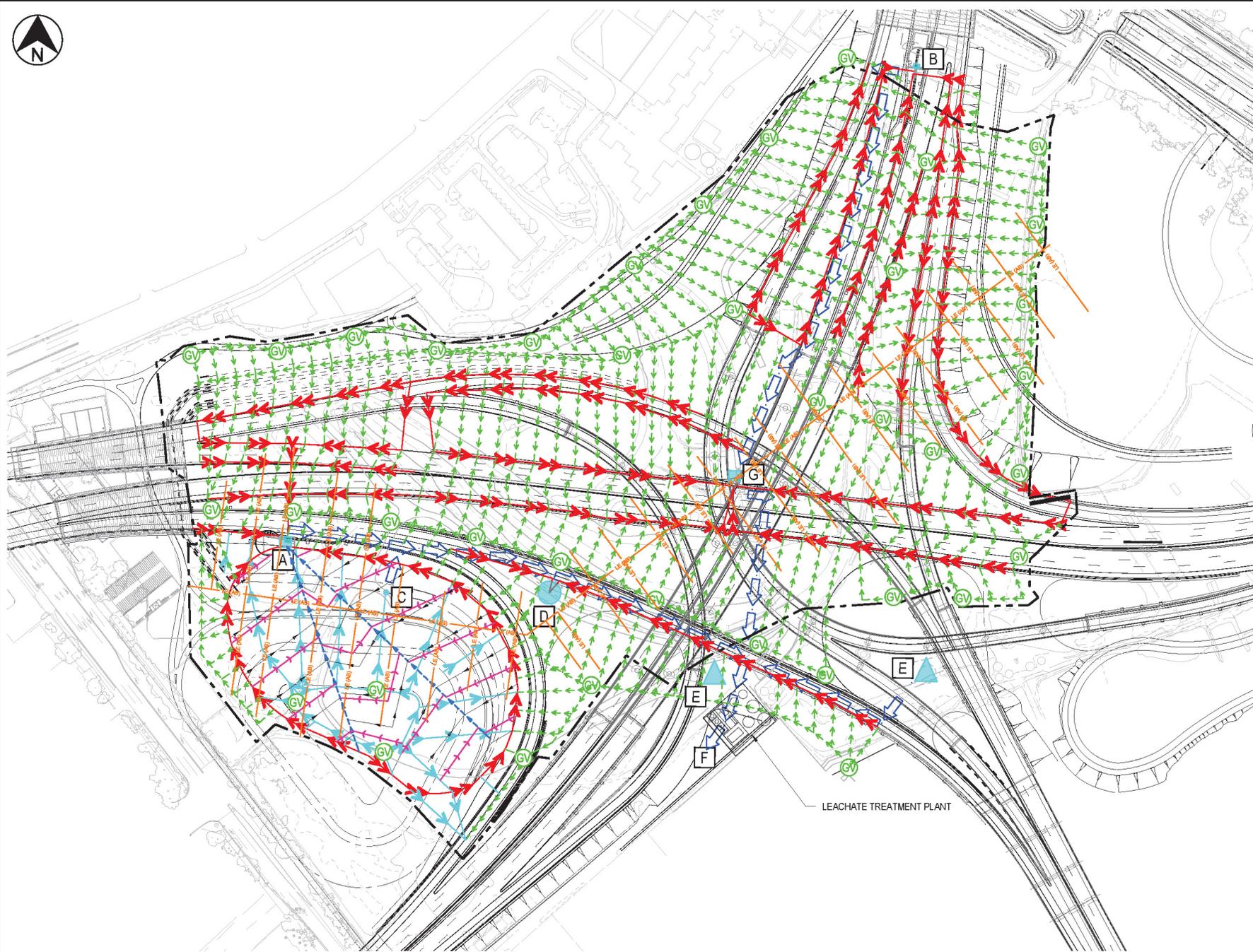
Key indicators for fires described in **Section 5.9** will be used to detect the potential of subsurface fire. All LFG wells are to be treated with caution and managed appropriately to reduce the potential for subsurface fires using one or more of the suppression approaches identified above, if required to eliminate the subsurface fire.

In the event of a subsurface fire, the local fire authority shall be immediately called (000) and the incident thoroughly investigated to prevent future fires from occurring.

Appendix A

Figures

Appendix A Figures



LEGEND

- EXTENT OF SITE CAPPING AND WASTE PLACEMENT
- RISER PIPELINE
- MAIN FEEDER DRAINS AND GAS COLLECTION (REFER NOTES 1 & 5)
- WASTE MOUND FEEDER DRAINS AND GAS COLLECTION (REFER NOTE 2)
- COLLECTOR DRAIN (SEE NOTE 3)
- LEACHATE COLLECTORS (REFER LINER DETAIL ON M5-LDS-DWG-700-390-TW-9140)
- LEACHATE FEEDER DRAINS ABOVE BASE LINER (REFER NOTE 6)
- LEACHATE FEEDER DRAINS BELOW BASE LINER (REFER NOTE 7)
- EXISTING LEACHATE COLLECTION SYSTEM MAINTAINED BY WDA
- PROPOSED GAS VENT (REFER NOTE 4)
- LEACHATE SUMP / STORAGE TANKS
- EXISTING 02.1m LEACHATE RISER / SUMP WELL
- FUTURE LEACHATE EXTRACTION WELL FIELD (6 No. WELLS)
- EXISTING BOTANY SANDS GROUNDWATER EXTRACTION SYSTEM TO BE RETAINED
- PROPOSED TREATED LEACHATE DISCHARGE POINT

NOTES

1. Ø150mm PERFORATED HDPE PIPE LOCATED IN 350mm SQUARE GRAVEL TRENCH AT 10m CENTRES.
2. Ø100mm PERFORATED HDPE PIPE LOCATED IN A 300mm SQUARE GRAVEL TRENCH AT 20m CENTRES.
3. Ø375mm HDPE PIPE WITH 600mm SQUARE CONCRETE PITS AT MAX 200m CENTRES. ALLOW FOR VENTING OF PITS.
4. GAS VENTS AT 50m SPACING IN GAS COLLECTOR PIPES. Ø200mm GALVANISED VENT PIPE TO BE 3m HIGH AND PROTECTED BY A 1.8m HIGH PERIMETER FENCE.
5. FEEDER DRAINS BELOW PAVEMENT COULD BE REPLACED BY A PERMEABLE LAYER BELOW PAVEMENT.
6. Ø150mm PERFORATED HDPE PIPE AT 25m CENTRES.
7. Ø100mm PERFORATED HDPE PIPE AT 20m CENTRES IN A 300mm SQUARE GRAVEL TRENCH.

INFORMATION SHOWN ON THIS DRAWING IS PRELIMINARY ONLY AND SUBJECT TO ADJUSTMENT DURING DETAILED DESIGN STAGE.

