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REMEDIAL ACTION PLAN FOR VALAD TEMPE COMMERCIAL DEVELOPMENT AT 630 - 726 PRINCES HIGHWAY AND AREAS 1A &1B TEMPE LANDS, TEMPE

Prepared for:

Valad Property Group Ltd
Level 9, 1 Chifley Square
Sydney NSW 2000

Report Date: 3 February 2009
Project Ref: ENVILCOV00315AH-R03d

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3 February 2009

Valad Property Group Ltd
Level 9, 1 Chifley Square
Sydney NSW 2000

Attention: Denis Ghersinich

Dear Denis

RE: Remedial Action Plan for Valad Tempe Commercial Development at 630 -726 Princes Highway and Areas 1A & 1B Tempe Lands, Tempe

Coffey Environments Pty Ltd (Coffey Environments) is pleased to provide a Remedial Action Plan for the abovementioned site.

This report should be read in conjunction with the attached "Important Information About Your Coffey Report", which contains important information about the report.

We trust that the report meets with your current requirements. Should you require further information, please do not hesitate to contact the undersigned.

For and on behalf of Coffey Environments Pty Ltd

Benedict Smith
Environmental Scientist

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CONTENTS

CONTENTS

CONTENTS

LIST OF ATTACHMENTS

Figures

Appendices

ABBREVIATIONS

AHD	Australian Height Datum
ALS	Australian Laboratory Services
ANZECC	Australian and New Zealand Environment and Conservation Council
C6-C36	Hydrocarbon chainlength fraction
Bgl	below ground level
BH	Borehole
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
COC	Chain of Custody
DLWC	Department of Land and Water Conservation (NSW)
DO	Dissolved Oxygen
EC	Electrical Conductivity
Eh	Oxidation/Reduction Potential
ESA	Environmental Site Assessment
LOR	Limit of Reporting
µg/L	micrograms per litre
mg/kg	milligrams per kilogram
mg/L	milligrams per litre
MW	Monitoring Well
NATA	National Association of Testing Authorities
NEPM	National Environment Protection Measure
NSW EPA	Environment Protection Authority of New South Wales
OCP	Organochlorine Pesticide

ABBREVIATIONS

OPP	Organophosphorous Pesticide
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PID	Photoionisation Detector
Ppm	parts per million
PQL	Practical Quantitation Limit
PSH	Phase Separated Hydrocarbon
PVC	Polyvinyl Chloride
QA	Quality Assurance
QC	Quality Control
RL	Reduced Level
RPD	Relative Percent Difference
SOP	Standard Operating Procedures
SWL	Static Water Level
TPH	Total Petroleum Hydrocarbon
UST	Underground Storage Tank
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

This document presents a Remediation Action Plan (RAP) prepared by Coffey Environments Pty Ltd (Coffey) for the site of the proposed IKEA development at 630 – 726 Princes Highway, Tempe, NSW and the adjacent areas of 1A and 1B of the former Tempe Landfill. The RAP has been prepared at the request of Valad Property Group Ltd (Valad) who is the proposed developer and current site owners. This RAP has been prepared in general accordance with the NSW EPA (1997) Guidelines for Consultants Reporting on Contaminated Sites. We understand that Mr Graeme Nyland of Environ, a NSW DECC accredited Site Auditor has been engaged to undertake a statutory audit of the site under the provisions of the Contaminated Land Management (CLM) act.

The land at Princes Highway comprises three separate properties, with the proposed development spanning across all. The development is also planned to use part of the adjacent Tempe Lands site known as Areas 1A and 1B. The site is located on the southern side of Princes Highway, Tempe NSW. The site consists of six different lots comprising Lot A DP 399884 (KAS Auto), Lot B in DP 399884 (Kennards Storage), Lot A DP 385209 & Lot E DP 385210 (Ateco) as well as Area 1A and Area 1B of the Tempe Lands located at Bellevue Street, Tempe, NSW. Areas 1A and 1B comprise Lot 201 in DP 1097238 and Lot 200 in DP 1097238.

The site is to be developed into a large two storey retail development, with associated car parking and transport infrastructure. According to the current architectural plans, the building structure is proposed to cover areas of the Ateco property and parts of the former Tempe Lands. The car park will predominantly cover the Kennards Storage property, KAS Auto and Tempe Lands. The total area of the development is 9.98ha.

A site history review completed by Coffey as part of a previous works package indicates that an area of the Site was used as a brick pit (former Tempe Lands) and associated brick works (located on the Kennards Storage property). KAS Auto is a former service station, known to have had underground storage tanks (USTs) until 1995, although the exact fate of the tanks is not known. The Ateco building, a Greenfield area until about 1954, had a large industrial warehouse style building built on it, initially owned and utilised by Penfolds Wine Pty Ltd and subsequently by Ateco for manufacture and storage of automotive parts. Currently the building is used as a storage warehouse and a logistics depot. A UST and bowser remain in the south east of the property, although they are understood to be no longer operational.

The Tempe Lands properties have been a rubbish tip since around 1910. The north-western section of the properties was initially used as a shale quarry. Following completion of quarrying activities, the quarry was used for landfilling of wastes. During this time it is understood that it received waste from a wide range of sources including domestic refuse, industrial waste, liquids and hazardous waste and general council waste.

Dumping at Tempe Lands ceased in the mid 1970s, at which time, part of Areas 1A and 1B were taken over by Wanless Scrap Metal. Wanless vacated the property in 1988 with it being unoccupied since, with the exception of a container storage facility located in the north west of the property, adjacent to the Princes Highway. Marrickville Council remediated the landfill areas by placing a VENM cap over the landfill material between 2004 and 2006. Following the capping of the landfill material a Site Audit Statement (ref GN 35-1, May 2006) and a Summary Site Audit Report (ref GN 35-1, ENVIRON Ref: 31-0024, May 2006) stating that Tempe Lands Area 1A and 1B are suitable for Commercial and Industrial Land use.

Over a period of 10 days on 19th through 31st May and 3rd June 2008 a contamination assessment was undertaken by Coffey Environments on the properties located at 630 – 726 Princes Highway. A

total of fifty one boreholes were drilled across the properties to collect soil samples and to assess the subsurface conditions. Environmental samples were collected from the near surface, at each layer of fill/natural soil encountered and also at 1m intervals within the fill and within the natural substrate. In total, 137 primary soil samples were selected for a range of laboratory analysis. Fourteen groundwater monitoring wells were installed in boreholes MW2 through MW18 down to a maximum of 15m depth. Groundwater samples were collected from the monitoring wells 5th and 6th June 2008.

Significant contamination was not identified within the soil samples tested. Heavy metals analysis returned results below the relevant HIL in all samples tested. Soil TPH (C_{10} – C_{36}) was detected at concentrations above the investigation criteria in four samples but the impact appeared localised. BTEX, benzo(a)pyrene, PCBs and OCPs (Aldrin and Dieldrin) were not detected above the relevant HILs in the samples tested. Asbestos, in the form of fibre bundles and /or fragments of fibre-cement sheeting was detected by the laboratory in three out of fifty soil samples analysed.

Based on the results of the contamination assessment undertaken, we consider that remediation and future environmental management is required to address potential contamination by asbestos in the fill across the Princes Highway properties, and hydrocarbon contamination associated with the USTs on both the KAS Auto property and the Ateco property. A localised area of hydrocarbon contamination was also identified in the centre of the Kennards Storage property.

It has been found through targeted landfill gas investigations that methane is present within the fill material associated with the former Tempe landfill. The investigations have also shown that methane is migrating laterally to the west and north into adjacent properties. The management of risks posed by methane is required during and following the site redevelopment.

The elevated methane generation, if still occurring, is likely to be in the former landfill area (The eastern and northern proposed development area however validation would be required other areas to confirm that significant methane was not being generated nor migrating laterally in the fill material.

Further investigation of the contamination status of fill material under structures across the Site should be undertaken after demolition of existing buildings occurs as part of the second stage of redevelopment of the Site. This RAP should be reviewed and amended as require when additional information is available.

The most appropriate remedial strategy for hydrocarbon impacted material is considered to be excavation and off site disposal, with a Site Environmental Management Plan (SEMP) produced for contamination at depth. For asbestos containing materials, it is considered the most appropriate action is to manage on site and cap as part of the proposed development. An EMP for the site would be produced for ongoing management. To mitigate landfill gas migration from the Tempe Lands site, a combination of a trench and well system, coupled with under floor ventilation of the building structure is considered suitable.

A SEMP will be designed by Coffey for implementation by the future site owners providing procedures that historical fill material and the associated potential for contamination and methane on the Site are managed in a manner which protects human health and the environment.

1 INTRODUCTION

1.1 Overview

This document presents a Remediation Action Plan (RAP) prepared by Coffey Environments Pty Ltd (Coffey) for the site of the proposed commercial development at 630 – 726 Princes Highway, Tempe, NSW and the adjacent areas of 1A and 1B of the former Tempe Landfill. The RAP has been prepared at the request of Valad Property Group Ltd (Valad) who is the proposed developer and current site owners.

The location of 630 – 726 Princes Highway site is shown on Figure 1 while a plan showing the proposed development is presented in Appendix A.

The land at Princes Highway comprises three separate properties, with the proposed development spanning across all. The development is also planned to use part of the adjacent Tempe Lands properties known as Areas 1A and 1B.

This RAP has been prepared in general accordance with the NSW EPA (1997) Guidelines for Consultants Reporting on Contaminated Sites.

We understand that Mr Graeme Nyland of Environ, a NSW DECC accredited Site Auditor has been engaged to undertake a statutory audit of the site under the provisions of the Contaminated Land Management (CLM) act.

1.2 Site Identification

The site is located on the southern side of Princes Highway, Tempe NSW (Figure 1). The site consists of six different lots in total. The properties at Princes Highway comprise the following four lots:

- Lot A DP 399884, including 630 Princes Highway – KAS Auto
- Lot B in DP 399884, including 632 Princes Highway – Kennards Storage
- Lot A DP 385209 & Lot E DP 385210, including 634-726 Princes Highway - Ateco

In addition to the land detailed above, part of the proposed development includes Area 1A and Area 1B of the Tempe Lands located at Bellevue Street, Tempe, NSW. Areas 1A and 1B comprise the following two lots:

- Lot 201 in DP1097238 – Area 1A
- Lot 200 in DP1097238 – Area 1B

Where the terms ‘site’ or ‘Site’ are used in this report, they refer to the entire land subject to the proposed commercial development. When reference is made to individual lots that make up the Site, the terms ‘lot’ or ‘property’ will generally be used.

1.3 Proposed Development

The area is to be developed into a large two storey retail development, with associated car parking and transport infrastructure. According to the current architectural plans, the building structure is proposed to cover areas of the Ateco site and parts of the former Tempe Lands site. The car park will

predominantly cover the Kennards Storage site, KAS Auto and Tempe Lands. A plan of the proposed development is presented in Appendix A.

1.4 Previous Studies

Three previous reports have been issued regarding the properties on Princes Highway. A brief summary of the reports is included below.

Preliminary Site Investigation, Proposed Residential Development 634-726 Princes Highway (EMS 03 2514) – Environmental Monitoring Services, 9 April 2003. The report notes the presence of two USTs near the workshop in the southern corner of the Ateco site. At the time of the report one was known to have been decommissioned in-situ by filling with sand. The other, at the time of the report remained in use. Asbestos fragments were noted on the area of land to the rear of the workshop.

Twelve boreholes were advanced across the property to a maximum depth of 3.1m below ground level (bgl). Fill was encountered across the site ranging from 0.2m to 1.7m bgl. Red brown clay, becoming grey with depth underlay the fill across the site. No groundwater was encountered.

No metals, TPH, BTEX or Organochlorine Pesticides were detected above the adopted commercial/industrial NSW EPA soil investigation levels in any of the samples tested.

Environmental Due Diligence Assessment, 634-726 Princes Highway (N200457.01) - MPL 21 June 2005. The report was produced to evaluate conditions of the environmental risks associated with the site. It is primarily a review of the EMS report (above) to assist in the pre-purchase of the Ateco site.

Contamination Assessment 630 – 726 Princes Highway, Tempe (ENVILCOV00315AH-R02) - Coffey Environments, 3 November 2008. The report covers the three properties along Princes Highway (KAS Auto, Kennards and Ateco). A summary of the details contained in this report are detailed in Section 4 and Section 5 of this report.

1.5 Tempe Lands Site Audit Statement

Part of the proposed development of the site covers areas 1A & 1B of the former Tempe landfill site. Coffey Environments (previously Coffey Geosciences) has undertaken a number of assessments of the landfill site.

Reports produced by Coffey on Areas 1A & 1B include:

- *Remediation and Development of the Tempe Lands, Ref 164CSA001, Remedial Action Plan, 4 September 2003* by Coffey Geosciences Pty Ltd.
- *Remediation and Development of Tempe Lands, Ref S2109/7-AI, Fill Quality/Soil Gas Investigation, Areas 1A and 1B 29 June 2004* by Coffey Geosciences.
- *Remediation and Development of Tempe Lands, Ref S2109/7, Landfill Gas Monitoring Plan, Tempe, NSW, 13 January 2005* by Coffey Geosciences.
- *Remediation and Development of Tempe Lands, Landfill Gas Investigation, 10 October 2005* by Coffey Geosciences.
- *Tempe Lands, Site Environmental Management Plan, Ref 509TR004, 12 July 2006* by Tenix Projects Pty Ltd.

- *Tempe Lands Remediation – Cap validation Report, Areas 1A and 1 B, final, 10 May 2006 by Coffey Geosciences.*

Following a review of the above documents and additional documents produced by Tenix and Mainland Civil Engineering, Graeme Nyland, an accredited NSW DECC Auditor produced a Site Audit Statement (ref GN 35-1, May 2006) and a Summary Site Audit Report (ref GN 35-1, ENVIRON Ref: 31-0024, May 2006) declaring that Tempe Lands Area 1A and 1B are suitable for Commercial and Industrial Land use subject to several conditions which were outlined in the Tenix SEMP and summarised below.

Future maintenance or construction works on the Tempe Lands site is managed by conditions outlined in the Tenix SEMP. Works are to be assessed for their potential to compromise the remedial measures in place at the landfill site. Any proposed works should be assessed by the council (the land owner of Areas 1A and 1B at the time) and comply with the following conditions:

- Works should not impact integrity of existing capping through excavation, changes in level or changes to drainage provision. If this is the case then works can proceed in accordance with normal council Procedures.

Should works be assessed to impact the integrity of the existing remedial measures then:

- The Site Auditor should be consulted to ensure proposed works and subsequent remedial measures deemed to have a significant impact on the cap are acceptable and compliant with conditions in the SEMP.
- Work Methodology Statements are to be submitted and reviewed for all works being undertaken on the landfill site.

Any landfill or contaminated material exposed by excavation during construction and maintenance works must be properly managed during the works in order to prevent:

- Contamination of the capping surface (use plastic sheeting or similar as a separation layer)
- Dispersion by wind blown dust (use covers or maintain the material in a damp condition)
- Dispersion by stormwater run off (proper management of stormwater)
- Tracking of material offsite by vehicles (cleaning of vehicle wheels)
- Release of contaminated groundwater to the environment (control of pumping and drainage routes and disposal via licensed means).

Upon completion of the works the cap must be reinstated with VENM of at least the same thickness and compaction level used for the original capping. Source documentation for the VENM must be provided to the Council's Manager Property including assessment by a suitable consultant that the material can be classified as VENM. The material should also be inspected at point of delivery for any signs of contamination such as odours, staining, presence of rubbish etc. The VENM materials should also be validated by a consultant and documentation provided to the Manager Property.

Any excavated contaminated material must be properly disposed of. This could be achieved by reburial under a suitable cap or disposal offsite following waste classification. Documentation should be provided by the Contractor to the Manager Property for any material disposed of off site including:

- Material testing
- Waste tracking (consignment authorisation and waste transport certificate)

It is also understood that, under the terms of the sale agreement for the Site (i.e. Areas 1A and 1B in this instance), Marrickville Council are required to have access to the cap and the gas mitigation system for the means of maintenance and monitoring.

2 OBJECTIVES

The objectives of the Remedial Action Plan are:

- Set the remediation goals;
- Review the available remedial options for each area;
- Select the preferred remedial option(s) for each area;
- Provide details of the remedial option(s) for each area;
- Outline the procedures and activities with implementation of the preferred remediation option in each area;
- Outline the requirements for the contractor to prepare environmental and occupational health and safety plans for the remediation;
- Outline the requirements for a contingency plan to be prepared for the remediation works;
- Outline the regulatory compliance requirements for the remedial works;
- Outline validation requirements for where contaminated material is removed or capped and where landfill gas measures are implemented; and
- Provide a framework for the long term SEMP for the Site.