STATUS: **SKETCH FOR INFORMATION**

RFT APP 2 - TENDER INFORMATION REQUIREMENTS VOLUME

DRAWING NUMBER: **M5-AJV-SKT-700-320-DR-7801** REV: **A**

DATE: 08/06/2015 07:45 PM, LOGIN NAME: GALLAGHER, QSOFT LOCATION: C:\projects\m5\ajv\skt\700-320-dr-7801.dwg

REV	DATE	DESCRIPTION	SG	RH	BO	PROJECT DIRECTOR
A	03.07.15	ISSUED FOR INFORMATION	SG	RH	BO	

TITLE	INITIAL	DATE
DRAWING PERSON	SG	03.07.15
DRAFTING CHECK		
DESIGNER		
DESIGN CHECK		
DESIGN MANAGER		
PROJECT DIRECTOR		

ORIGINAL DRAWING AT A3 SIZE

SCALE 1:2000

COORDINATE BY STEM: MEA Zone 56 HEIGHT DATUM: A.H.D.

CLIENT: **NSW GOVERNMENT** **Transport WestConnex Delivery Authority**

RIGHT TO PHOTOGRAPHY: SAMSUNG CAT JOINT VENTURE

PROJECT: **WESTCONNEX STAGE 2 NEW M5 MAIN WORKS DESIGN & CONSTRUCT**

TITLE: **ST. PETERS INTERCHANGE LEACHATE TREATMENT AND GAS COLLECTION PASSIVE SYSTEM GENERAL ARRANGEMENT PLAN**



PRINCES HIGHWAY

C
7806

A
7807

B
7808

WOODLEY DRIVE

CAMPBELL LANE

HOLLAND STREET

BURROWS ROAD

ALEXANDRA CANAL

CANAL ROAD

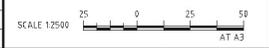
LEGEND

- ROAD CONTROL LINE
- 2000 CONTROL LINE CHAINAGE
- ALEXANDRA LANDFILL SITE
- DESAL PIPELINE - SYDNEY SOUTH
- CADASTRAL BOUNDARY
- EXTENT OF SITE CAPPING AND WASTE PLACEMENT
- CAP TYPE 1 (REFER DRG TW-9143)
- CAP TYPE 2 (REFER DRG TW-9143)
NOTE: CAP TYPE 1 TO BE USED IN AREAS STEEPER THAN 3H:1V
- ROADWAY FORMS CAPPING SYSTEM

DATE: 03/07/15 4:40:37 PM, LOGIN NAME: TIBORNEB, P1414
LOCATION: U:\Work\Stage 2\IE - Design\B-Drawings\BSP1 AND LOCAL ROADS\FINAL\320\400\650\001\LDS-SKT-700-320-DR-7803.dwg

REV	DATE	DESCRIPTION	BC	RH	BO	PROJECT DIRECTOR
A	03.07.15	ISSUED FOR INFORMATION				

TITLE	INITIAL	DATE
DRAFTSPERSON	BC	03.07.15
DRAWING CHECK		
DESIGNER		
DESIGN CHECK		
DESIGN MANAGER		
PROJECT DIRECTOR		



CLIENT

Transport WestConnex Delivery Authority

RIGHT TO PROCEEDS SHARING CAT JOINT VENTURE

PROJECT: WESTCONNEX STAGE 2
NEW M5 MAIN WORKS DESIGN & CONSTRUCT

TITLE: ALEXANDRA LANDFILL CLOSURE PLANS
EXTENT OF CAPPING

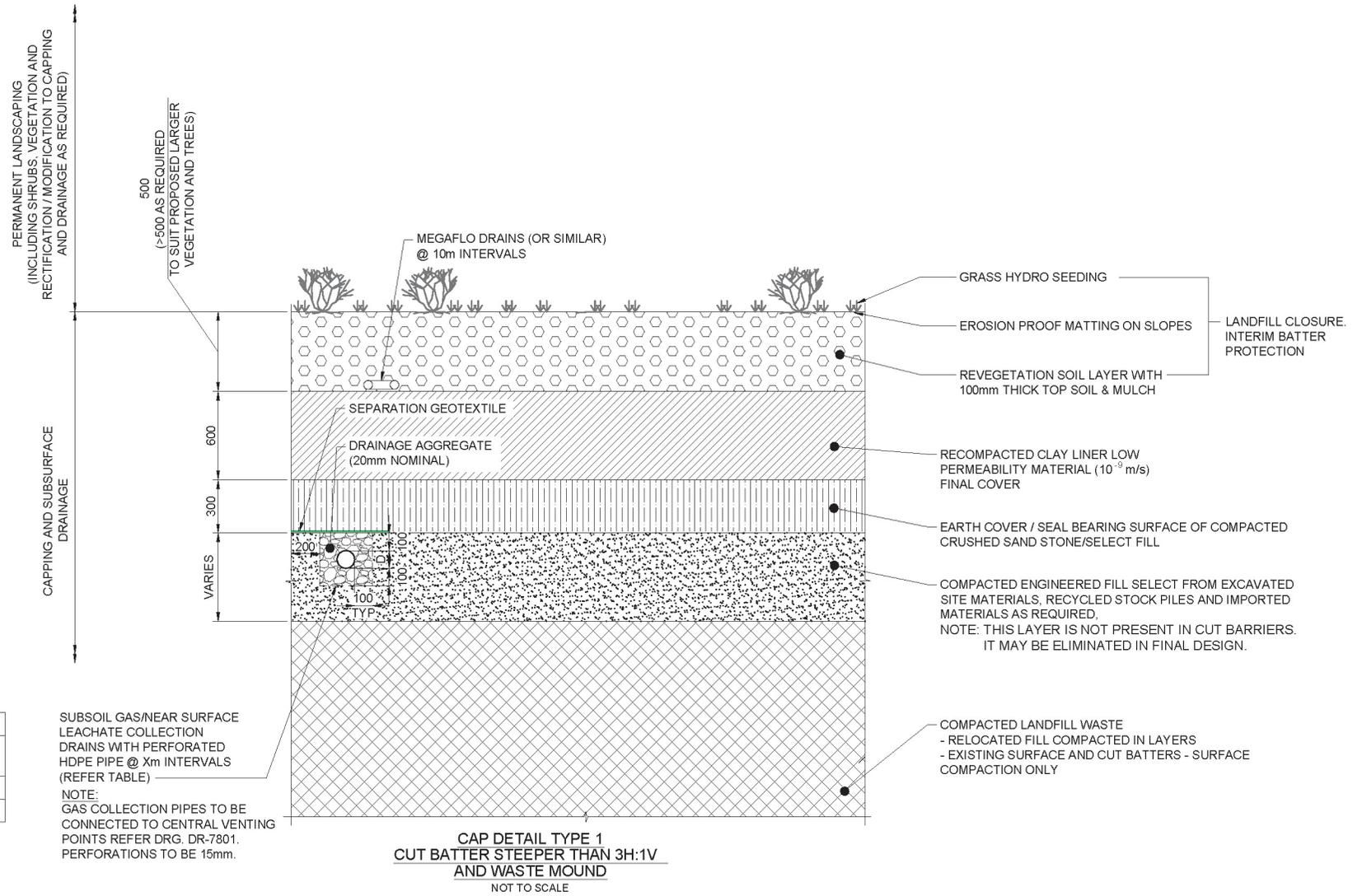
STATUS: **SKETCH INFORMATION ONLY**

DRW APP 2 - TENDER INFORMATION REQUIREMENTS VOLUME

DRAWING NUMBER: M5-LDS-SKT-700-320-DR-7803

REV: A

DATE: 03/07/15 4:45:03 PM, LOCAL NAME: T:\BOWEN_R\IAN, LOCATION: U:\Work\Stage 2\IE - Design\IEB - CAD\IEB Drawings\SIPI AND LOCAL ROAD\FINAL\320\400\65000\IEB-LDS-SKT-700-320-DR-7804.dwg



SUBSOIL GAS PIPE		
	DIAMETER D (mm)	SPACING X (mm)
CUT BATTERS	Ø150	10
WASTE MOUND	Ø100	20

REV	DATE	DESCRIPTION	BY	CHKD	APP'D	PROJECT DIRECTOR
A	03.07.15	ISSUED FOR INFORMATION	BC	RH	BO	

TITLE	INITIAL	DATE
DRAFTSPERSON	BC	03.07.15
DRAFTING CHECK		
DESIGNER		
DESIGN CHECK		
DESIGN MANAGER		
PROJECT DIRECTOR		

CLIENT

DRAGADOS SAMSUNG S&T

PROJECT: WESTCONNEX STAGE 2
NEW M5 MAIN WORKS DESIGN & CONSTRUCT

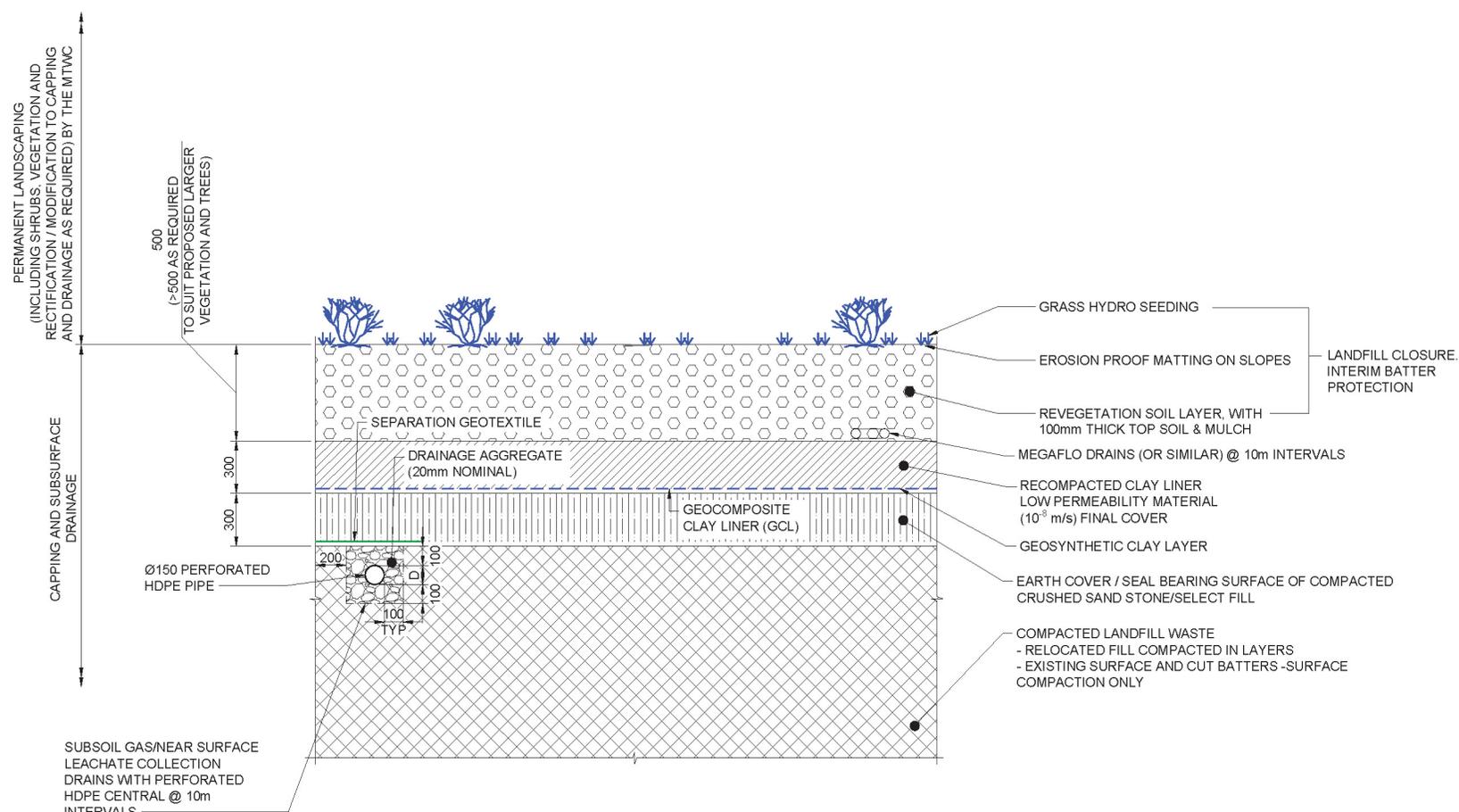
TITLE: ALEXANDRA LANDFILL CLOSURE PLANS
TYPICAL CAPPING LAYER DETAILS
SHEET 1

STATUS: **SKETCH INFORMATION ONLY**

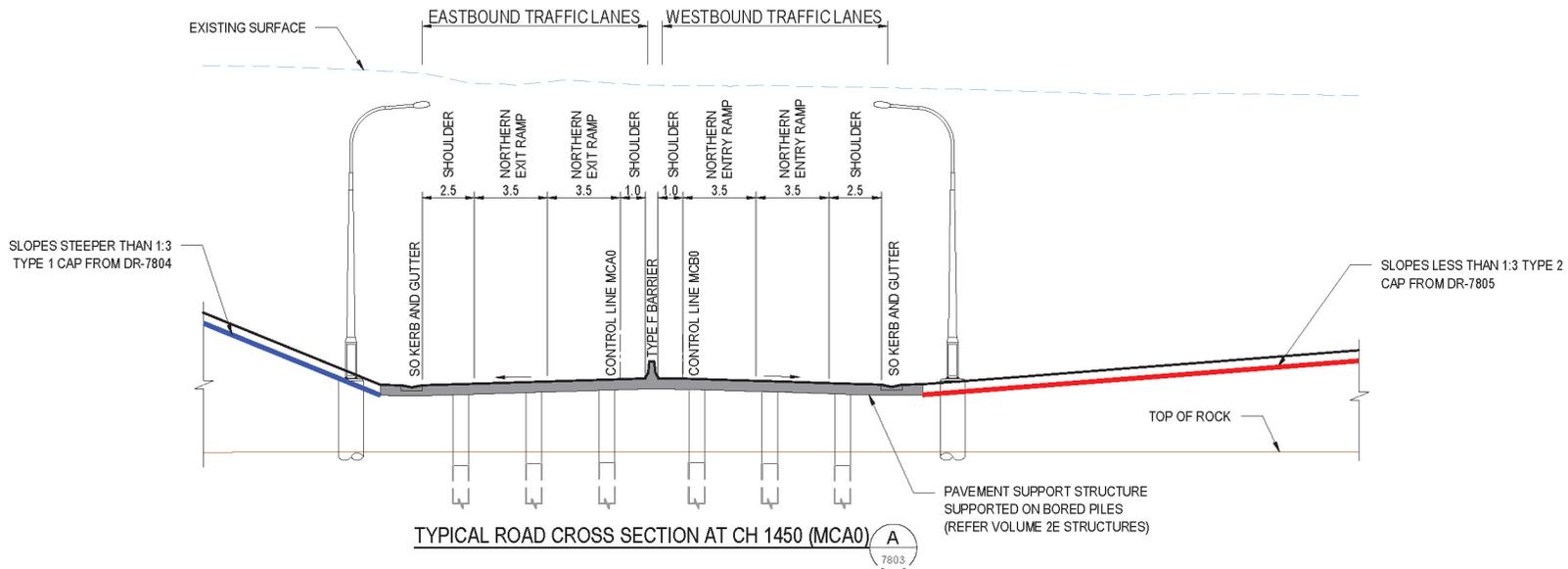
DRIVING NUMBER: M5-LDS-SKT-700-320-DR-7804

REV: A

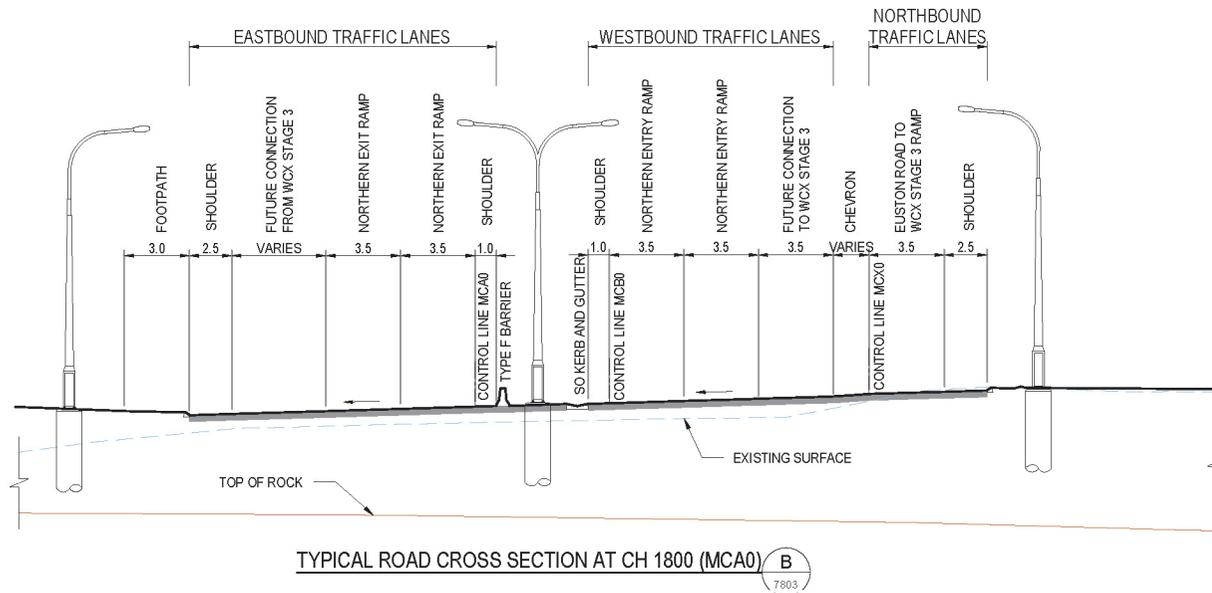
DATE: 03/07/15 4:50 PM, LOCAL NAME: TUBOINER, PLAN LOCATION: U:\AEC\Drawings\2015\LOCAL\ROADS\FINAL\320\400\650001E\LDS-SKT-700-320-DR-7805.dwg



DATE: 03/07/15 4:50 PM, LOCAL NAME: TUBOINER, PLAN LOCATION: U:\AEC\Drawings\2015\LOCAL\ROADS\FINAL\320\400\650001E\LDS-SKT-700-320-DR-7805.dwg		TITLE: ALEXANDRA LANDFILL CLOSURE PLANS TYPICAL CAPPING LAYER DETAILS SHEET 3		CLIENT: Transport WestConnex Delivery Authority		PROJECT: WESTCONNEX STAGE 2 NEW M5 MAIN WORKS DESIGN & CONSTRUCT		STATUS: SKETCH INFORMATION ONLY	