3 SITE CONDITION AND SURROUNDING ENVIRONMENT

3.1 Site Description

The site comprises four lots along the southern side of Princes Highway and two lots on Bellevue Street that make up Areas 1A and 1B of the Tempe Lands landfill.

630 Princes Highway is about 0.2 ha in area and contains a mechanical workshop the eastern part, an attached office area on the western part and a canopy that extends from the main building to the front of the property. The property is bounded to the north by the Princess Highway and further on by commercial buildings and residences, to the south and east by vacant land (former Tempe landfill) and to the west by Industrial warehousing (Kennards Self Storage).

The Lot is generally flat and with the exception of planter beds along the front boundary, buildings, asphalt or concrete pavements cover the site. Based on the topography of the surrounding area, which falls away to the south east and west, it is considered that this lot may have been filled. The fill may have been imported to backfill the tank and pipe excavations as well as other underground utility excavations on the site.

632 Princes Highway comprise Kennards Self Storage, a large storage facility consisting mainly of rectangular, galvanised sheeting, single and double storey buildings. Six single storey structures and 4 double storey structures were observed on site during the site visit. The lot is entirely paved by sealed surfaces in good condition. A former residential building, now used as an office by Kennards, is located in the north eastern corner of the lot. Access from Princes Highway is provided by the gates along the northern boundary. The topography of the northern part of the site gently slopes towards south east from the northern boundary to the middle of the site where a drop of approximately 3m was observed. The southern half of the lot is essentially flat.

The goods stored on this lot are unknown although site protocols prevent hazardous goods from being stored. It is considered that most goods are personal belongings and goods for commercial purposes. There are several areas where old vehicles (cars buses and boats) are stored. One area in the centre of the site is used for the storage of old electrical appliances comprising ovens, washing machines and fridges.

634-726 Princes Highway include sealed surfaces and garden beds. The main structure is a two storey building with an approximate rectangular shape and allocates an empty warehouse in its northern part, the “Summit Logistics” warehouse in the central part, where numerous boxes of appliances were observed at the time of the recent investigations by Coffey, and alloy wheel and tyre storage (ground level) and Volkswagen and Audi car storage (top level) in the southern part. A sealed car park for truck loading operations is located along the north eastern boundary of this lot. A minor building, used as a car workshop, was observed in the south western corner of the lot. The workshop also comprises a car wash facility. Three concrete lined car inspection pits were noticed in this building. A small quantity of waste engine oil (approximately 2 litres) was present in a small sump in the base of one of the pits. Two vent pipes suggesting the presence of two underground storage tanks were observed respectively in the car workshop area and below the car access ramp situated in the southern corner of the main building.

The Tempe Lands Areas 1A and 1B are irregular in shape and cover an area of 4.37 hectares and 1.21 hectares respectively. The site is currently vacant with scrub vegetation coverage, having been capped as part of remedial works between 2004 and 2006.

3.2 Surrounding Site Uses

The Site is bounded to the northwest by the Princess Highway and further on by commercial buildings and residences, to the south and east by vacant land (former Tempe landfill) and to the west by 'Pretty Girl' clothing warehouse.

3.3 Local Geology

The 1:250,000 Sydney Geological Series Sheet (Geological Survey of New South Wales, 3rd ed.1966) indicates that the site locality is underlain by Quaternary alluvial deposits characterized by alluvium, gravel, sand, silt and clay. This overlies the Ashfield Shale from the Triassic. Underlying the Ashfield Shale is Hawkesbury Sandstone, medium to coarse grained sandstone with minor shale lenses.

Both the Ashfield Shale and Hawkesbury Sandstone have low primary or matrix permeability to groundwater. However, both formations can have appreciable localised secondary permeability owing to the presence of fractures, joints and other defects.

Soil Landscape of The Sydney Sheet Map (Chapman et al., 2005) indicates the site is located on the Oxford Falls division of the Fluvial Landscapes group soils.

The soils in the Fluvial Landscapes group are described as hanging valleys on Hawkesbury Sandstone with occasional broad benches and broken scraps, relatively wide valley floors and often poorly drained soils, characterised by low eucalypt woodland, scrub, heathland and sedgeland.

Soils in this group generally include moderately deep to deep earthy sands, yellow earths, siliceous sands on slopes, deep leached sands, podzols and grey earths on valley floors.

Limitations in this soil group may include very high soil erosion hazard, perched water tables and swamps, highly permeable soil, very low to low soil fertility, localised rock outcrop.

3.4 Hydrogeology

The site topography is essentially flat, sloping gently towards the south. Alexandria Canal is situated approximately 300m south-east of the site and the Cooks River approximately 700m south-west of the site.

Regional groundwater would be expected to be present within the bedrock beneath the site. Perched groundwater could potentially be present on top of the bedrock. The regional groundwater is likely to flow in the southern direction towards the canal and the river. Locally groundwater flow is likely to be significantly influenced by the development features (buildings, paved areas, roads) and infiltration zones such as the unpaved Area 1A and 1B of Tempe Lands.

3.5 Acid Sulphate Soils

The Australian Soil Research Information Service (A.S.R.I.S.) map (CSIRO Land and Water, 2006) was accessed to provide a preliminary indication of the risk of acid sulphate soils at the site. According to A.S.R.I.S. map, no data on acid sulphate soil is available for the site. A.S.R.I.S recommends low probability for the occurrence of Acid Sulphate Soils on site. However, possibility of potential acid sulphate soils could not be ruled out, given the site is very close to the Cooks River and the Alexandria Canal. The area immediately south and south-east of the site is indicated on the ASRIS map as characterised by low probability of acid Sulphate soil occurrence. Areas characterised by high

probability of acid sulphate soil occurrence are situated between 700 and 1000m south and south-west of the site.

The site topography shows that the site occurs in the disturbed terrain that may include filled areas which often occur during reclamation of low lying swamps for urban development. Other disturbed terrain includes areas which have been mined or dredged, or have undergone heavy ground disturbance through general urban development or construction of dams or levees. Soil investigations are required to assess these areas for acid sulphate soils.

3.6 Landfill Gas

Approximately 50% of the proposed development area will be located atop Tempe Lands, a former landfill site that was owned and operated by Marrickville Council and its predecessor Councils. The remaining 50% of the proposed development is located to the west of the landfill and currently comprises a mixture of commercial and industrial units. The area of former landfill which is encompassed within the development site has been subject to capping.

The majority of the development site will be covered with an open air car park and vegetated areas, however a large retail building will encompass an area of approximately 20,000m^2 within the southern development area. Approximately 25% of this building will be developed on top of the former landfill site.

Monitoring of landfill gas along the boundary between the landfill and the neighbouring commercial/industrial units (which will be encompassed within the proposed redevelopment area) has shown that landfill gas is present in Tempe Lands and also migrating from the landfill to the western development area. Gas investigations and periodic monitoring have been undertaken within the proposed development area and between the former landfill and commercial/industrial units since 2005 and have indicated that methane is present at levels exceeding the NSW EPA (1996) guideline of 1.25%v/v. Methane Gas investigations have been most recently reported by Coffey Environments in a report entitled Tempe Lands Remediation, Feasibility Study of Landfill Gas Migration Mitigation Measures, dated 09 July 2007 (Ref: ENVILCOV00315AF-R01).

Given the presence of methane gas in fill material associated with the former landfill and in off-site areas to the immediate west, the remedial action plan is required to be developed to address methane gas which could migrate vertically into the building footprint and open air car park and vegetated areas proposed to be located atop the former landfill and to address the potential of methane gas migrating from the former landfill area to the western development area.

4 SITE HISTORY

A site history review was undertaken as part of the Contamination Assessment undertaken by Coffey Environments (ENVILCOV00315AH-R02, November 2008). Council and Workcover records were obtained for the site as well as an aerial photograph study. A brief summary of the site history is detailed below.

4.1 Summary of Site History

630 Princes Highway - KAS Auto

The Lot appeared to be already developed prior to 1951 and, according to the title search documentation, belonged to a brick maker. This suggests it was part of the brickworks facility located in the lot adjacent to the south western boundary.

A Caltex service station was erected in the northern corner of this lot between 1951 and 1961 and redeveloped into an automotive workshop, the current land use, between 1978 and 1986.

WorkCover records confirmed the presence of UST's at the site between at least 1957 and 1995.

632 Princes Highway - Kennards Self Storage

The lot was used for industrial purposes since prior to 1951. According to the Land Title documentation, it allocated a brickwork facility with a quarry in the southern part until at least 1973. This lot was redeveloped into a storage facility between 1978 and 1986. The site is currently used as a storage facility. According to WorkCover records, no dangerous goods were stored at the site.

634 – 726 Princes Highway - Ateco

The south-western part of the site consisted mainly of grassed areas and garden beds in 1951, when according to the Land Title documentation belonged to private owners. In 1954 Penfolds Wines Pty Ltd purchased this part of the site and an industrial style building was erected between 1951 and 1961.

The site features remained substantially unchanged since 1961, while an automotive company took ownership of the site in 1995 and Valad Commercial management limited, the current owner, purchased the lots in 2007. Different areas of the main building are currently used for different purposes, as revealed by the site walkover, including tyre storage, warehouse and car storage. The smaller building in the southern corner of this part of the site is currently used by a car workshop.

WorkCover records revealed that a number of USTs have been kept in the depot situated in the south west corner of the main building since 1958. Filling points were located in the automotive area of the lot. According to a declaration signed by the site owner, dangerous goods were no longer stored in this part of the site in 2008.

A possible vent pipe was located on the eastern wall of the Ateco building in the loading yard area. It is possible that this could be linked to an underground storage tank. No other infrastructure associated with an underground tank was seen and no records of a tank in that location were revealed in the WorkCover search.

Areas 1A & 1B Tempe Lands

The Tempe Lands site has been as a rubbish tip since around 1910. The north-western section of the site was initially used as a shale quarry. Following completion of quarrying activities, the site was a

landfill. During this time it is understood that it received waste from a wide range of sources including domestic refuse, industrial waste, liquids and hazardous waste and general council waste.

Dumping at the site ceased in the mid 1970s, at which time, part of the site was taken over by Wanless Scrap Metal. Wanless vacated the site in 1988 and the site has been unoccupied since, with the exception of a container storage facility located in the north west of the site, adjacent to the Princes Highway.

All of Tempe Lands, including Areas 1A and 1B which forms part of the site, was remediated by Marrickville Council between 2004 and 2006. The remediation works undertaken in Areas 1A and 1B included grading the surface of the landfill and placement of a cap made of virgin excavated natural material (VENM). The VENM was imported to the site and comprised mainly of excavated shale and sandstone sourced directly from the places of origin. The VENM cap has a thickness greater than 0.5m at all locations.

5 SUMMARY OF PREVIOUS WORKS

5.1 Summary of Investigation – 630 – 726 Princes Highway

Field investigations were undertaken over 10 days on 19th through 31st May and 3rd June 2008 by Coffey Environmental Scientists.

A total of fifty one boreholes were drilled on site to collect soil samples and to assess the subsurface conditions. Locations for sampling were based upon historical information, targeting areas such as the USTs in both the KAS Auto site and the Ateco site, and other areas of potential environmental concern. The remainder of the sample locations were selected to give a general coverage of the site.

Environmental samples were collected from the near surface, at each layer of fill/natural soil encountered, and also at 1m intervals within the fill and within the natural substrate. In total, 137 primary soil samples were selected for a range of laboratory analysis.

Fourteen groundwater monitoring wells were installed in boreholes MW2 through MW18 down to a maximum of 15m depth. Groundwater samples were collected from the monitoring wells 5th and 6th June 2008.

The analysis suite was generally based on the chemicals of concern identified during the site history review, summarised in Section 5 of the Contamination Assessment report ENVILCOV00315AH-R02, November 2008.

The soil samples were selected for analysis on the basis of field observations and PID measurements which targeted AECs, as well as providing lateral and vertical distribution of sampling across the investigation area.

5.2 Basis of Assessment Criteria

5.2.1 Soil

The investigation criteria for soil were established based on the following references:

- NSW DECC (2006) Guidelines for the NSW Auditor Scheme (Second Edition);
- NSW EPA (1994) Guidelines for Assessing Service Station Sites; and
- NEPC (1999) National Environmental Protection (Assessment of Site Contamination) Measure (NEPM).

Other references were used to supplement the above, where appropriate.

The NSW DECC (2006) Guidelines for the NSW Site Auditor Scheme and the NEPM present health based investigation levels for different land-uses (e.g. industrial / commercial, residential, recreational etc.) as well as provisional phytotoxicity based investigation levels.

The site is proposed to be developed as a large retail development with associated car parking which is considered to be consistent with a commercial land-use. Consequently the human health based soil investigation levels (HILs) for commercial and industrial land-use, provided in Column 4 of Appendix II in the NSW DECC (2006) Guidelines for the NSW Site Auditor Scheme (Second Edition) were adopted

as the soil investigation levels. Phytotoxicity does not need to be considered for commercial / industrial land-use.

NSW DECC (2006) Guidelines do not provide threshold levels for volatile petroleum hydrocarbon compounds. NSW EPA (1994) Guidelines for Assessing Service Station Sites provide an indication of acceptable cleanup levels for petroleum hydrocarbons compounds at service station sites to be reused for sensitive land-uses. The EPA has advised that these guidelines should also be used for less sensitive land-uses. For semi-volatile petroleum hydrocarbons (C16 – C35 and >C35) investigation levels are provided in the NSW DECC (2006) Guidelines, however, these are based on the NEPM health-based criteria, which require the laboratory analysis to unequivocally differentiate between aromatic and aliphatic compounds. If this cannot be done, the C10 – C40 criteria in the service station guidelines should be applied. For this investigation, we have adopted the service station guidelines for all petroleum hydrocarbon fractions.

There are currently no national or DECC-endorsed guidelines relating to human health of environmental investigation of material containing asbestos on sites. NSW DECC (2006) advise that until such guidelines become available, auditors must exercise their professional judgement when assessing if a site is suitable for a specific use in the light of evidence that asbestos may be a contaminant of concern. NSW DECC (2006) states that NSW Health will provide advice to auditors on a case-by-case basis, where appropriate. The NSW DECC previously provided interim advice that “no asbestos in the soil at the surface is permitted”. Enhealth (2005) ‘Guidelines for Asbestos in the Non-Occupational Environment’, provides some guidance on assessing and managing asbestos in soil although does not provide a threshold concentration or investigation level for asbestos. Coffey Environments has adopted an asbestos investigation level of “non-detect” for this site as an initial screening criteria.

5.2.2 Groundwater

The beneficial uses of groundwater down gradient of the site were considered in order to establish the most relevant criteria by which to assess the quality of the groundwater.

During the Site History Review, a search for borehole records was carried out by the Department of Water and Energy under the request of Coffey Environments. The search did not reveal any borehole records within a 1km radius of the site.

Regional groundwater occurs in bedrock (Ashfield Shale) which typically gives poor yields with poor quality (moderate to high salinity). Therefore this, coupled with the proximity to the landfill, it is not considered a significant source for potable water.

Alexandria Canal is situated approximately 300m south-east of the site and the Cooks River approximately 700m south-west of the site.

It is considered that groundwater from the site would eventually discharge into these surface water bodies either directly or through a storm water channel. These water bodies are tidal and could potentially be used for recreational water use.

On this basis potential environmental values of groundwater are considered to include:

- Protection of marine aquatic ecosystems; and
- Recreational water use.

The investigation levels presented in the ANZECC (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality are considered applicable for the protection of ecosystems of the

receiving waters. As these guidelines apply to receiving waters, it is generally conservative to apply these to groundwater discharging to receiving waters.

ANZECC (2000) advocates a site-specific approach to developing guideline trigger values based on such factors as local biological affects data, the current level of disturbance of the ecosystem etc. The guidelines present 'low risk guidelines trigger values' which are defined as concentrations of key performance parameters below which there is a low risk that adverse biological effects will occur. It is important to note that these are not threshold values at which an environmental problem is likely to occur if exceeded. Rather, if the trigger values are exceeded, then further action is required which may include either further site-specific investigations to assess whether or not there is an actual problem or management / remedial action.

Low risk trigger values are provided for the protection of 80-99% of species in marine (presented in Table 3.4.1 of the guidelines), with the trigger value depending on the health of the receiving waters.