DRAWN: BC		DATE: 03.07.15		DESIGNER: BC		DESIGN CHECK: RH		DESIGN MANAGER: BO	
PROJECT DIRECTOR: []		APPROVAL: []		REVIEWED: []		DRAWING NUMBER: M5-LDS-SKT-700-320-DR-7805		REV: A	



TYPICAL ROAD CROSS SECTION AT CH 1450 (MCA0) A



TYPICAL ROAD CROSS SECTION AT CH 1800 (MCA0) B

DATE: 03/07/15 15:45:05 PM LOCATION: M5 - TILBURNIER - PLAN LOCATION: U:\M5 Stage 2\E - Design\B-Drawings\BSP1 AND LOCAL ROADS FINAL\3300400\660004\LDS-SKT-700-320-DR-7807.dwg

REV	DATE	DESCRIPTION	BY	CHKD	APP'D	PROJECT DIRECTOR
A	03.07.15	ISSUED FOR INFORMATION	BC	RH	BO	

TITLE	INITIAL	DATE
DRAFTSPERSON	BC	03.07.15
DRAFTING CHECK		
DESIGNER		
DESIGN CHECK		
DESIGN MANAGER		
PROJECT DIRECTOR		

ORIGINAL DIMING AT A3 SIZE

SCALE 1:25

COORDINATE SYSTEM: MGA Zone 56 HEIGHT DATUM: AHD

CLIENT

Transport WestConnex Delivery Authority

RIGHTS TO FORM OURS SAMSUNG CAT JUNE VENTURE

PROJECT

**WESTCONNEX STAGE 2
NEW M5 MAIN WORKS DESIGN & CONSTRUCT**

TITLE

**ALEXANDRA LANDFILL CLOSURE PLANS
TYPICAL ROAD DETAILS
SHEET 1**

STATUS

SKETCH INFORMATION ONLY

DRAWING NUMBER

M5-LDS-SKT-700-320-DR-7807

REV

A

This page has been left blank intentionally.