It is understood that the DECC's policy is that the trigger values for the protection of 95% of aquatic ecosystems should be used except where contaminants are potentially bio-accumulative in which case the trigger values for protection of 99% of species should be used.

ANZECC (2000) states that there is currently insufficient data to derive high reliability trigger values for various contaminants. For these contaminants, low reliability trigger values have been adopted.

ANZECC (2000) state that there is currently insufficient data to derive a high reliability trigger value for TPH but propose a low reliability trigger value for TPH of 7μg/L. This guideline is generally considered by industry to be overly conservative and is also well below the TPH detection limit, which most laboratories can achieve. Given the conservative value of the trigger there is no IL established for these analytes. The LOR is considered to be the default IL for the purpose of this investigation.

Guidelines for the recreational water use are also presented in the ANZECC (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality (Table 5.2.3 of the guidelines).

5.2.3 Landfill Gas

The lower explosive limit (LEL) in relation to methane refers to the minimum concentration of methane which will form an explosive mixture in air. A concentration of about 5% methane corresponds to 100% LEL if the only 'explosive' gas present is methane. Methane concentrations greater than 300% LEL (or 15%) are generally not explosive, although are considered to represent an explosion risk as dilution could result in the methane concentration dropping below 15%.

Guidance on methane criteria can be found in the NSW EPA (1996) Environmental Guidelines: Solid Waste Landfills. These guidelines require that on solid waste landfill sites all buildings within 250m of areas having the potential to have methane concentrations greater than 1.25% (or 25% LEL) should be designed and constructed so as not to allow accumulation of methane gas. For this reason 1.25% was adopted as an investigation level for methane at the site.

5.3 Summary of Previous Results

5.3.1 Sub Surface Conditions - 630 – 726 Princes Highway

Investigations indicate the three sites along Princes Highway to be underlain by varying thicknesses of fill (increasing to the south), overlying residual soil comprising sandy gravels and shale bedrock. Further details are provided below:

630 Princes Highway - KAS Auto Site

Shallow fill comprising gravely sandy clay to a maximum depth of 0.8m bgl was encountered across the northern portion and central portion of the property. Fill comprising graded sand within a concrete pit (depth approximately 2.8m bgl) was encountered in the western portion of the property. This is thought to be a UST pit that has been backfilled. A suspected UST was also noted in eastern portion of the property as investigations were terminated at refusal approximately 0.35m bgl on a metallic object.

Extensive fill material to a depth of 9m below ground level was present in the eastern portion of the property. Fill comprised gravely sand with brick fragments, glass, concrete and metal pieces. It is considered that this indicates the edge of the former brick pit possibly filled with demolition and building rubble.

Residual soils comprising silty clay underlie the fill material to a depth of approximately 1.2m bgl.

Bedrock comprising weathered shale was encountered across the property underlying the residual soils.

Evidence of significant contamination such as hydrocarbon odours or staining was not observed in the boreholes during the investigations.

Given that depth of fill across the property is shallow, it is considered that the base of the former UST pits (and potentially remaining tanks) are likely to be within residual soils and where necessary, been extended into the top of shale bedrock.

632 Princes Highway - Kennards Self Storage

Fill comprising gravely sand and clayey sand was encountered across the property with the exception of the far north western portion of the property where residual soils/bedrock were encountered immediately below the property surface. Depth of fill increased in the southern portion of the property. In the southern portion of the property the fill comprising suspected landfill waste (clothing, metal, rubble and porcelain) was encountered at depth. This is thought to be the edge of the old pit associated with the former brickworks.

Residual soil comprised gravelly sand and on occasion silty clay across the property. Shale was encountered in the boreholes extending beyond the residual soils from depths between 5-6 metres below ground level. The shale observed in the boreholes was typically moderately to extremely weathered with iron indurated bands.

Evidence of significant contamination such as hydrocarbon odours, staining or asbestos fragments were not observed in the boreholes during the investigations.

634 – 726 Princes Highway - Ateco Site

Shallow fill comprising gravely sand and clayey sand was encountered across the site. Depth of fill increased slightly along the southern boundary of the site.

Residual soil comprised gravely sand and on occasion silty clay across the site. Shale was encountered in the boreholes extending beyond the residual soils from depths between 5-6 metres below ground level. The shale observed in the boreholes was typically moderately to extremely weathered with iron indurated bands.

Evidence of significant contamination such as hydrocarbon odours, staining or asbestos fragments were not observed in the boreholes during the investigations.

5.3.2 Groundwater

Groundwater was observed as steady inflow at between approximately 7m and 10m depth within the shale bedrock. The exact depths of groundwater strikes could not be determined due to the drilling method of rotary air blasting.

Groundwater levels were measured on 5th and 6th June 2008 at depths between 1.701m (southern portion of the Ateco site) and 10.335m (eastern portion of Kennards site behind KAS) below the top of the casing from the fifteen monitoring wells installed across the site.

5.3.3 Landfill Gas

5.3.3.1 Gas Monitoring Wells Located on the Former Landfill (GW9 to GW14)

Gas monitoring wells GW9 to GW13 were installed on the western and northern boundary of the Tempe landfill site in April 2005. All 5 wells are located within the footprint of the proposed development. The locations of these gas monitoring wells are shown in Figure 4. Gas monitoring has been undertaken in these wells since April 2005 to the present with results indicating continued methane generation within all wells over this time. At all wells concentrations of methane were significantly in excess of the NSW EPA (1996) guideline of 1.25% v/v in the gas monitoring wells.

Monitoring wells GW9, GW10, GW11 have been installed within Stage 1 landfill material, which has previously been shown to be gas generating or to contain landfill gas. Gas monitoring wells GW12 and GW13 were installed within natural soils and the elevated methane levels in these two wells were concluded as being attributable to lateral migration of landfill gases from the adjacent Stage 1 landfill material.

5.3.3.2 Gas Monitoring Wells located on the Commercial/Industrial Properties to the West and Salvation Army Land to the North of the Landfill (GW16 to GW21)

Gas monitoring wells GW16 to GW18 were installed within the Salvation Army Property to the north of the former landfill and GW19 to GW21 within the adjacent properties (Ateco Automotive and Millers Self Storage) to the west of the former landfill in March 2006 to assess the potential offsite migration of landfill gases. The locations of these gas monitoring wells are shown in Figure 4. Gas monitoring has been undertaken in these wells since March 2006 to the present with results indicating the presence methane gas at five locations over the duration of the monitoring.

Concentrations of methane in offsite wells GW16, GW18, GW19, GW20 and GW21 have generally exceeded the NSW EPA (1996) guideline level of 1.25% v/v. However, methane concentrations in GW21 have been 0.1% during the November 2006 round, and have not been detected in the previous two rounds. Methane has been detected in GW17 but at concentrations that are well below the guideline of 1.25% v/v. Methane was not detected in GW17 in the last two monitoring rounds.

5.3.3.3 Gas Monitoring of Buildings to the Immediate North and West of the Former Landfill.

Due to the presence of significant concentrations of methane in the Ateco Automotive and Millers Self Storage properties to the immediate west of the former landfill and elevated concentrations in the eastern most area of the Salvation Army Site, monitoring of gas accumulation in buildings and service pits/stormwater drains within these properties has been undertaken bi-annually since 2005. Monitoring was also undertaken in the KAS Automotive property to the north of Millers Self Storage, where no previous soil gas monitoring had been undertaken.

The gas monitoring was undertaken within and beneath occupied buildings on each property as well as from service pits and stormwater drains within the property boundaries (where possible). The gas monitoring within buildings was carried out in rooms and spaces which were enclosed and/or poorly ventilated.

The results of the bi-annual monitoring indicated that methane has not been detected within the buildings and stormwater drains/service pits located within the Salvation Army Stores, ATECO Automotive and Millers Self Storage during the monitoring period.

During the third monitoring round (August 2006), methane or another explosive gas was detected above background concentrations (but below the NSW EPA (1996) guideline) in a bathroom sink adjacent to the garage at KAS Automotive property. Methane was not detected in other locations in the bathroom. A methane concentration of 0.6% was also noted in the Telstra pit on the footpath adjacent to the driveway of KAS Automotive. However, during the following monitoring round, methane was not detected within the buildings and stormwater drains/service pits located within KAS Automotive.

On the basis of the observations as well as the landfill gas conditions within the landfill, the potential for methane migrating through preferential pathways (i.e. service trenches/stormwater drains, piles) into buildings adjacent to Tempe landfill, and impacting upon the health safety of occupants/workers within these properties, was considered low.

5.3.4 Discussion on Results

5.3.4.1 Soil

The soil results indicate elevated levels of TPH (C10 – C36) in the soil within the fill material in BH5, MW8 and MW17. The site history review indicates that the KAS Auto site used to be a service station with several underground storage tanks within its boundary (although the exact location of these is not known). Samples taken from MW17 are thought to represent the fill within a concrete lined tank pit, in the eastern portion of the KAS Auto site. The sample comprised graded sand with heavy dark staining, although limited odour was noted within the samples. The sand was saturated suggesting perched water held within the pit. The borehole itself was terminated at 2.8m bgl due to refusal on concrete. This is considered to be the base of the former tank pit. It was not progressed further in order to avoid the completion of a preferential pathway of potentially impacted material and water in the former pit with the natural material below.

Elevated levels of TPH in MW8 occur at a depth of approximately 10m bgl. Material in this hole can be associated with the former landfill adjacent to the Kennards storage site. The source of the exceedance is most likely to come from localised material that is present within the landfill at this location. Samples from higher in the profile do not exhibit the same levels of TPH suggesting that the exceedance in this location is localised within the landfill waste and has not migrated from sources up gradient.

Across the extent of the site, no exceedances were noted in soil samples tested for heavy metals. All values were below the adopted HILs.

Asbestos was detected in the form of fibre bundles and /or fragments of fibre-cement sheeting in BH24, BH30 and BH52. The distribution appears to be random and isolated to the shallow fill material. The occurrence of the asbestos is most likely due to the demolition of the brick works site and the development of the Kennards property and the Ateco building.

5.3.4.2 Groundwater

Groundwater results from MW19 indicate levels of TPH (C6-C9) and TPH (C10-C14) in the order of approximately 6 and 7 times the default GIL respectively. This sample represents groundwater that is on the boundary of the former service station at KAS Auto and Princes Highway. It is thought that there may be some slurry filled USTs present just to the east of the well location.

Groundwater results from MW8 marginally exceed the default GILs for the TPH (C15-C28) and TPH (C29-C36). The location of the well represents material that is on the margin of the former landfill. The water is likely to be heavily influenced by the presence of the fill in this area of the site.

Concentrations of a number of heavy metals in groundwater exceeded the relevant GILs in all monitoring wells. The majority of these exceedances were slight, although some high levels of arsenic were encountered in MW9 and lead in MW8.

The source of the elevated metal concentrations is most likely to be from the fill material and previous on-site activities across all the sites. The source of the fill across much of the southern portion of the Kennards and Ateco sites is unknown. It is possible that some or all of the fill to be the spoil and tailings from the work undertaken in the former brick pit and brick work site, and in the case of the material around MW8, a relatively small quantity of landfill waste.

Ammonia was encountered in groundwater samples from MW6, MW7 and MW8. Monitoring wells MW6 and MW8 are in close proximity to the boundary of the landfill site. Some relatively deep fill material in MW8 was identified as possible landfill waste. The groundwater flow is in a general south easterly direction, towards the Tempe landfill, which has been found to contain groundwater/leachate containing ammonia well in excess of the investigation levels.

Given that the levels of contaminants detected within the groundwater at the site are considered to be consistent with those expected across much of the local area, and the fact that the aquifer is not seen as a viable source of potable water, impact upon the groundwater is not considered to present a significant issue or constraint with regards to the proposed development. Therefore remediation of the groundwater is not considered necessary.

5.3.4.3 Landfill Gas

It is considered that methane is being generated within the fill material associated with the former Tempe landfill. The methane generated is migrating laterally to the west and north into adjacent properties. While the Salvation Army property to the north of the landfill will not form part of the proposed development site, the three industrial/commercial properties (KAS Auto, Kennards and Ateco) to the west are part of the development site.

It is considered that mitigation of risks posed by methane is required during and following the site redevelopment.

It is considered the elevated methane generation and/or presence is likely to be mainly occurring in the former landfill area, however validation would be required in other areas to assess whether significant methane was not being generated nor migrating laterally in the fill material.

Further investigation of the contamination status of fill material in the southern portion of the Site should be undertaken after demolition of existing buildings occurs as part of the redevelopment of the Site. This RAP should be reviewed and amended as required when additional information is available.

6 EXTENT OF REMEDIATION REQUIRED BASED ON INVESTIGATION WORKS

Based on the results of the investigations undertaken to date, it is considered that for the Site to be suitable with respect to contamination for the proposed development, the following are considered to be remediation or management requirements:

1. Remediation of likely localised hydrocarbon contamination present on KAS Auto site (although none was identified during the course of the investigation) and the removal of potential USTs and/or service station infrastructure that may remain on site;
2. Removal and subsequent remediation of bowser, USTs, associated pipe work and potential soil and groundwater contamination present in the southern corner of the Ateco site;
3. Management of potential asbestos containing materials to be present in shallow fill across all sites;
4. Removal of hydrocarbon contamination present within the shallow material in the centre of the Kennards site;
5. Installation of a gas mitigation system along the boundary of Areas 1A & 1B of Tempe Lands and the properties comprising 630 – 726 Princes Highway due to the migration of landfill gas across the boundary from the adjacent landfill.

7 REMEDIATION GOALS AND REMEDIATION CRITERIA

7.1 Remediation Goals

The broad remediation goals are to:

1. To render the Site suitable for the proposed development (i.e. to remediate the Site to levels which do not pose an unacceptable risk to Site users and the general public); and
2. To reduce potential environmental impacts (if any) from the site to acceptable levels.

7.2 Remediation Criteria

7.2.1 Soil

The threshold concentrations presented in the following references are generally the primary guidelines used in NSW when setting remediation (acceptance) criteria for chemical concentrations in soil:

- NSW EPA (2006) Guidelines for the NSW Site Auditor Scheme;
- NSW EPA (1994) Guidelines for Assessing Service Station Sites; and
- NEPC (1999) National Environmental Protection (Assessment of Site Contamination) Measure (NEPM).

It is important to note that these criteria are presented as a guide only. Depending on the characteristics and the quantity of soil requiring remediation, further site-specific risk based remediation criteria may be developed by undertaking human health and ecological risk assessments, prior to or during site remediation.

The proposed remediation (acceptance) criteria are presented in Table 2.

Table 7.1: Summary of Soil Remediation (Acceptance) Criteria

Contaminant	Adopted Remediation Levels for Commercial/Industrial Land Use (mg/kg)	Source
Arsenic	500	1
Cadmium	100	1
Chromium	60%	1
Copper	5000	1
Nickel	3000	1
Lead	1500	1
Zinc	35000	1

Contaminant	Adopted Remediation Levels for Commercial/Industrial Land Use (mg/kg)	Source
Mercury	75	1
Benzo(a)pyrene	5	1
Total PAHs	100	1
TPH C6-C9	65	2
TPH C10-C36	1000	2
Benzene	1	2
Toluene	130	2a
Ethyl Benzene	50	2a
Xylene	25	2a
Aldrin + Dieldrin	50	1
Chlordane	250	1
DDT	1000	1
Heptachlor	50	1
PCBs	50	1
Asbestos	Not Detected	3

1. Based on NSW EPA (2006) Column 4 HIL Commercial/Industrial Investigation Levels
2. Based on NSW EPA (1994) Service Station Guidelines
3. Interim policy advice from the NSW EPA (31 March, 2000) states that no asbestos should be present in surface soils.
a. human health based levels

7.2.2 Groundwater

Groundwater investigation levels adopted in the previous investigation will be used to assess whether significant groundwater contamination is present in the vicinity of the former USTs for the ongoing groundwater monitoring. Otherwise it has previously been assessed that groundwater remediation is not required and hence groundwater remediation criteria have not been nominated.

7.2.3 Imported Fill

Should fill be required to be imported onto site during the construction of the proposed development, the imported fill will also be required to meet the soil remediation criteria as discussed in the previous section.

However in addition, it is considered that the imported material should:

- Classify as Virgin Excavated Natural Material (VENM) as defined in the *Protection for the Environment Operations Act 1997* where VENM is natural material (such as clay, gravel, sand, soil or rock fines):
  - that has been excavated or quarried from areas that are not contaminated with manufactured chemicals or process residues, as a result of industrial, commercial, mining or agricultural activities; and
  - that does not contain any sulphidic ores or soils or any other waste.
- Meet the criteria for residential use with gardens and accessible soil landuse (i.e. the lower of human health based investigation levels in Columns 1 and the provisional phytotoxicity based threshold levels in Column 5 of the NSW EPA 1998) noting that VENM would not be expected to have concentrations of contaminants exceeding these criteria.

It is noted that any detections of organic compounds (i.e. TPH, BTEX, OCP, PCB, PAH etc) would cast doubt on the VENM classification of the material. Hence we have adopted ‘not detected’ as validation criteria for imported soil. Where organic compounds are detected in the validation samples, further assessment would be undertaken of the source and the extent of the contamination and whether this would impact the VENM classification.

In addition to the meeting these criteria, in order for the material to be classified as VENM, the material should show no visual or olfactory signs of contamination such as hydrocarbon odours or oil staining, and also be free of any anthropogenic material such as broken concrete, asphalt, bricks, tiles or timber

The proposed validation criteria for imported soil are presented in Table 3.

TABLE 7.2: PROPOSED Validation CRITERIA FOR imported soil

CHEMICAL	IMPORTED SOIL VALIDATION CRITERIA (mg/kg	SOURCE*
Benzo(a)pyrene	1	1
Total PAH	20	1
Arsenic	20	2
Cadmium	3	2
Chromium	400	2
Copper	100	2
Lead	300	1
Nickel	60	2
Zinc	200	2
Mercury (Inorganic)	1	2
TPH C6-C9	Not Detected	4
TPH C10-C36	Not Detected	4
Benzene	Not Detected	4
Toluene	Not Detected	4
Ethyl Benzene	Not Detected	4
Xylene	Not Detected	4
PCB	Not Detected	4
Total OCP	Not Detected	4
Asbestos	Not Detected	5

** Sources: 1. Based on the Health Based Soil Investigation Level in Column 1 of the NSW EPA (2006) Auditor Guidelines*
2. Based on the Provisional Phytotoxicity Soil Investigation Level in Column 5 of the NSW EPA (2006) Auditor Guidelines.
3. Based on NSW EPA (1994).
4. Based on organics not being expected to be detected in VENM
5 .Interim policy advice from the NSW EPA (31 March, 2000) states that no asbestos should be present in surface soils.

7.2.4 Landfill Gas

The lower explosive limit (LEL) in relation to methane refers to the minimum concentration of methane which will form an explosive mixture in air. A concentration of 5% methane corresponds to 100% LEL. Methane concentrations greater than 300% LEL (or 15%) are generally not explosive, although are considered to represent an explosion risk as dilution could result in the methane concentration dropping below 15%.

Guidance on methane criteria can be found in the NSW EPA (1996) Environmental Guidelines: Solid Waste Landfills. These guidelines require that on solid waste landfill sites all buildings within 250m of areas having the potential to have methane concentrations greater than 1.25% (or 25% LEL) should be designed and constructed so as not to allow accumulation of methane gas. For this reason 1.25% has been adopted as a remediation level for methane at the site.

8 REMEDIAL OPTIONS

8.1 Remediation Options for Localised Soil Contamination

8.1.1 Remediation Hierarchy

The NSW EPA (2006) *Guidelines for the NSW Site Auditor Scheme* provides a preferred hierarchy of options for site clean-up and/or management. The NEPC *National Environment Protection (Assessment of Site Contamination) Measure* (1999) also has a similar hierarchy of options. These hierarchies are largely consistent and can be summarised as follows:

1. On-site treatment of the contamination so that is it destroyed and the associated risk is reduced to an acceptable level;
2. Offsite treatment of excavated soil, so that the contamination is destroyed or the associated risk is reduced to an acceptable level, after which the soil is returned to the site;
3. Removal of contaminated material to an approved facility, followed, where necessary, by replacement with clean fill; and
4. Consolidation and isolation of the soil onsite by containment with a properly designed barrier.

The NSW EPA (2006) *Guidelines for the NSW Site Auditor Scheme* also indicates:

- If the remediation is likely to cause greater adverse effect than would occur were the site left undisturbed, then remediation should not proceed;
- In cases where it is not viable to remediate large quantities of soil with low levels of contamination, alternative remediation strategies might need to be considered or developed; and
- The appropriateness of any particular option will vary depending on a range of local factors. Where a site auditor supports, in the site audit report, any specific remediation option or options proposed by the consultant, they must clearly justify the reasons for their support in terms of relative advantages, as well as the reasons for the rejection of particular options.

8.1.2 Potential Remedial Options

A range of different remediation technologies are available for remediation of contaminated sites. It is considered that the following strategies represent methods that may be applicable to the remediation of the impacted soil on the Princes Highway sites.

- Onsite and/or Offsite Treatment;
- Excavation and offsite disposal of contaminated soil to landfill; and
- Managing the risks posed by contaminants by preventing any direct exposure pathway between the known and potential contaminated soil and users of the proposed commercial development (through capping).

8.1.3 Potential Remedial Options Review

8.1.3.1 Treatment Option

Soil treatment remediation technologies are broadly grouped into either in-situ remediation or ex-situ remediation. The treatment available depends on the type of contaminant present at the subject site. In-situ methods can include soil vapour extraction, in-situ-bioremediation and chemical leaching or fixation whilst ex-situ methods such as bioremediation (landfarming, biopiling), chemical catalytic oxidation, thermal desorption, soil washing and mechanical separation can be considered.

Most commonly, for site contamination of the type and volume found at this Site (hydrocarbon and asbestos), the technologies adopted are ex situ, requiring excavation of the contaminated material. In-situ remediation technologies generally require a longer timeframe for completion than ex-situ technologies. Most of the treatment technologies that require excavation of the contaminated material could be undertaken on or offsite, subject to obtaining licences.

The main contaminant identified across the Sites is petroleum hydrocarbon contamination and asbestos which has been identified in the form of asbestos fibre bundles within the soil identified by analysis. Physical separation techniques such as hand picking or mechanical sieving are therefore deemed to be inappropriate due to volume of material impacted and the fact that only fibres have been identified during the analysis.

Generally in Australia, where treatment is concerned, costs are considerably higher than landfilling costs and therefore would only usually be considered where the levels of contaminants are such that landfills would not accept the waste without pre-treatment.

8.1.3.2 Excavation and Offsite Disposal Option

This method involves the excavation of contaminated materials and disposal of the materials off-site to a landfill licensed by the NSW DECC.

Excavated soils must be classified before disposal to an appropriate landfill. Depending on the levels of contamination, soil may require pre-treatment (to reduce contaminant levels or immobilise contaminants) prior to offsite disposal to the licensed landfill. Asbestos containing soil classifies as special waste under the NSW DECC *Waste Classification Guidelines (2008*) *Part 1: Classifying Waste.*

8.1.3.3 Managing the risks by abating direct exposure pathway between contaminated soil and Site users (through capping) option

Onsite capping is used to isolate contaminated areas in the subsurface from the surrounding uncontaminated environment. A physical barrier such as a layer of clean soil, synthetic material liners, asphalt and concrete layers may be installed to cap the contaminated material. A cap as a barrier is typically used where it is required to remove exposure to the contaminated soils and where the contaminated soils are not mobile or there is no contact with groundwater. Where there is potential for contaminants to leach to groundwater as a result of surface water infiltration, the cap should be constructed of low permeability material such as concrete or compacted clay.

A site management plan is required with any capping strategy. The site management plan identifies the party responsible for adhering to the plan, and includes commitments for ongoing monitoring and maintenance of the cap as well as control of future excavations, which must be minimised or if required,

the appropriate occupational health and safety procedures are adopted and permits acquired before work is carried out.

Enhealth (2005) state that onsite containment of asbestos is the preferred option providing restrictions are appropriately recorded (i.e. land title and / or planning certificates) and can be enforced. Enhealth state that this can be achieved through isolation by barrier (i.e. essential capping) with the barrier consisting or membranes, clean fill, building, hard structures, vegetation cover or combination of these. The depth of barrier must be decided on a case by case basis depending on the potential for disturbance during future land use. Enhealth (2005) state that a management plan is required for on-site containment of asbestos.

8.1.3.4 Contamination at Depth

As a general principle, contamination at a site must be remediated to meet the appropriate remediation criteria if viable. For site such as landfill sites, it may not be a viable option due to volume, depth and variety of contaminants.

Clean-up criteria for contaminated soils at depth may differ from the criteria for shallow soils due to differences in exposure opportunities. However, the inhalation of volatile contaminants and the need to protect groundwater require consideration, irrespective of depth. Where remediation criteria for contaminated soils at depth are different from those for shallower soils the need for any ongoing management of the contamination at depth in addition to any requirements for managing shallow soil contamination.

Irrespective of the depth of contamination, any proposal to leave contamination which may pose an unacceptable human health or environmental risk should make sure that the following issues are satisfactorily addressed:

- investigation has demonstrated that the remaining contamination will not affect the groundwater quality and that any contaminant vapours will not migrate to the surface and pose a risk to human health
- an environmental management plan has been developed, will be implemented, and can be enforced under relevant laws to ensure that, if the contaminated soil is disturbed, it will be handled in an appropriate manner to avoid any increase in potential risks to human health or the environment
- the local planning authority is notified that contamination remains at depth on the site, together with its location, nature and extent, details of the environmental management plan and any other regulatory requirements that relate to the contamination, thus allowing the local authority to record this information, as it considers appropriate, in its property information system for the site, such as s.149 certificates.

8.1.4 Remediation Options Review

The most appropriate remedial strategy for hydrocarbon impacted material is considered to be excavation and off site disposal, unless the depth at which the hydrocarbon contaminated soil is present may render this option marginal with respect to overall environmental benefits and costs. For asbestos containing materials, it is considered the most appropriate action is to manage on site and cap as part of the proposed development as almost all of the site will be paved with concrete, asphalt or some other form of cover which could act as a barrier. A SEMP for the site would be produced for ongoing management.

8.1.5 Rationale for the Selection of Remediation Strategy

For each contaminant of concern identified at the site, the rationale for the most appropriate remedial strategy is given below in order to render the site suitable for the proposed Ikea development:

8.1.5.1 Localised Hydrocarbon Contamination

Excavation and off site disposal is considered the most appropriate option for the remediation of hydrocarbon impacted materials identified on site during the contamination assessment. The reasoning is:

- Considering the likely comparative low volume in-situ treatment costs would be prohibitively expensive;
- Excavation and disposal will allow a targeted approach with minimal impact upon the proposed development; and
- It would limit ongoing liabilities associated with contamination remaining on site.

8.1.5.2 Asbestos Impacted Material

Onsite containment and management of the asbestos containing material is considered to be the most appropriate option for the remediation of asbestos containing material found on site during the contamination assessment. The reasoning is:

- Potentially large volume of material on site contains low levels of asbestos fibres.
- Capping and containment on site with an ongoing management plan, considering the proximity to the former landfill site, would have limited impact on the proposed development.

8.2 Mitigation of Landfill Gas Impacts

Coffey Environments has submitted and the DECC accepted a feasibility report which outlined the overall strategy for the mitigation of migration of landfill gas across the boundary from Tempe Lands to the properties located to the north and west which included the lots comprising 630 – 726 Princes Highway. The mitigation proposed will comprise a combined trench and well interception and collection system with passive venting of landfill gases collected.

The remedial options are discussed in detail within two Coffey Environments reports entitled; Tempe Lands Remediation Feasibility Study of Landfill Gas Migration Mitigation Measures, dated 9 July 2007 (Ref: ENVILCOV00315AF-R01 Feasibility Report Final) and ADDENDUM 1: Tempe Lands Remediation: Revised Feasabilty Study of Landfill Gas Migration Mitigation Measures, Chain Linkage - 25.00 to 254.54 (draft document), dated 11 November 2008 (Ref: ENVILCOV00315AF-R01a).

In addition to the proposed passive trench and well venting system for the mitigation of migrating landfill gas, mitigation measures are also required for beneath the eastern most part of the proposed building which will be constructed atop the former landfill area.

Coffey Environments has, in conjunction with the civil/structural engineers for the project, TTW, designed a passive under-slab methane collection and venting system for the building to mitigate the potential for landfill gas to ingress the building.

A methane proof membrane will be utilised above the passive venting system and below the concrete ground slab to inhibit the migration of methane that may accumulate below the slab.

The passive underslab collection and ventilation system is to be installed below the methane proof membrane. The purpose of the underslab collection and ventilation system is to reduce build-up of methane pressures beneath the slab such that opportunities for methane ingress through the barrier and slab into the building would be further reduced.

A methane proof membrane will also be applied to the western wall of the passive trench system to ensure that any methane gas not captured by the under-slab passive venting system is directed to the north and south of the building and is vented via the passive trench and well system.

It is noted that a detailed design of the management measures for both options will be required. These will be prepared as an addendum to the RAP. The methane design reports will be subject to DECC approval prior to installation and will also require approval post installation.

Figures 5 to 8 illustrate the proposed gas mitigation measures including their extent and the key features. Figure 5 illustrates the extent of the gas mitigation measure and Figures 6, 7 and 8 illustrate the proposed boundary gas mitigation measure outside of the building footprint, including details on the boundary with potential offsite receptors. Figure 8 also includes details of the gas mitigation system under the footprint of the proposed building.

Currently Coffey is undertaking a landfill gas characterisation study to assess whether trace gases other than the primary components of landfill gas (being methane and carbon dioxide), are present and emanating from the landfill at significant levels. The purpose of this investigation is mainly to assess whether the passive direct atmospheric venting of methane from the above systems is acceptable from a human health point of view. The finding of this assessment will be reported separately. Should the findings indicate that direct passive venting may not be suitable, an addendum to this RAP will be developed.

9 PROPOSED REMEDIATION AND VALIDATION ACTIVITIES

The following sections outline the remediation / management activities that will be required due to the presence of contaminated soil at the Princes Highway sites.

9.1 Petroleum Hydrocarbon Impacted Material Remediation and UST Removal

9.1.1 KAS Auto

In the area of KAS Auto, a former service station, the exact status of the tanks is not known. It was reported by the site owner that the tanks and their appurtenances have been removed; however no report was available documenting the removal and validation of the works. No above ground evidence that service station infrastructure remained on site was noted at the time of the investigation. However, during the investigation, several holes met refusal on an apparent metallic object just below the site surface in the eastern portion of the site. Petroleum hydrocarbon contamination at levels above the adopted HIL were identified within a suspected tank pit in the western portion of the site. Petroleum Hydrocarbon was also detected in several other areas in the eastern portion of the site, although not above the adopted HILs.

Further investigation should be conducted to establish the exact location and status of the USTs on the site. This would likely take the form of removal of the surface slab in suspected areas of USTs and visual inspection for the presence of any USTs.

Should USTs or their appurtenances be identified as remaining on site, these will be removed and validated as outlined in Section 9.1.3 onwards.

Should no USTs be identified, then validation of the former UST area and excavation of any impacted material will be undertaken as detailed in Section 9.1.3.5 onwards.

9.1.2 Kennards Storage

An area of hydrocarbon contamination was identified in the centre of the northern section of the Kennards site around BH5 up to approximately 1.5m bgl. The impact is thought to be localised.

9.1.2.1 Excavation of Hydrocarbon Impacted Material

The excavation will be extended until visual, olfactory and PID observations by on site Coffey personnel indicate that the contaminated soil or shale is likely to have been removed to the extent practicable. Excavated soil will be temporarily stockpiled on the designated temporary stockpiling area.

Coffey Environments personnel will be present on site to guide the excavation activities.

The excavation will be left open until validation results have been obtained. The Contractor will need to maintain the excavation according to WorkCover regulations.

Depending on the extent of contamination and the quality of the surrounding shale bedrock, temporary shoring of the excavation may be required.

If the contamination is found to extend deep into shale bedrock, over a significant distance or under adjacent structures making excavation of all contaminated material not practicable, then other remedial strategies may be considered for that portion of the contamination in consultation with the Site Auditor.

9.1.2.2 Validation of Excavations

The validation work at the site will entail collecting soil samples for laboratory testing when it is judged in the field that all material requiring remediation has been removed from around the area of impact. Visual checks will also be made in the excavations for potential preferred migration pathways such as underground service trenches.

The number of validation samples will be decided based on the size of each excavation. However as a guideline the following sampling regime will be adopted.

The validation sampling rate will be as follows:

- 5 samples on the base of each excavation (1 centre base and 1 per base of each wall);
- 1 sample per 5m length of each wall of each excavation (minimum one per wall) at the level of the identified contamination;
- Potentially additional samples targeting preferred migration pathways on the walls of base of the excavation (if identified);

The soil samples will be tested for TPH and BTEX. In addition, 25% of samples will also be tested for PAHs and VOCs.