Appendix B

Existing Data

Appendix B Existing Data

Analyte	Units	LOR	Assessment Criteria	Location	LG301	LG302	LG303	LG303	LG304	LG305	LG306	LG307	LG308	LG309	LG310	LG311	-	MW313	LG313	LG313	-
				Field ID	LG301	LG302	LG303	DC101	LG304	LG305	LG306	LG307	LG308	LG309	LG310	LG311	LG312	GW212/ MW311	LG313	QC100	MW311
Field																					
Monitoring Date				24/02/2015	24/02/2015	24/02/2015	-	24/02/2015	24/02/2015	24/02/2015	24/02/2015	24/02/2015	24/02/2015	24/02/2015	24/02/2015	24/02/2015	24/02/2015	24/02/2015	24/02/2015	24/02/2015	24/02/2015
Peak Methane	%		1.25*	8.3	58.5	59.7	-	0	54.2	58.1	0.8	68.1	1.9	70.5	2.7	0	66.2	6.8	-	67.9	
Stable Methane	%			8.2	58.1	59.6	-	0	32.5	57.4	0	68.1	1.8	70.4	2.2	0	66.2	6.8	-	67.9	
Carbon Dioxide	%			3.6	36.9	33.6	-	0.4	25.6	32	7.2	18.5	2.1	27.4	2.7	6.7	32.1	0.7	-	20.1	
Oxygen	%			0	0	0	-	19.8	6.9	0	0.4	0	0.2	0	8.1	7.1	0	0.5	-	0.3	
Lower Explosive Limit	%			OL	OL	OL	-	0	OL	OL	0	OL	44.8	OL	51.5	0	OL	OL	-	OL	
Hydrogen Sulphide	%		1**	0	OL	1194	-	0	2	0	0	1	0	7	0	0	0	0	-	2	
Carbon Monoxide	%			0	10	5	-	1	15	2	0	0	5	3	3	1.3	5	63	-	7	
Flow Rate	L/hr			-0.1	1.6	4.2	-	1	-2.6	0.1	0	5.8	0.9	2.7	0	0	2.9	0.3	-	7.2	
Barometric Pressure	kPa			1010	1010	1010	-	1011	1011	1011	1010	1011	1011	1010	1011	1011	1011	1010	-	1011	
Laboratory																					
Sample date				16/03/2015	16/03/2015	16/03/2015	16/03/2015	16/03/2015	16/03/2015	16/03/2015	16/03/2015	16/03/2015	16/03/2015	16/03/2015	16/03/2015	16/03/2015	16/03/2015	16/03/2015	16/03/2015	16/03/2015	16/03/2015
Methane	mg/m ³	330		45,300	359,000	386,000	388,000	920	368,000	398,000	920	485,000	23,200	480,000	139,000	-	432,000	83,000	83,000	-	
Ethane	mg/m ³	120		<240	<240	<240	<240	<240	<240	<240	<240	<240	<240	<240	<240	-	<240	<240	<240	-	
Propane	mg/m ³	180		<360	<360	<360	<360	<360	<360	<360	<360	<360	<360	<360	<360	-	<360	<360	<360	-	
Butane	mg/m ³	1200		<2400	<2400	<2400	<2400	<2400	<2400	<2400	<2400	<2400	<2400	<2400	<2400	-	<2400	<2400	<2400	-	
Carbon Dioxide	mg/m ³	90		100,000	658,000	584,000	585,000	9130	732,000	560,000	124,000	311,000	69,800	484,000	84,700	-	570,000	20,900	20,300	-	
Carbon Monoxide	mg/m ³	5		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	-	<10	<10	<10	-	
Hydrogen	mg/m ³	4		<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	-	<8	11	11	-	
Helium	mg/m ³	8		<16	<16	<16	<16	<16	<16	<16	<16	<16	<16	<16	<16	-	<16	<16	<16	-	
Oxygen	mg/m ³	1310		<2620	<2620	<2620	<2620	261,000	<2620	<2620	75,400	<2620	46,200	<2620	68,600	-	<2620	<2620	<2620	-	
Inert Gases (N2, Ar) by difference	mg/m ³	1100		1,000,000	97,300	96,100	93,800	908,000	34,300	92,700	998,000	97,300	1,020,000	<2200	788,000	-	25,200	986,000	986,000	-	
Ethane	Mol %	0.01		<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.021	<0.020	-	<0.020	<0.020	<0.020	-	
Propane	Mol %	0.01		<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.021	<0.020	-	<0.020	<0.020	<0.020	-	
Carbon Monoxide	Mol %	0.0005		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0011	<0.0010	-	<0.0010	<0.0010	<0.0010	-	
Butane	Mol %	0.05		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.11	<0.10	-	<0.10	<0.10	<0.10	-	
Hydrogen	Mol %	0.005		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.011	-	<0.010	0.013	0.014	-	
Helium	Mol %	0.005		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.011	-	<0.010	<0.010	<0.010	-	
Methane	Mol %	0.05		6.93	54.9	59.1	59.3	0.14	56.3	60.8	0.14	74.2	3.54	73.4	21.2	-	66.1	12.7	12.7	-	
Oxygen	Mol %	0.1		<0.20	<0.20	<0.20	<0.20	20	<0.20	<0.20	5.76	<0.20	3.53	<0.21	5.24	-	<0.20	<0.20	<0.20	-	
Carbon Dioxide	Mol %	0.005		5.59	36.6	32.5	32.5	0.507	40.7	31.1	6.87	17.3	3.88	26.9	4.71	-	31.7	1.16	1.13	-	
Inert Gases (N2, Ar) by difference	Mol %	0.1		87.5	8.5	8.4	8.2	79.4	3	8.1	87.2	8.5	89	<0.21	68.8	-	2.2	86.1	86.2	-	

Notes:
 OL - over instrument measurement limit
 *NSW EPA (1996) Environmental Guidelines: Solid Waste Landfills
 ** WHO (2000) Air Quality Guidelines for Europe.
 mg/m³ - milligrams per cubic metre