A PID will be used for all validation works associated with the hydrocarbon contamination, including base and wall sample collection from the excavation pit. Sample collection methods will be recorded and reported, with rationale for sample selection.

Based on the validation sampling results, one of the following actions will be made:

i. If some of the validation samples fail the remediation (acceptance) criteria, the soil identified as failing the remediation criteria will be further excavated. Further validation of these areas will be required. Statistical interpretation of validation data may be used to assess whether the remediation goals have been met.

ii. If some of the validation samples fail the remediation (acceptance) criteria and further excavation is not considered practicable, alternate remedial strategies and / or risk assessment to assess the significance of the remaining contamination may be considered in consultation with the Site Auditor.

iii. If all validation samples meet the remediation criteria, no further remedial works will be required.

9.1.2.3 Backfill of Remedial Excavations

Following the completion of the remedial works and the removal of the tanks, the excavations are to be backfilled with appropriate material (see Section 8.3). Geotechnical advice should be sought to establish the appropriate compaction levels of the imported material depending on the material used and the proposed development design.

9.1.2.4 Ateco

The following sections outline the remediation work which will be required for the removal of underground storage tanks (USTs) identified on the site in the south western corner, and associated soil contamination (if any). The normal environmental control and mitigation measures required for similar construction/demolition works would still need to be in place for the remediation work. Unless

otherwise identified, all activities discussed below will be the responsibility of the Contractor or its representative.

UST removal work should be carried out in accordance with the relevant procedures outlined in the following documents:

- Australian Institute of Petroleum (AIP) Code of Practice on "The Removal and Disposal of Underground Petroleum Storage Tanks" (Ref: AIP CP22-1994)
- WorkCover Requirements for "Abandoning Underground Tanks" (Ref: DG 310)
- The Australian Standard for the "Storage and Handling of Flammable and Combustible Liquids" (Ref: AS 1940)

Excavation and remediation/management of associated contaminated soil, if any, and subsequent validation of the excavations should be carried out in accordance with the NSW EPA Guidelines for Assessing Service Station Sites (1994).

9.1.2.5 Site Preparation and Controls

Prior to the earthworks commencing, the Contractor will undertake appropriate site preparations, including preparation of a health and safety plan and environmental management plan as per the requirements of Section 10 and implementation of any required environmental and health and safety controls.

Any licences, approvals or notifications required including, but not necessarily limited to those discussed in Section 14, should be obtained.

Geotechnical advice should be obtained prior to undertaking excavations near structures such as the road, the canopy footings, and the former service station building. Alternatively, above ground structures such as the canopy and the building could be demolished prior to remedial works if surplus to proposed development requirements.

Designated areas for temporarily stockpiling of contaminated soil will be prepared. Stockpile areas will be located on polythene or low-density polyethylene sheet (at least two layers of 0.25mm thickness). The stockpiles will be controlled to prevent access by unauthorised personnel. Once the soils have been stockpiled, the stockpiles will be covered by polythene sheets or tarpaulins to prevent erosion of stockpiled materials until the material can be disposed of. Heavy objects not containing sharp edges will be placed on the sheets to prevent them from being blown by wind. Adequate straw bales and/or silt fences will be placed around the perimeter of the stockpile area to filter runoff from the stockpiles.

A material tracking system will be designed and implemented to track material from excavations to stockpiles to reuse/disposal.

9.1.2.6 WorkCover Notification

WorkCover require notification of UST removal prior to commencement of work. The form Notice of Intention to Commence Construction Work (available from any WorkCover office) will be filled out and sent to WorkCover by the Contractor prior to commencement of work**.** WorkCover also require notification following completion of the UST removal.

9.1.2.7 Emptying and Vapour Freeing the Tanks

Prior to excavations around the USTs, petroleum product (if any) will be removed from each of the tanks by a licensed liquid waste contractor using an air operated pump or other equipment suitable for a hazardous area and a suction hose, or spear, reaching to the bottom of the tank. The product will be pumped into a tanker and disposed of to an appropriately licensed Hazardous Waste Treatment Plant for treatment and/or recycling. Dockets for liquid waste disposal must be supplied by the Contractor to Coffey.

Also prior to excavations around USTs, the USTs will be vapour freed in accordance with the AIP Guidelines.

9.1.2.8 Removal of the USTs and Associated Pipework

Concrete or asphalt pavement is to be removed above USTs and along the paths of UST pipework. Drain, disconnect and remove all redundant pipework, withdraw any tank mounted equipment, and plug all openings including the vent. One plug should have a 3mm hole to act as a pressure equalising vent.

Complete the excavation to expose the total width and length of the tank, and remove concrete anchors, if present. Care should be taken to prevent the excavator striking the tank in any way. On no account should the excavator be used to punch holes in the tanks.

Once removed, the condition of the USTs will be observed by Coffey, who will assess the USTs for rust or any holes.

The work should be planned so that as soon as the tank is fully exposed, it is immediately removed from the excavation and transported offsite as soon as practicable. The USTs should be disposed to an approved facility for destruction. Destruction certificates must be provided to Coffey by the Contractor.

Immediately after removal of the tank from the ground it should be permanently marked with warning labels as follows:

“NOT GAS FREE

NO SMOKING

NO NAKED LIGHTS

TANK HAS CONTAINED FLAMMABLE LIQUID

NOT SUITABLE FOR STORAGE OF FOOD OR LIQUIDS INTENDED FOR HUMAN OR ANIMAL CONSUMPTION”

9.1.2.9 Excavation of Contaminated Soil Around USTs

The USTs are expected to have been installed into pits in the shale bedrock. At this stage, the extent of contaminated soil and/or shale around the USTs is not known.

Initially any liquids (such as ponded water or product) within the excavations will be pumped out by a liquid waste contractor and disposed of to an appropriately licensed Hazardous Waste Treatment Plant for treatment. Any backfill sands within the excavation will then be excavated and stockpiled in the designated temporary stockpiling area.

The UST excavations will then be extended until visual, olfactory and PID observations by on site Coffey personnel indicate that the contaminated soil or shale is likely to have been removed to the extent practicable. Excavated soil will be temporarily stockpiled on the designated temporary stockpiling area.

Coffey Environments personnel will be present on site to guide the excavation activities.

The excavation will be left open until validation results have been obtained. The Contractor will need to maintain the excavation according to WorkCover regulations.

Depending on the extent of contamination and the quality of the surrounding shale bedrock, temporary shoring of the excavation may be required.

If the contamination is found to extend deep into shale bedrock, over a significant distance or under adjacent structures making excavation of all contaminated sandstone not practicable, then other remedial strategies may be considered for that portion of the contamination in consultation with the Site Auditor.

9.1.2.10 Validation of UST Excavations

The validation work at the site will entail collecting soil samples for laboratory testing when it is judged in the field that all material requiring remediation has been removed from around the USTs. Visual checks will also be made in the excavations for potential preferred migration pathways such as underground service trenches.

The validation work at the UST area will be undertaken in accordance with the guidelines presented in NSW EPA (1994) Guidelines for Assessing Service Station Sites. Validation soil samples will be collected from each wall and floor of each UST excavation as well as from beneath the pipework to assess the extent of removal of hydrocarbon impacted soil. The number of validation samples will be decided based on the size of each excavation.

The validation sampling rate will be as follows:

- 1 sample per 25m^2 on the base of each excavation (minimum one per base);
- 1 sample per 10m length of each wall of each excavation (minimum one per wall);
- Potentially additional samples targeting preferred migration pathways on the walls of base of the excavation (if identified);
- 1 sample per 10m length of pipework (minimum one per pipe) if present;
- 1 sample beneath the bowser stand if identifiable.

The soil samples will be tested for TPH and BTEX. In addition, 25% of samples will also be tested for PAHs and VOCs.

A PID will be used for all validation works associated with the USTs, including base and wall sample collection from the excavation pit. Sample collection methods will be recorded and reported, with rationale for sample selection.

Based on the validation sampling results, one of the following actions will be made:

i. If some of the validation samples fail the remediation (acceptance) criteria, the soil identified as failing the remediation criteria will be further excavated. Further validation of these areas will be

required. Statistical interpretation of validation data may be used to assess whether the remediation goals have been met.

ii. If some of the validation samples fail the remediation (acceptance) criteria and further excavation is not considered practicable, alternate remedial strategies and / or risk assessment to assess the significance of the remaining contamination may be considered in consultation with the Site Auditor

iii. If all validation samples meet the remediation criteria, no further remedial works will be required.

9.1.2.11 Backfill of Remedial Excavations

Following the completion of the remedial works and the removal of the tanks, the excavations are to be backfilled with appropriate material (see Section 8.3).Geotechnical advice should be sought to establish the appropriate compaction levels of the imported material depending on the material used and the proposed development design.

9.1.2.12 Validation of Groundwater

The need for remediation and as such a validation strategy for groundwater in the vicinity of the USTs will be assessed once the USTs have been removed and the extent of contamination in the shale has been better defined.

If the need for additional groundwater validation activities is deemed necessary, remedial options will be considered and an addendum to this RAP or a new RAP will be prepared outlining remediation and validation procedures for the groundwater.

9.1.3 Validation of Imported Soil

Clean soil (VENM) will need to be imported to the site for construction of the cap and potentially for other reasons.

The procedure for validation of imported VENM is presented in Appendix D.

The procedure includes:

- Assessment and approval of proposed source sites prior to importation; and
- Checking of material as it enters the site to confirm it is consistent with the approved material and with VENM.

Imported fill should meet the validation criteria presented in Table 3.

Geotechnical advice should be obtained on compaction requirements for the fill material.

Any non-VENM material proposed to be imported to the site would need to classify as inert waste and would only be imported with prior site auditor approval. Procedures for validation of inert waste would be assessed on a case by case basis in consultation with the site auditor.

9.2 Asbestos Impacted Material

Three areas of the site have been identified to have asbestos fibre bundles in the soil at depths less than 1.2m bgl. The presence of asbestos in the shallow fill material is considered to be widespread throughout much of the site. No asbestos fragments were noted during the investigation. Note that the site management plan during construction and the long term site management plan should include

contingency measures in the event that unexpected asbestos is identified across the site during the development and any future maintenance work that is required during the life of the development. Unexpected asbestos would be defined as numerous fragments of asbestos material in a single location or across a close area, not large quantities of soil expected to contain asbestos bundles.

A Coffey Environmental Scientist or Engineer will be present on site during the excavation work to guide the excavation activities and undertake validation testing.

Due to the presence of asbestos containing materials at the site, the earthworks are required to be undertaken under the supervision of an AS1 licensed asbestos contractor.

Should unexpected asbestos be found at the site, excavations will be extended until the contractor with assistance from Coffey has visually assessed that soil containing asbestos that has been removed from that area. The stripped surface will then be validated. Prior to Coffey validating the surface soils, the AS1 contractor will complete an inspection of the area. Should the AS1 Contractor identify any evidence of asbestos, they will remove the fragments and document the location. Following the inspection by the AS1 contractor, a further inspection of the area by a Coffey Environmental Engineer or Scientist will be completed to visually check for the presence of remaining fill material or other evidence of asbestos as well as collection of validation samples from the stripped surface. Any fragments or evidence of asbestos found by Coffey will be marked for removal by the AS1 contractor. Should Coffey identify any fragments or evidence of fill then the cause of this will be assessed as well as additional remedial requirements. Once the additional remedial requirements are completed (which may include further stripping of soil) Coffey will undertake another inspection of the area. This process will be completed until no fragments of asbestos are observed by Coffey during an inspection. Validation samples will be tested for asbestos at the rate of approximately one sample per 200m2 or in accordance with the minimum requirements of the NSW EPA (1994) Sampling Design Guidelines whichever is greater. Visual validation may be considered adequate where soil has been stripped down to the shale bedrock.

To prevent recontamination of the remediated areas, following stripping of the fill material and subsequent validation and backfilling, the areas will be temporarily barricaded with no further site activity to be undertaken in these areas. Similarly trucks etc whose wheels have come into contact with contaminated material will not be allowed into this area.

The remediated areas will also be surveyed so that an accurate plan showing areas from which asbestos has been removed and areas in which asbestos requires capping and has been capped can be produced.

9.3 Validation and Maintenance of Gas Mitigation Measures

9.3.1 Venting System – Installation Validation

The quality control / quality assurance (QA/QC) for the methane management system shall be as follows:

- Installer to provide report and necessary documentation confirming the system was installed in accordance with specifications;
- Valad are to provide an as-built diagram of the system at the completion of the works;
- The System designer is to review as-built diagram at completion to confirm it has been built in accordance with approved specifications;

- Coffey Environments to be present periodically during installation to check on certain aspects of the installation. At this stage it is anticipated that this would include random checks on the thickness of the gravel layer, collect selected samples of the gravel and subject it to gradings analysis to check it complies with the specification, view smoke tests on pipework and view critical parts of the pipework installation.

9.3.2 Monitoring and Maintenance Requirements for Capping and Methane Venting Systems

Inspections of the capping and passive venting systems will be undertaken by a suitably qualified person/s with knowledge of the site conditions and SEMP requirements, to assess:

- whether there has been any changes in site conditions that may result in increased exposure to fill material on the site from current conditions; or
- disturbance of the methane management system and in particular if any change of conditions have interfered with geo-vent risers associated with the passive venting system.

Inspections should be undertaken at least quarterly.

The monitoring / maintenance program is to include:

- Assessment of unpaved areas (if any) to identify evidence of erosion of, or damage to, the capping layer and any areas where the cap may have been breached;
- Assessment of whether there have been any substantial changes to site conditions (i.e. a breach in capping) that may have resulted in increased exposure to contaminated soil or disturbance to the methane management system;
- Visual assessment of the condition of geo-vent risers associated with passive system;
- Quarterly air monitoring of the basement car park and any enclosed basement areas: and
- Assessment of whether any corrective actions are required.

The inspections are also to include a review of any excavations and maintenance activities undertaken in the subject area to assess whether the activities have been undertaken in accordance with SEMP requirements.

In the event where conditions of the area have been altered potentially resulting in increased exposure to contaminated soil or disturbed the methane management system, corrective action will be undertaken to restore the area to its former state.

The responsibility for implementing corrective actions lies with the operations manager and subsequent facilities manager.

With respect to works that may penetrate the cap, each contractor working on site who damages the cap (either intentionally or accidentally) will be responsible for repair of the cap before they leave the site. Two principal ways that the operations/facilities manager and relevant sub-contractor could control potential damage to the cap during site maintenance work is by specification (the addition of a clause relating to the repair of the cap in contracts) and through monitoring of the work as it progresses and after it is complete.

Should damage or disturbance to the passive methane management system occur (i.e. future ground or building works penetrate the cap, damage passive vents or vent risers) this should be repaired in

accordance within the design specification for the passive system including QA/QC checks associated with the re-application any capping material.

The quarterly visual inspections of the site and air monitoring events shall be documented in an easy to review and audit format.

The findings of the inspections shall be documented by the facilities manager. Any maintenance activities or other activities where the cap may have been breached during the period will also need to be documented in the report, along with any corrective actions undertaken

9.4 Managing Unexpected Occurrences

If during the remediation work, material is encountered which appears to be potentially contaminated and appears to be different from the soils described in our previous assessment reports, the following procedures should apply:

- Any suspicious material/soil which has already been excavated should be bunded and stockpiled on a minimum of two layers of polythene or low-density polyethylene sheet of at least 0.25mm thickness, protected from erosion and all seepage retained.
- Excavation works at that part of the site where the suspicious material (soil) was encountered should cease until inspection is carried out by Coffey.
- Based on visual inspection, Coffey will provide interim advice on health and safety of remedial works, soil storage and soil disposal to allow remediation to proceed if possible.
- Based on sampling and analysis of the material, Coffey will provide advice as to remedial requirements for the material.

In the context of the above, “suspicious” material would include fibrous, oily or odorous material, drums, metal or plastic chemical containers or brightly coloured material etc.

9.5 Quality Control and Reporting

The scope of validation activities has been described in the previous sections. The following sub-sections describe quality control procedures, laboratory testing and data assessment and reporting methodologies for validation sampling.

9.5.1 Sampling Activities

Sampling activities will be carried out in accordance with industry’s accepted standard practice and relevant NSW DEC Guidelines by experienced Coffey personnel. Samples will be collected using a new pair of disposal latex gloves where applicable. Sampling equipment which has direct contact with samples will be decontaminated between samples by scrubbing with a Decon 90 solution and then with potable water.

During validation sampling, adequate quality control samples comprising field inter and intra laboratory duplicates (at a minimum rate of 10% for intra-laboratory duplicate samples and 5% for inter-laboratory duplicate samples), and equipment wash blanks will be collected, where appropriate. Trip spikes and blanks will be used for each batch of samples collected and analysed. Samples will be kept in ice or in a cool room of approximately 4°C and sample handling will be carried out under chain of custody protocols and in accordance with industry’s accepted standard practice.

Data quality indicators for field and laboratory QA/QC samples will be as follows:

Table 9.1: Data Quality Indicators

Type of Quality Control Sample	Control Limit
Duplicate Samples	RPDs within 50% for soil
Spikes	Recoveries within the following ranges: • Phenols – 50% to 130% • SVOCs – 60% to 130% • Other organics – 60% to 130% • Inorganics – 70% to 130%
Blanks	Analytes not detected

9.5.2 Laboratory Testing

The chemical testing laboratories engaged to perform the laboratory testing will be NATA registered for the analysis undertaken. The laboratory will be instructed to perform and report results of internal quality control tests, which will consist of performing reagent blanks and surrogate spike analysis for organics and standard reference matrix (SRM) for inorganic analysis.

The laboratory quality control data will be checked as follows:

- Checking that the reporting limits and procedures are satisfactory;
- Checking that the samples are analysed within holding times;
- Checking that laboratory blanks / reagent blanks are less than the laboratory reporting limits;
- Checking the reproducibility of samples by calculating the Relative Percentage Differences (RPDs) between primary and duplicate laboratory samples using a control limit of 50%; and
- Checking that laboratory spikes, surrogate spikes, matrix spikes and duplicate matrix spike recoveries are within acceptable control limits.

9.5.3 Data Assessment and Reporting

DQOs and DQIs will be evaluated in terms of sensitivity, completeness, comparability, representativeness, precision and accuracy.

The laboratory data will be reviewed by Coffey to assess data usability by applying the generally applied data validation guidelines. Statistical interpretation of validation data may be used to assess whether the remediation goals have been met. Based on the assessment, areas that have been satisfactorily remediated will be identified and will be designated by the environmental consultant as “No Further Action Required.” Where the remediation criteria have not been met, Coffey will communicate to Valad as to areas requiring further remediation.

A site remediation and validation report will be prepared by Coffey at the completion of remediation in accordance with the NSW EPA (1997) *Guidelines for Consultants Reporting on Contaminated Sites*.

Interim validation reports may be prepared for aspects of the remediation for review and approval by the Auditor as the remediation progresses. These would then be incorporated into the final validation report.

10 SITE MANAGEMENT

A site management plan for the remediation will be prepared by the Contractor prior to remediation commencing remediation works. The objectives of the site management plan will be to:

- Protect the health of site workers and the general public during the remediation works;
- Ensure the works do not negatively impact on potential environmental receptors and comply with applicable environmental legislation.

The site management plan should include (but not necessarily be limited to):

- site access – suitable access (at more than one location) to the site needs to addressed considering residents and traffic movements both on and off site, site security for both on site and off site personnel;
- site signage requirements (including contact numbers) – outlining hazard and site access requirements and emergency procedures;
- soil and stormwater management – consider stockpile and spoil placement, stormwater drain protection, silt fences and covering areas of site/stockpiles;
- transport and disposal of contaminated soil – suitable vehicles utilised, correct licenses in place, decontamination procedures, coverings for vehicles on and off site, routes to and from site/landfill;
- noise control – consider working hours, equipment use and all works compliant with acceptable limits outlined in the NSW EPA (1994) Environmental Noise Control Manual;
- dust control – dampening surfaces, wind breaks, scheduling works to avoid periods of dry and windy weather, securing and covering loads to and from site and visual monitoring of dust generation;
- odour control – measures could include the spraying of surfactants to neutralise odours or to adjust working times to limit impact;
- control of spillages and vehicular tracking of soils off site – consider spill control methods and procedures;
- refuelling and maintenance restrictions – provide safe environment to limit potential impact of spills and fire/explosive risk;
- waste management;
- covering of loads, stockpiles etc;
- material tracking and documentation;
- designation, delineation and control of access to various work zones;
- inductions and awareness of personnel accessing the site during remediation;
- contingencies; and
- occupational health and safety (including risks posed by contamination and asbestos).

The site management plan must comply with the Marrickville Council Contaminated Land Policy and any other applicable guidelines and legislation.

11 SITE MANAGEMENT PLAN (DURING REMEDIATION)

A contingency plan is outlined in Table 5, listing some potential events that may arise during the remediation and actions that will be undertaken if unexpected conditions occur. The Contractor is to assess other potential events that could occur (if any) and identify contingency measures prior to commencement of remediation.

Table 11.1: Contingency Plan

Unexpected Condition	Action
1. Contaminated soil extends beneath structures.	The contaminated material beneath the building would be temporarily left in place. Further sampling of soils will be undertaken to delineate the extent of remaining contamination. Options for management of the contamination will then be assessed which may include a risk assessment, identification of a methodology to remove the soils, or implementation of an in-situ remediation technology.
2. Either observations during the remedial works or groundwater monitoring suggests that significant groundwater contamination could be present.	Undertake further groundwater monitoring from existing wells and potentially new wells. If groundwater remediation is considered necessary, prepare an addendum to the RAP detailing remediation and validation procedures.
3. Identification of unexpected contaminated materials during the removal of the USTs.	Stop work in that area. Follow procedures in Section 9.1.3 Additional validation samples and analytes may be required to be collected and analysed for (depending on the nature of the material).
4. Validation samples fail criteria.	Excavate additional soil and revalidate that area or assess other potential remediation or validation options.
5. Landfarming is not effective within a reasonable timeframe.	Assess whether the landfarming methodology can be modified to accelerate the process (e.g. additives to enhance biodegradation, additional turning etc). Alternatively dispose of the soil offsite to an appropriately licensed landfill
6. Additional USTs are identified.	Follow same procedures as per the identified USTs
7. Soil classifies as hazardous waste.	Either pre-treat by landfarming on site or transport to a licensed offsite treatment facility

Unexpected Condition	Action
8. Environmental and / or OHS Controls Fail or environmental or OHS monitoring indicates potential hazards.	Environmental and OHS contingencies would be presented in the Site Management Plan to be prepared by the Contractor.
9. Other	Any other unexpected events which may affect the outcome of the investigation would be notified to the Project Manager and Coffey. At that time potential actions to address the unexpected event will be assessed and presented.

12 REMEDIATION SCHEDULE AND HOURS OF OPERATION

The hours of operation will be consistent with the requirements imposed by Council's policy.

13 CONTACT DURING REMEDIATION

A list of remediation contacts including site personnel will be prepared by the contractor prior to commencement of the remediation.

14 IDENTIFICATION OF REGULATORY COMPLIANCE REQUIREMENTS

This section discusses some of the regulatory compliance requirements associated with the remediation. It is important to note that this section is not exhaustive and the Contractor must ensure that they comply with all applicable legislation and guidelines etc.

During the course of the project, the Contractor will comply with all relevant applicable environmental regulatory and legislative requirements. The following list includes some State legislation that may be relevant to the remediation activities:

- Contaminated Land Management Act 1997 (DEC);
- Environmental Planning and Assessment Act 1979 (Department of Planning);
- Protection of the Environment Operations Act 1997 (DEC);
- Waste Avoidance and Resource Recovery Act 2001 (DEC); and
- OHS Act 2000 and OHS Regs 2001 (Workcover).

The remedial work should be carried out in accordance with SEPP55 and appropriate NSW DEC guidelines.

It is considered that the remediation classifies as Category 2 remediation in accordance with SEPP55. Category 2 remediation requires written notification to Council a minimum of 30 days prior to commencement (this notification has already been provided to Marrickville Council). Prior approval from a licensed disposal facility will be required prior to removal of contaminated soil or liquid from the site. Soil or liquids disposed of from the site must be classified in accordance with the NSW DECC (2008) *Waste Classification Guidelines Part 1: Classifying Waste.*.

A licensed Contractor is required to pump liquids from the USTs. USTs must be disposed to an approved facility.

WorkCover require notification of UST removal prior to commencement of work. The form Notice of Intention to Commence Construction Work (available from any WorkCover office) must be filled out and sent to WorkCover before UST removal work begins. WorkCover also require notification following completion of UST removal.

Handling (including excavation) of any materials containing asbestos containing materials and removal of any asbestos from the site will need to be undertaken by an AS1 licensed contractor in accordance with WorkCover regulations and guidelines. A WorkCover permit would be required for any works involving handling of asbestos.

15 STAGED PROGRESS REPORTING

Where considered necessary, interim validation reports will be prepared for review by the Auditor prior to completion of remediation and validation.

16 COMMUNITY RELATIONS PLANS

The Contractor will develop a plan to deal with the community prior to commencement of works.

17 LONG TERM SITE MANAGEMENT PLAN

Areas 1A and 1B of the Tempe Lands are subject to a long term site management plan. This would remain in place over the lifetime of the development. Areas of the 630-726 Princes Highway will also be subject to a site management plan due to the presence of asbestos and contamination at depth (suspected landfill material). Following the remediation of the site it is likely one single management plan, incorporating Areas 1A and 1B would be produced for the site which ensures the site is managed in a manner which protects human health and the environment and ensures that any works undertaken on the at the site which may disturb the subsurface soils, and/or the gas mitigation system installed at the site are undertaken using appropriate health and safety and environmental precautions.

The objectives of the Long Term Management Plan are to:

- implement a monitoring program to check the ongoing performance of the containment;
- implement controls on site excavation and maintenance work; and
- provide a framework for appropriate environmental management, occupational health and safety and waste management to be implemented during any excavation or maintenance works that penetrate the cap and/or disturb contaminated soil.

The Long Term Management Plan should discuss:

- the approximate location and nature of the contained soil;
- the containment design;
- a monitoring program for the containment area;
- controls on future excavation works across the site and through the cap;
- responsibility for implementation of the plan and documentation requirements; and

- Provide recommendations for work procedures to be implemented during any works undertaken on the site which entails disturbing contaminated soil.

18 CONCLUSION

The broad management and remediation goals of this RAP are:

i To remove the USTs and manage and/or remediate contamination associated with the USTs to a condition which does not pose an unacceptable risk to site users and/or the general public and are suitable for commercial and industrial landuse;

ii To reduce potential environmental impacts (if any) from contamination to acceptable levels.

It is considered that the above objectives will be able to be achieved through implementation of this RAP.

COFFEY ENVIRONMENTS PTY LTD

19 REFERENCES

Geological Survey of NSW (1966) 1:100,000 Sydney Geology Sheet

NSW EPA (1995) Sampling Design Guidelines. ISBN 0-7310-3756-1.

NSW EPA (1997) Guidelines for Consultants Reporting on Contaminated Sites. ISBN 0 7310 3892 4.

NSW EPA (1994) Guidelines for Assessing Service Station Sites. ISBN 0-7310-3712-X.

NSW EPA (2006) Guidelines for the NSW Site Auditor Scheme. ISBNo0-7313 0177 3

ANZECC (2000) Australian Water Quality Guidelines for Fresh and Marine Waters. Australian and New Zealand Environment & Conservation Council. ISBN 0-642-18297-3.

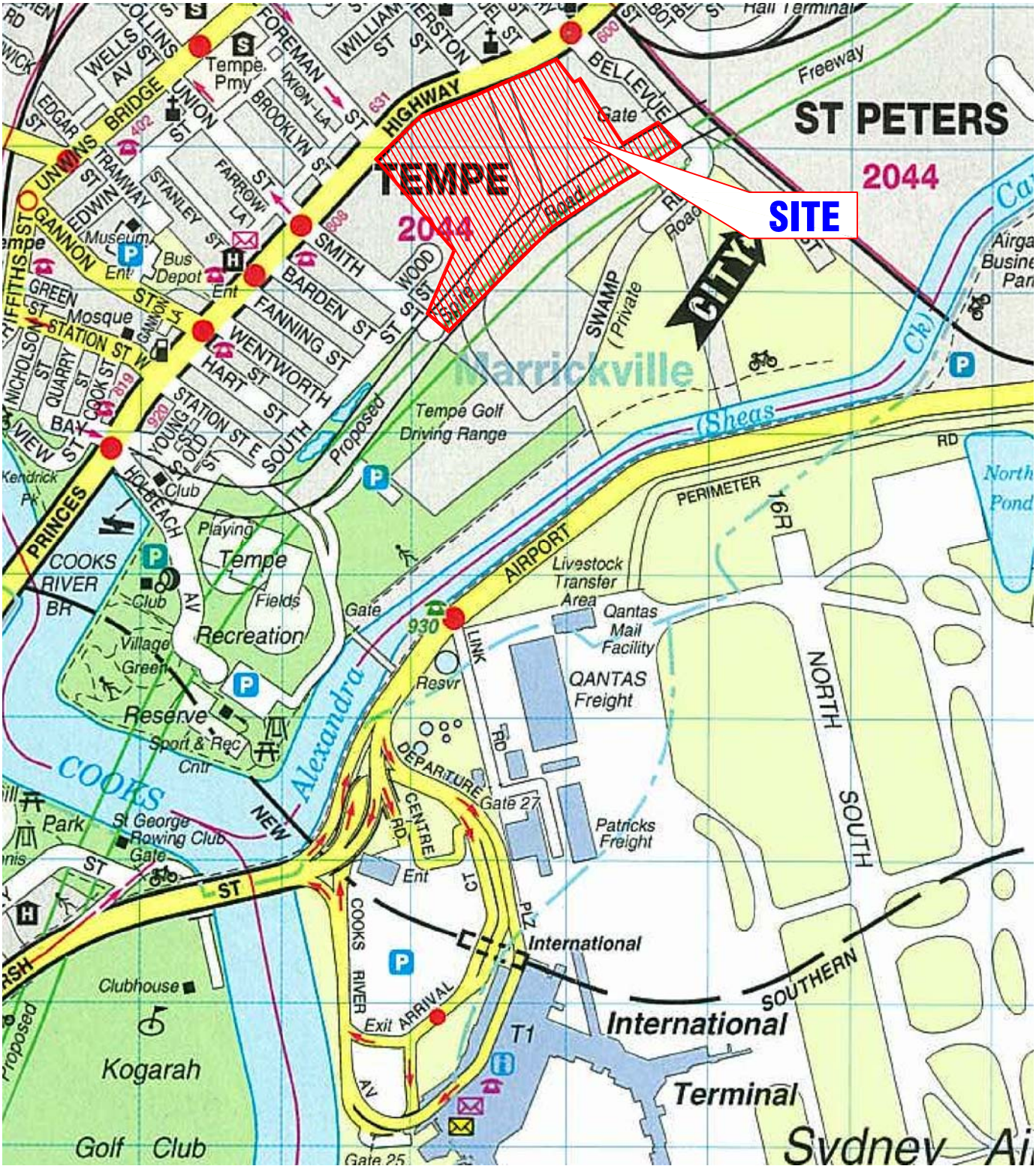
Netherlands (1994) Environmental Quality Objectives in the Netherlands. Ministry of Housing, Spatial Planning and the Environment, Netherlands Government. ISBN 90-6092-783-4.