Chemical Name	Units	LOR	CRC Care (2011) HSLs Non Petroleum			CRC Care (2011) HSLs Petroleum			NEPM (2013)	WHO (2000)*	WHO (2010)*	US EPA (2015)	Location	LG300	LG301	LG302	LG303	LG303	LG304	LG305	LG306
			HSL C - Sand 1 to < 2m	HSL C - Sand 2 to < 4m	IMW Sand 0 to < 2m	HSL C Sand 1 to < 2m	HSL C Sand 2 to < 4m	IMW Sand 0 to < 2m					Field ID	LG300	LG301	LG302	LG303	QC101	LG304	LG305	LG306
												Sample Code	EN1510906006	EN1510906015	EN1510906014	EN1510906012	EN1510906013	EN1510906005	EN1510906011	EN1510906010	
												Sample Date	16/03/2015	16/03/2015	16/03/2015	16/03/2015	16/03/2015	16/03/2015	16/03/2015		
1,1-dichloroethene	µg/m³	200									8800	<200	<200	<200	<200	<200	<200	<200	<200	<200	
1,2,4-trichlorobenzene	µg/m³	370							500		88	<370	<370	<370	<370	<370	<370	<370	<370	<370	
1,2,4-trimethylbenzene	µg/m³	240									310	<240	<240	6440	410	383	<240	33,500	<240	<240	
1,2-dibromoethane	µg/m³	380									2	<380	<380	<380	<380	<380	<380	<380	<380	<380	
1,2-dichlorobenzene	µg/m³	300									8800	<300	<300	<300	<300	<300	<300	<300	<300	<300	
1,2-dichloroethane	µg/m³	200									4,7	<200	<200	<200	<200	<200	<200	<200	<200	<200	
1,2-dichloropropane	µg/m³	230							35,7		12	<230	<230	<230	<230	<230	<230	<230	<230	<230	
1,3,5-trimethylbenzene	µg/m³	240									240	<240	<240	1120	<240	<240	<240	<240	13,600	<240	
1,3-Butadiene	µg/m³	110									4,1	<110	<110	<110	<110	<110	<110	<110	<110	<110	
1,3-dichlorobenzene	µg/m³	300									300	<300	<300	<300	<300	<300	<300	<300	<300	<300	
1,4-dichlorobenzene	µg/m³	300									11	<300	<300	<300	<300	<300	<300	<300	<300	<300	
1-methyl-4-ethyl benzene	µg/m³	240							10000		240	<240	<240	963	<240	<240	<240	<240	9380	<240	
2-Chloro-1,3-butadiene	µg/m³	180									0,41	<180	<180	<180	<180	<180	<180	<180	<180	<180	
2-chlorotoluene	µg/m³	260									260	<260	<260	<260	<260	<260	<260	<260	<260	<260	
4-Methyl-2-pentanone	µg/m³	200									130,000	<200	<200	<200	<200	<200	<200	<200	528	<200	
Acroetin	µg/m³	110									0,88	<110	<110	<110	<110	<110	<110	<110	<110	<110	
Bromodichloromethane	µg/m³	340									3,3	<340	<340	<340	<340	<340	<340	<340	<340	<340	
Bromoform	µg/m³	520									110	<520	<520	<520	<520	<520	<520	<520	<520	<520	
Bromomethane	µg/m³	190									220	<190	<190	<190	<190	<190	<190	<190	<190	<190	
Carbon disulfide	µg/m³	160									1000	<160	<160	<160	<160	<160	<160	<160	<160	<160	
Carbon tetrachloride	µg/m³	310									61	<310	<310	<310	<310	<310	<310	<310	<310	<310	
Chlorobenzene	µg/m³	230									2300	<230	<230	<230	<230	<230	<230	<230	<230	<230	
Chlorodibromomethane	µg/m³	430									4,5	<430	<430	<430	<430	<430	<430	<430	<430	<430	
Chloroethane	µg/m³	130									440,000	<130	<130	<130	<130	<130	<130	<130	<130	<130	
Chloroform	µg/m³	240									5,3	<240	<240	<240	<240	<240	<240	<240	<240	<240	
Chloromethane	µg/m³	100									3900	<100	<100	<100	<100	<100	<100	<100	<100	<100	
cis-1,3-dichloropropene	µg/m³	230									230	<230	<230	<230	<230	<230	<230	<230	<230	<230	
Cyclohexane	µg/m³	170									260,000	<170	296	3260	3130	3000	<170	7280	3750	<170	
Dichlorodifluoromethane	µg/m³	250									4400	<250	<250	<250	<250	<250	<250	<250	<250	<250	
Dichloromethane	µg/m³	170									12,000	<170	<170	<170	<170	<170	<170	<170	<170	<170	
Diisopropyl ether	µg/m³	210									31,000	<210	<210	<210	<210	<210	<210	<210	<210	<210	
Ethanol	µg/m³	90									90	<90	<90	<90	<90	<90	<90	<90	<90	<90	
Hexachlorobutadiene	µg/m³	530									5,6	<530	<530	<530	<530	<530	<530	<530	<530	<530	
Isopropylbenzene	µg/m³	250									18,000	<250	<250	1500	1150	1120	<250	3710	<250	<250	
Methyl Methacrylate	µg/m³	210									31,000	<210	<210	<210	<210	<210	<210	<210	<210	<210	
n-butylbenzene	µg/m³	270									270	<270	<270	281	<270	<270	<270	922	<270	<270	
n-propylbenzene	µg/m³	250									44,000	<250	<250	1680	639	614	<250	10,400	<250	<250	
sec-butylbenzene	µg/m³	270									270	<270	<270	<270	358	352	<270	872	<270	<270	
Styrene	µg/m³	210									210	<210	<210	<210	<210	<210	<210	<210	<210	<210	
tert-butylbenzene	µg/m³	270									2600	<270	<270	<270	<270	<270	<270	<270	<270	<270	
trans-1,2-dichloroethene	µg/m³	200									200	<200	<200	<200	<200	<200	<200	<200	<200	<200	
trans-1,3-dichloropropene	µg/m³	230									230	<230	<230	<230	<230	<230	<230	<230	<230	<230	
Trichlorofluoromethane	µg/m³	280									31,000	<280	<280	<280	<280	<280	<280	<280	<280	<280	
Vinyl acetate	µg/m³	180									8800	<180	<180	<180	<180	<180	<180	<180	<180	<180	
Vinyl bromide (bromoethene)	µg/m³	220									3,8	<220	<220	<220	<220	<220	<220	<220	<220	<220	

Notes:
 LO R - Laboratory limit of reporting
 µg/m³ - micrograms per cubic metre
 mg/m³ - milligrams per cubic metre
 < denotes result less than LOR
 HSL - Health screening levels
 HSL C - Open Space
 * Attenuation factor of 10 applied

CRC Care (2011) - Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC CARE) Technical Report No.10 - Health Screening Levels for
 World Health Organisation (WHO) 2010, WHO Guidelines for Indoor Air Quality, Selected Pollutants, World Health Organization, Europe
 World Health Organisation (WHO) 2000, Guidelines for Air Quality, World Health Organization, Geneva.
 US EPA (2015) - United States Environmental Protection Agency (US EPA) (2015) - Regional Screening Levels - Industrial Air, January
 so you need to ensure you are using the most up to date version of these values.
 NEPM (2013) National Environment Protection Council (NEPC) (2013), National Environment Protection (Assessment of Site Contamination) Amendment Measure, 2013 (No.1), Interim soil vapour health investigation levels (HILs) for volatile organic chlorinated compounds (VOCCs).

Chemical Name	Units	LOR	CRC Care (2011) HSLs Non Petroleum			CRC Care (2011) HSLs Petroleum			NEPM (2013)	WHO (2000)*	WHO (2010)*	US EPA (2015)	LG307	LG308	LG309	LG310	LG311	LG313	LG313	MW313
			HSL C - Sand 1 to < 2m	HSL C - Sand 2 to < 4m	IMW Sand 0 to < 2m	HSL C Sand 1 to < 2m	HSL C Sand 2 to < 4m	IMW Sand 0 to < 2m					EN1510906001 16/03/2015	EN1510906002 16/03/2015	EN1510906004 16/03/2015	EN1510906003 16/03/2015	EN1510906009 16/03/2015	EN1510906007 16/03/2015	EN1510906008 16/03/2015	EN1510906016 16/03/2015
Sampling Quality Assurance																				
Pressure	kPa	0.1										102	98.3	100	97.6	97.2	96.9	96.7	99	
Pressure - Laboratory Atmosphere	kPa	0.1										101	101	101	101	101	101	101	101	101
Temperature	°C	0.1										27	27	27	27	27	27	27	27	27
Petroleum Hydrocarbons in Gaseous Samples																				
TRH C10-C14	µg/m3	35,000										<35,000	287,000	<35,000	205,000	<35,000	<35,000	<35,000	254,000	
TRH C6-C9	µg/m3	20,000										<20,000	106,000	<20,000	103,000	<20,000	<20,000	<20,000	250,000	
Total Recoverable Hydrocarbons - NEPM 2013																				
TRH >C10-C16	µg/m3	40,000	NL	NL	NL	NL	NL	NL				<40,000	208,000	<40,000	150,000	<40,000	<40,000	<40,000	184,000	
TRH >C10-C16 less Naphthalene (F2)	µg/m3	40,000		NL		NL	NL	NL				<40,000	208,000	<40,000	150,000	<40,000	<40,000	<40,000	184,000	
TRH C6-C10	µg/m3	20,000										<20,000	142,000	<20,000	123,000	<20,000	<20,000	<20,000	259,000	
TRH C6-C10 less BTEX (F1)	µg/m3	20,000	1.38E8	2.76E8	4.E+07	NL	NL	1.8E8				<20,000	141,000	<20,000	122,000	<20,000	<20,000	<20,000	257,000	
VOCs by USEPA Method TO15																				
2-isopropyltoluene	mg/m3	0.27										<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	
Ethyl tert-Butyl Ether (ETBE)	mg/m3	0.21										<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	
Naphthalene	µg/m3	100	NL	NL	880000	NL	NL	880000		100	3.6	<100	<100	<100	<100	<100	<100	<100	387	
tert-Amyl Methyl Ether (TAME)	mg/m3	0.21										<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	
tert-Butyl alcohol	mg/m3	0.15										<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	
Tetrachloroethene (PCE)	µg/m3	340							4000	2500	2500	<340	<340	<340	<340	<340	<340	<340	<340	
Trichloroethene (TCE)	µg/m3	5.4							400	230	230	<5.4	<5.4	<5.4	<5.4	<5.4	102	108	<5.4	
cis-1,2-dichloroethene	µg/m3	20							2000			<20	22.6	<20	<20	<20	79.2	86.4	<20	
Vinyl chloride	µg/m3	5.1							500	100		<5.1	<5.1	<5.1	36.3	<5.1	437	485	<5.1	
Total Xylene	µg/m3	650								8700	4400	<650	<650	<650	<650	<650	<650	<650	<650	
Benzene	µg/m3	100	2.4E6	4.8E6	760000	2.4E6	4.7E6	760000		17		<100	<100	<100	177	<100	<100	<100	910	
Ethylbenzene	µg/m3	220	NL	NL	NL	NL	NL	NL		220000		<220	<220	<220	<220	<220	<220	<220	<220	
Toluene	µg/m3	190	NL	NL	NL	NL	NL	NL		2600		<190	<190	<190	<190	<190	<190	<190	<190	
Xylene (m & p)	µg/m3	430									220,000	<430	556	<430	<430	<430	<430	<430	<430	
Xylene (o)	µg/m3	220									4400	<220	<220	<220	<220	<220	<220	<220	<220	
Freon 113	µg/m3	380									1,300,000	<380	<380	<380	<380	<380	<380	<380	<380	
Freon 114	µg/m3	350										<350	<350	<350	<350	<350	<350	<350	<350	
2-Propanol	µg/m3	120									310,000	<120	<120	<120	<120	<120	<120	<120	<120	
Isocotane	µg/m3	230										<230	509	<230	780	<230	340	366	770	
Propene	µg/m3	90									130,000	<90	<90	<90	<90	<90	<90	<90	<90	
1,4-Dioxane	µg/m3	180									25	<180	<180	<180	<180	<180	<180	<180	<180	
Acetone	µg/m3	120									1,400,000	<120	<120	<120	<120	<120	<120	<120	<120	
Acetonitrile	µg/m3	80									2600	<80	<80	<80	<80	<80	<80	<80	<80	
Acrylonitrile	µg/m3	110									1.8	<110	<110	<110	<110	<110	<110	<110	<110	
Allyl chloride	µg/m3	160									20	<160	<160	<160	<160	<160	<160	<160	<160	
Ethyl acetate	µg/m3	180									3100	<180	<180	<180	<180	<180	<180	<180	<180	
Heptane	µg/m3	200										<200	766	<200	557	<200	377	404	2900	
Hexane	µg/m3	180									31,000	<180	1710	<180	1460	<180	683	764	1460	
Methyltributyl Ether	µg/m3	180									470	<180	<180	<180	<180	<180	<180	<180	<180	
Tetrahydrofuran	µg/m3	150									88,000	<150	<150	<150	<150	<150	<150	<150	<150	
Methyl Ethyl Ketone	µg/m3	150									220,000	<150	<150	<150	<150	<150	<150	<150	<150	
2-hexanone (MBK)	µg/m3	200									1300	<200	<200	<200	<200	<200	<200	<200	<200	
Benzyl chloride	µg/m3	260									2.5	<260	<260	<260	<260	<260	<260	<260	<260	
1,1,1,2-tetrachloroethane	µg/m3	340									17	<340	<340	<340	<340	<340	<340	<340	<340	
1,1,1-trichloroethane	µg/m3	270									220,000	<270	<270	<270	<270	<270	<270	<270	<270	
1,1,2,2-tetrachloroethane	µg/m3	340									2.1	<340	<340	<340	<340	<340	<340	<340	<340	
1,1,2-trichloroethane	µg/m3	270									7.7	<270	<270	<270	<270	<270	<270	<270	<270	
1,1-dichloroethane	µg/m3	200									77	<200	<200	<200	<200	<200	<200	<200	<200	