Department of Land and Water Conservation (DLWC) Water Data Services, Hunter Valley

NSW DECC (2008) Waste Classification Guidelines Part 1: Classifying Waste

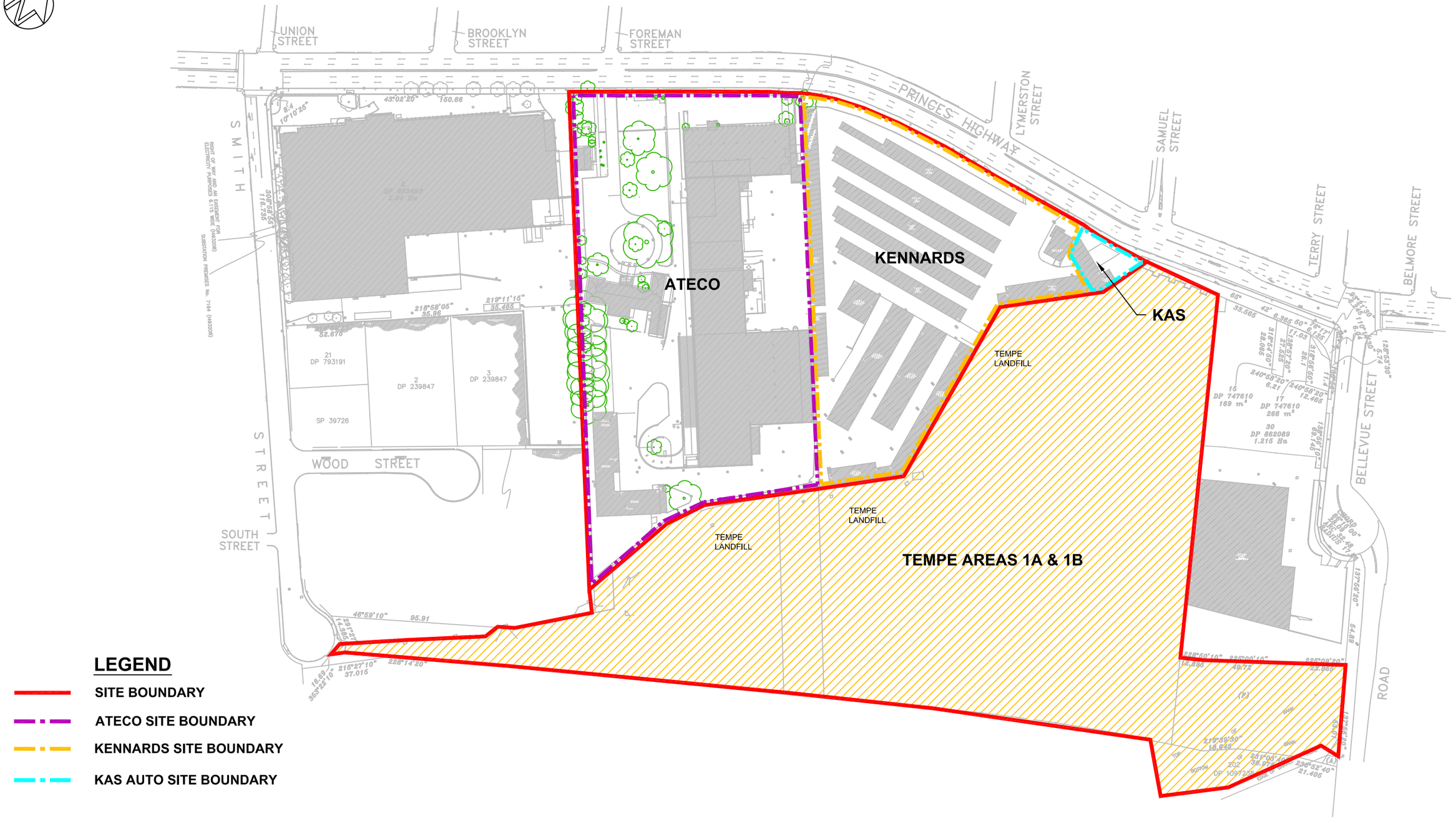
Figures

Remedial Action Plan
630 - 726 Princes Highway and Areas 1A & 1B Tempe Lands



SOURCE: SYDNEY AND BLUE MOUNTAINS STREET DIRECTORY
NEW SOUTH WALES
44TH EDITION, 2008, MAP: 275

drawn	MV	coffey environments SPECIALISTS IN LIVING AND WORKING PLACES	client: VALAD PROPERTY GROUP LTD	
approved			project: RAP FOR VALAD TEMPE COMMERCIAL DEVELOPMENT AT 630-726 PRINCES HIGHWAY & AREAS 1A & 1B, TEMPE LANDS, TEMPE NSW	
date	12.11.2008		title: SITE LOCATION PLAN	
scale	1:20 000		project no: ENVILCOV00315AH-D02	figure no: FIGURE 1
original size	A4			



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drawn	MV
approved	
date	12.11.2008
scale	AS SHOWN
original size	A3

coffey environments
SPECIALISTS IN LIVING AND WORKING PLACES

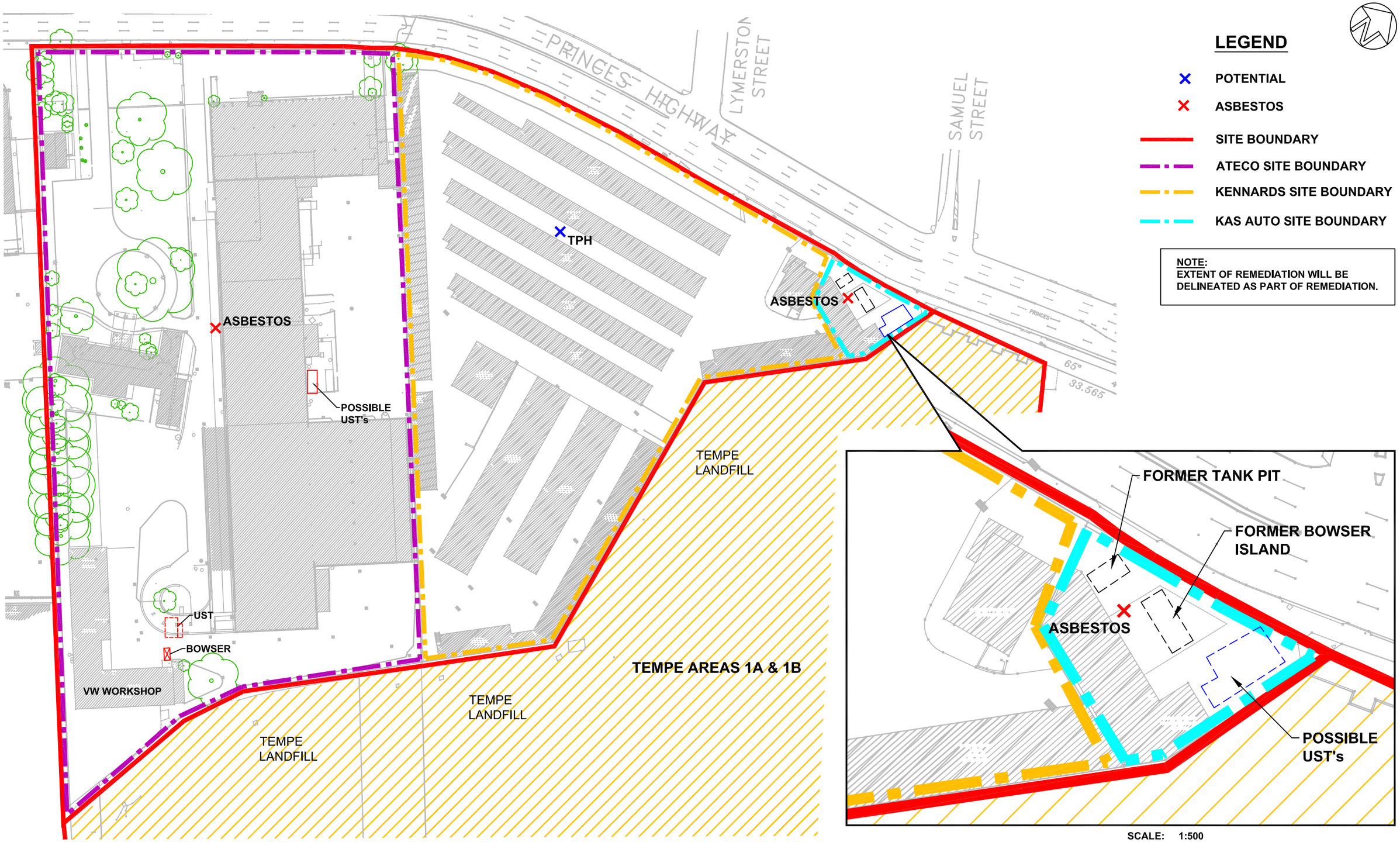
client: VALAD PROPERTY GROUP LTD

project: RAP FOR VALAD TEMPE COMMERCIAL DEVELOPMENT AT 630-726 PRINCES HIGHWAY & AREAS 1A & 1B, TEMPE LANDS, TEMPE NSW

title: SITE LAYOUT PLAN

project no: ENVILOV00315AH-D02

figure no: FIGURE 2



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date	12.11.2008
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original size	A3

coffey environments
SPECIALISTS IN LIVING AND WORKING PLACES

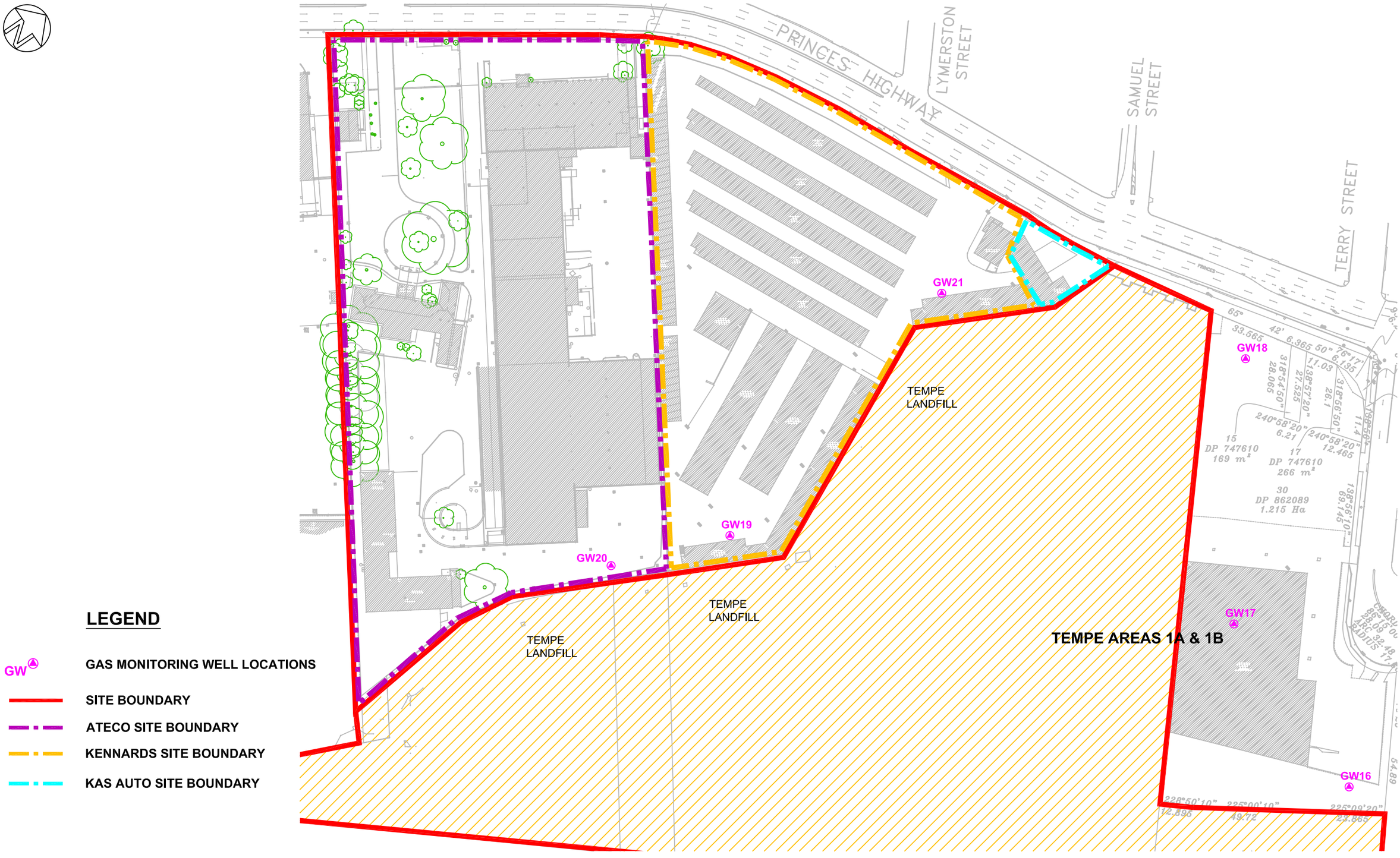
client: VALAD PROPERTY GROUP LTD

project: RAP FOR VALAD TEMPE COMMERCIAL DEVELOPMENT AT 630-726 PRINCES HIGHWAY & AREAS 1A & 1B, TEMPE LANDS, TEMPE NSW

title: REMEDIATION AREAS

project no: ENVILOV00315AH-D02

figure no: FIGURE 3



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original size	A3

coffey environments
SPECIALISTS IN LIVING AND WORKING PLACES

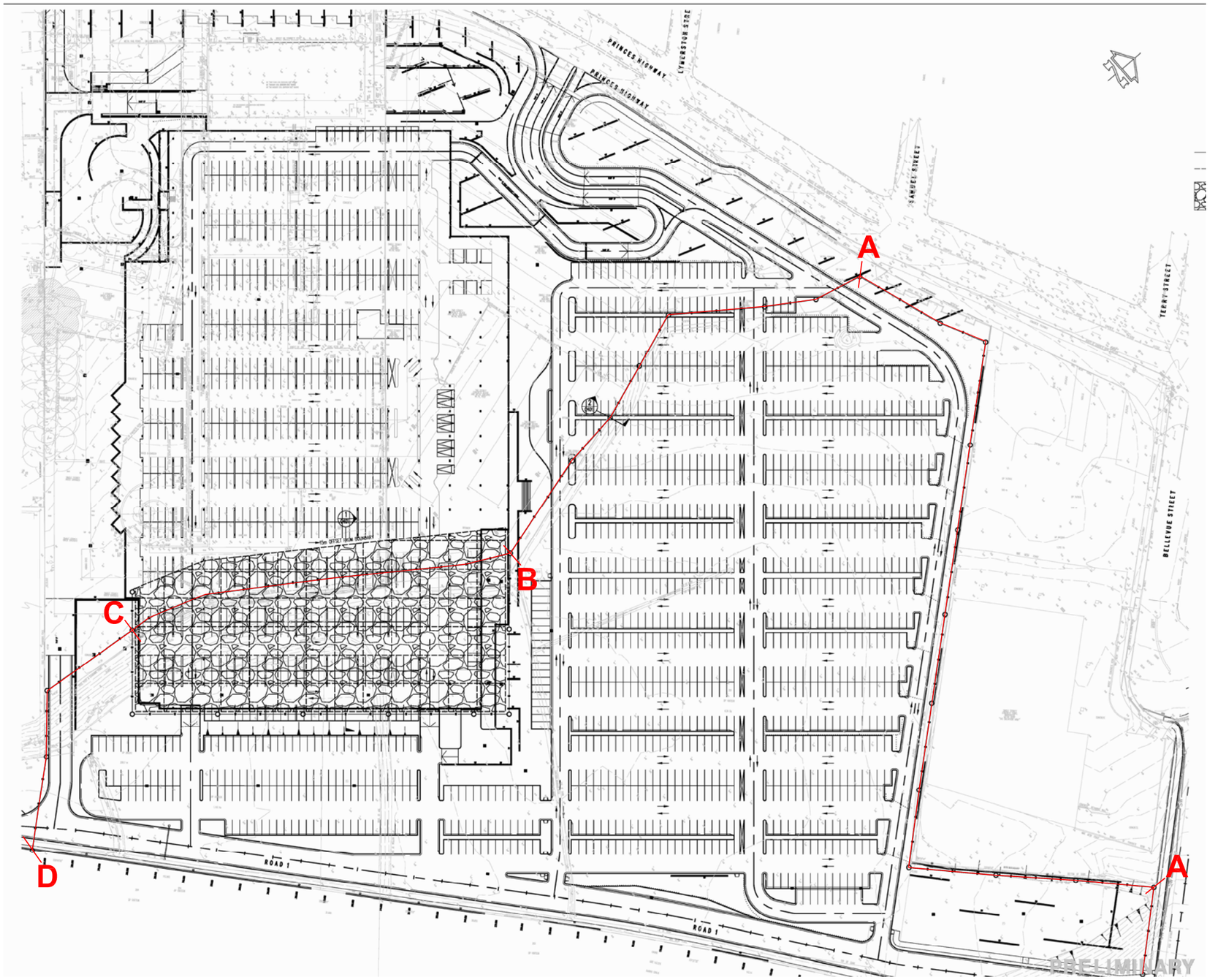
client: VALAD PROPERTY GROUP LTD

project: RAP FOR VALAD TEMPE COMMERCIAL DEVELOPMENT AT 630-726 PRINCES HIGHWAY & AREAS 1A & 1B, TEMPE LANDS, TEMPE NSW

title: LANDFILL GAS WELL LOCATION

project no: ENVILOV00315AH-D02

figure no: FIGURE 4



LEGEND

———	GAS MITIGATION TRENCH
A-A	TYPE 1 (see figures 6 &7)
A-B	TYPE 2 (see figure 8)
B-C	TYPE 3 (see figure 8)
C-D	TYPE 2 (see figure 8)