Chemical Name	Units	LOR	CRC Care (2011) HSLs Non Petroleum			CRC Care (2011) HSLs Petroleum			NEPM (2013)	WHO (2000)*	WHO (2010)*	US EPA (2015)	Location	LG307	LG308	LG309	LG310	LG311	LG313	LG313	MW313
			HSL C - Sand 1 to < 2m	HSL C - Sand 2 to < 4m	IMW Sand 0 to < 2m	HSL C Sand 1 to < 2m	HSL C Sand 2 to < 4m	IMW Sand 0 to < 2m					Field ID	EN1510906001 16/03/2015	EN1510906002 16/03/2015	EN1510906004 16/03/2015	EN1510906003 16/03/2015	EN1510906009 16/03/2015	EN1510906007 16/03/2015	EN1510906008 16/03/2015	EN1510906016 16/03/2015
1,1-dichloroethene	µg/m³	200									8800	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200
1,2,4-trichlorobenzene	µg/m³	370							500		88	<370	<370	<370	<370	<370	<370	<370	<370	<370	<370
1,2,4-trimethylbenzene	µg/m³	240									310	<240	<240	<240	<240	<240	<240	<240	<240	<240	<240
1,2-dibromoethane	µg/m³	380									2	<380	<380	<380	<380	<380	<380	<380	<380	<380	<380
1,2-dichlorobenzene	µg/m³	300									8800	<300	<300	<300	<300	<300	<300	<300	<300	<300	<300
1,2-dichloroethane	µg/m³	200							35,7		4,7	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200
1,2-dichloropropane	µg/m³	230									12	<230	<230	<230	<230	<230	<230	<230	<230	<230	<230
1,3,5-trimethylbenzene	µg/m³	240										<240	<240	<240	<240	<240	<240	<240	<240	<240	<240
1,3-Butadiene	µg/m³	110									4,1	<110	<110	<110	<110	<110	<110	<110	<110	<110	<110
1,3-dichlorobenzene	µg/m³	300										<300	<300	<300	<300	<300	<300	<300	<300	<300	<300
1,4-dichlorobenzene	µg/m³	300										<300	<300	<300	<300	<300	<300	<300	<300	<300	<300
1-methyl-4-ethyl benzene	µg/m³	240							10000		11	<240	<240	<240	<240	<240	<240	<240	<240	<240	<240
2-Chloro-1,3-butadiene	µg/m³	180									0,41	<180	<180	<180	<180	<180	<180	<180	<180	<180	<180
2-chlorotoluene	µg/m³	260										<260	<260	<260	<260	<260	<260	<260	<260	<260	<260
4-Methyl-2-pentanone	µg/m³	200									130,000	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200
Acrolein	µg/m³	110							500		0,88	<110	<110	<110	<110	<110	<110	<110	<110	<110	<110
Bromodichloromethane	µg/m³	340									3,3	<340	<340	<340	<340	<340	<340	<340	<340	<340	<340
Bromoforn	µg/m³	520									110	<520	<520	<520	<520	<520	<520	<520	<520	<520	<520
Bromomethane	µg/m³	190									220	<190	<190	<190	<190	<190	<190	<190	<190	<190	<190
Carbon disulfide	µg/m³	160									1000	<160	<160	<160	<160	<160	<160	<160	<160	<160	<160
Carbon tetrachloride	µg/m³	310									61	<310	<310	<310	<310	<310	<310	<310	<310	<310	<310
Chlorobenzene	µg/m³	230									5000	<230	<230	<230	<230	<230	<230	<230	<230	<230	<230
Chlorodibromomethane	µg/m³	430									4,5	<430	<430	<430	<430	<430	<430	<430	<430	<430	<430
Chloroethane	µg/m³	130									440,000	<130	<130	<130	<130	<130	<130	<130	<130	<130	<130
Chloroform	µg/m³	240									238,1	<240	<240	<240	<240	<240	<240	<240	<240	<240	<240
Chloromethane	µg/m³	100									3900	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
cis-1,3-dichloropropene	µg/m³	230										<230	<230	<230	<230	<230	<230	<230	<230	<230	<230
Cyclohexane	µg/m³	170									260,000	<170	2920	<170	1980	204	598	671	4400	250	250
Dichlorodifluoromethane	µg/m³	250									4400	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250
Dichloromethane	µg/m³	170									12,000	<170	<170	<170	<170	<170	<170	<170	<170	<170	<170
Diisopropyl ether	µg/m³	210									31,000	<210	<210	<210	<210	<210	<210	<210	<210	<210	<210
Ethanol	µg/m³	90										<90	<90	<90	<90	<90	133	162	<90	<90	<90
Hexachlorobutadiene	µg/m³	530									5,6	<530	<530	<530	<530	<530	<530	<530	<530	<530	<530
Isopropylbenzene	µg/m³	250									18,000	<250	428	<250	1330	<250	<250	<250	<250	<250	1160
Methyl Methacrylate	µg/m³	210									31,000	<210	<210	<210	<210	<210	<210	<210	<210	<210	<210
n-butylbenzene	µg/m³	270										<270	<270	<270	<270	<270	<270	<270	<270	<270	<270
n-propylbenzene	µg/m³	250									44,000	<250	<250	<250	<250	<250	<250	<250	<250	<250	904
sec-butylbenzene	µg/m³	270										<270	380	<270	434	<270	<270	<270	<270	<270	351
Styrene	µg/m³	210									2600	<210	<210	<210	<210	<210	<210	<210	<210	<210	<210
ter-butylbenzene	µg/m³	270										<270	<270	<270	<270	<270	<270	<270	<270	<270	<270
trans-1,2-dichloroethene	µg/m³	200										<200	<200	<200	<200	<200	<200	<200	<200	<200	<200
trans-1,3-dichloropropene	µg/m³	230										<230	<230	<230	<230	<230	<230	<230	<230	<230	<230
Trichlorofluoromethane	µg/m³	280										<280	<280	<280	<280	<280	<280	<280	<280	<280	<280
Vinyl acetate	µg/m³	180									8600	<180	<180	<180	<180	<180	<180	<180	<180	<180	<180
Vinyl bromide (bromoethene)	µg/m³	220										<220	<220	<220	<220	<220	<220	<220	<220	<220	<220

Notes:
LO R - laboratory limit of reporting
µg/m³ - micrograms per cubic metre
mg/m³ - milligrams per cubic met
< denotes result less than LOR
HSLs - Health screening levels
HSL C - Open Space
* Attenuation factor of 10 applied

CRC Care (2011) - Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC CARE) Technical Report No.10 - Health Screening Levels for
World Health Organisation (WHO) 2010, WHO Guidelines for Indoor Air Quality, Selected Pollutants, World Health Organization, Europe
World Health Organisation (WHO) 2000, Guidelines for Air Quality, World Health Organization, Geneva.
US EPA (2015) - United States Environmental Protection Agency (US EPA) (2015) - Regional Screening Levels - Industrial Air, January
so you need to ensure you are using the most up to date version of these values).
NEPM (2013) National Environment Protection Council (NEPC) (2013), National Environment Protection (Assessment of Site Contamination) Amendment Measure, 2013 (No.1), Interim soil vapour health investigation levels (HILs) for volatile organic chlorinated compounds (VOCCs).

This page has been left blank intentionally.