revision	description	drawn	approved	date

NOT TO SCALE

drawn	MV
approved	
date	12.11.2008
scale	AS SHOWN
original size	A3

coffey environments
SPECIALISTS IN LIVING AND WORKING PLACES

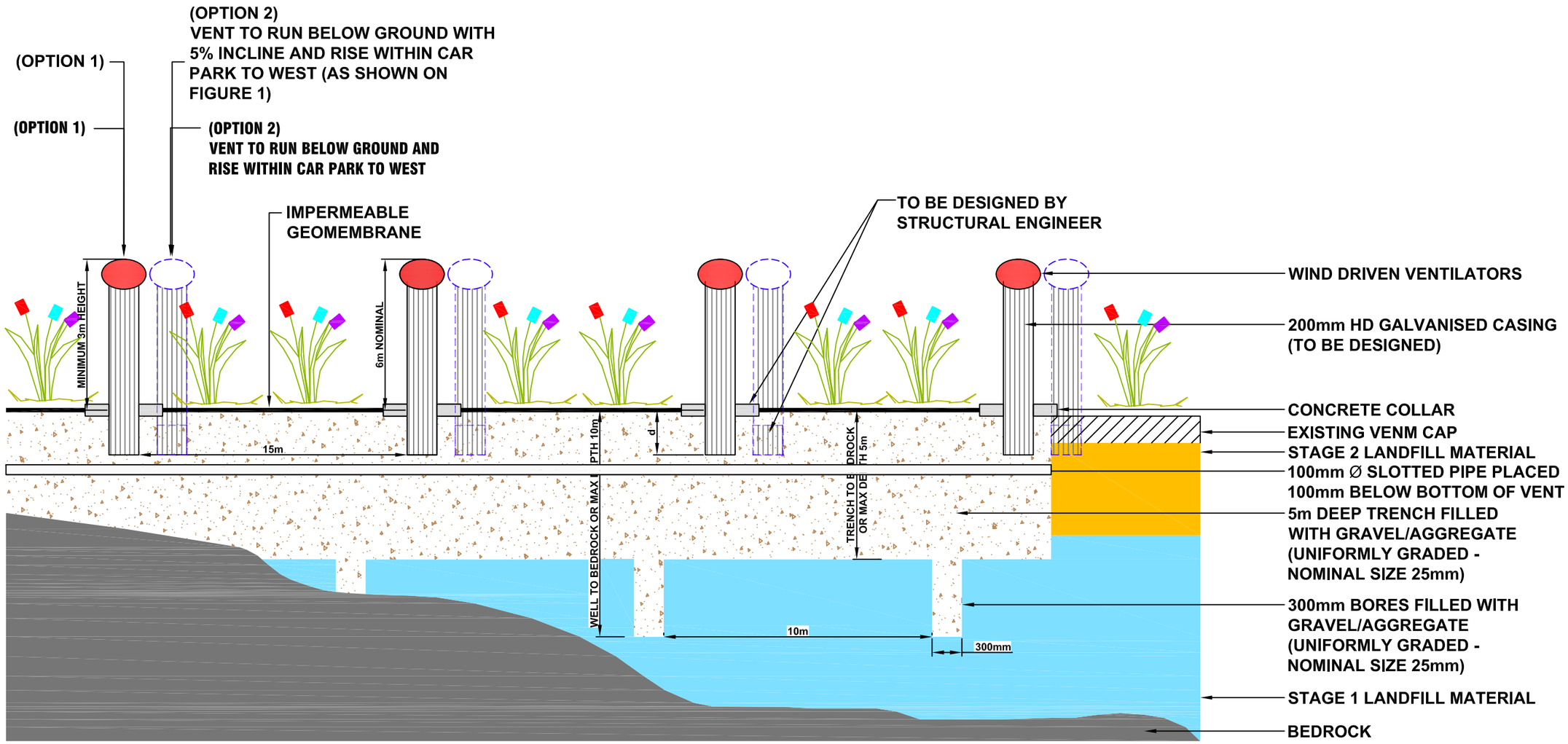
client: VALAD PROPERTY GROUP LTD

project: RAP FOR VALAD TEMPE COMMERCIAL DEVELOPMENT AT 630-726 PRINCES HIGHWAY & AREAS 1A & 1B, TEMPE LANDS, TEMPE NSW

title: GAS MITIGATION ALONG BOUNDARY PLAN

project no: ENVILOV00315AH-D02

figure no: FIGURE 5



CHAIN LINKAGE 100

CHAIN LINKAGE 160

TYPE 1

revision	description	drawn	approved	date

NOT TO SCALE

drawn	MV
approved	
date	12.11.2008
scale	AS SHOWN
original size	A3

coffey environments
SPECIALISTS IN LIVING AND WORKING PLACES

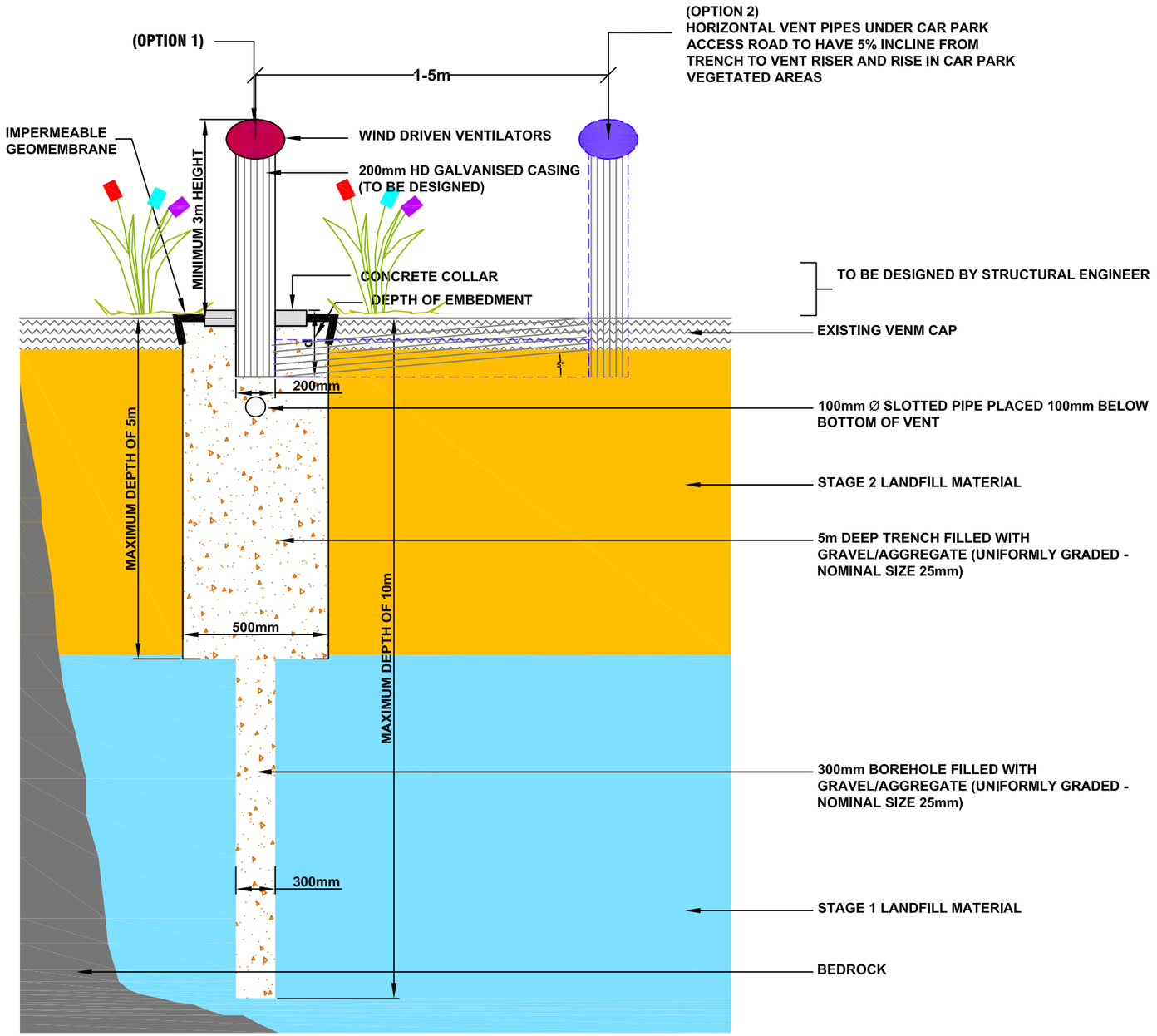
client: VALAD PROPERTY GROUP LTD

project: RAP FOR VALAD TEMPE COMMERCIAL DEVELOPMENT AT 630-726 PRINCES HIGHWAY & AREAS 1A & 1B, TEMPE LANDS, TEMPE NSW

title: SCHEMATIC TYPICAL LONG SECTION OF THE TRENCH & WELL SYSTEM APPLICABLE TO CHAIN LINKAGE 100.00 to 160.00 - (TYPE 1)

project no: ENVILOV00315AH-D02

figure no: FIGURE 6



TYPE 1

revision	description	drawn	approved	date

NOT TO SCALE

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date	12.11.2008
scale	AS SHOWN
original size	A3

coffey environments
SPECIALISTS IN LIVING AND WORKING PLACES

client: VALAD PROPERTY GROUP LTD

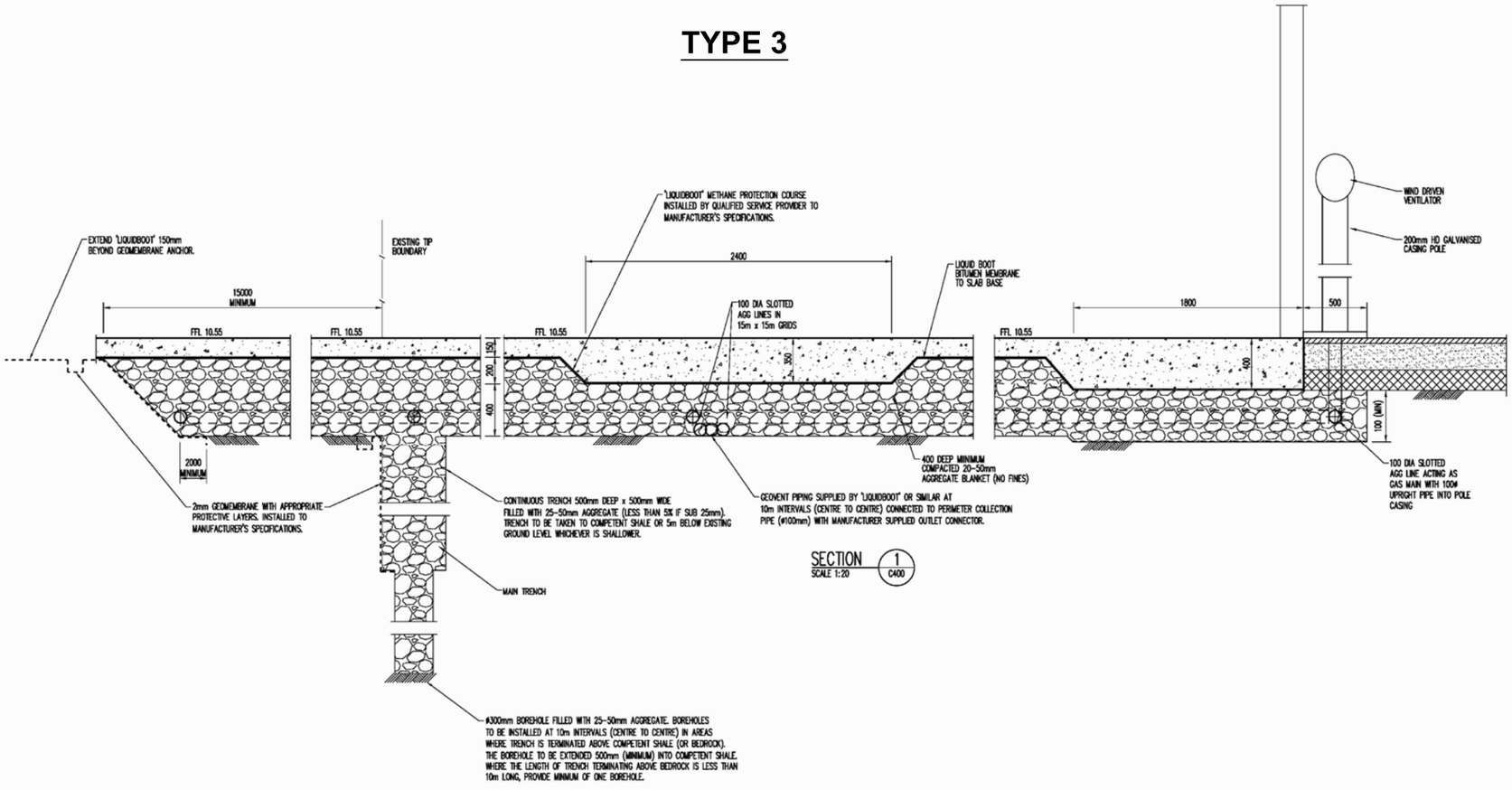
project: RAP FOR VALAD TEMPE COMMERCIAL DEVELOPMENT AT 630-726 PRINCES HIGHWAY & AREAS 1A & 1B, TEMPE LANDS, TEMPE NSW

title: SCHEMATIC CROSS SECTION OF THE TRENCH & WELL SYSTEMS - (TYPE 1)

project no: ENVILOV00315AH-D02

figure no: FIGURE 7

TYPE 3



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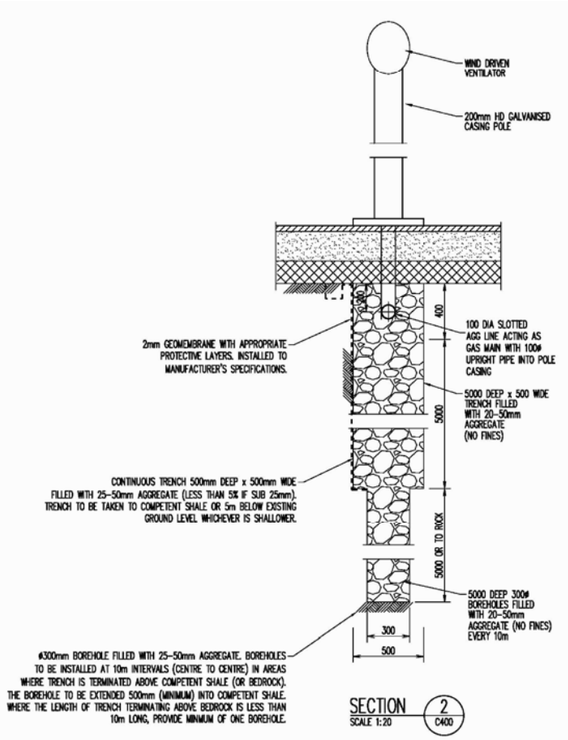

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date	**12.11.2008**
scale	**AS SHOWN**
original size	**A3**

coffey environments
SPECIALISTS IN LIVING AND WORKING PLACES

client: **VALAD PROPERTY GROUP LTD**

project: **RAP FOR VALAD TEMPE COMMERCIAL DEVELOPMENT AT 630-726 PRINCES HIGHWAY & AREAS 1A & 1B, TEMPE LANDS, TEMPE NSW**

title: **SCHEMATIC CROSS SECTION OF THE TRENCH & WELL SYSTEMS - (TYPE 2 & 3)**

project no: **ENVILOV00315AH-D02**

figure no: **FIGURE 8**

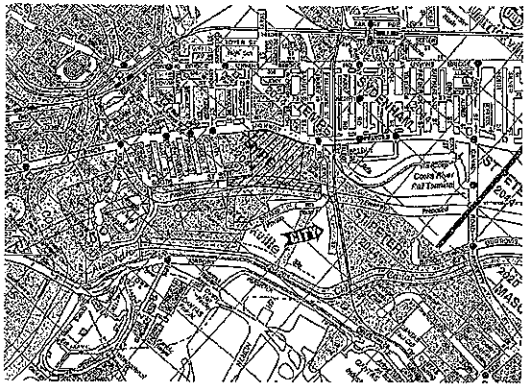
Appendix A
Proposed Development Plans

Remedial Action Plan
630 - 726 Princes Highway and Areas 1A & 1B Tempe Lands

TEMPE IKEA

PART 3A APPLICATION

16/10/2008



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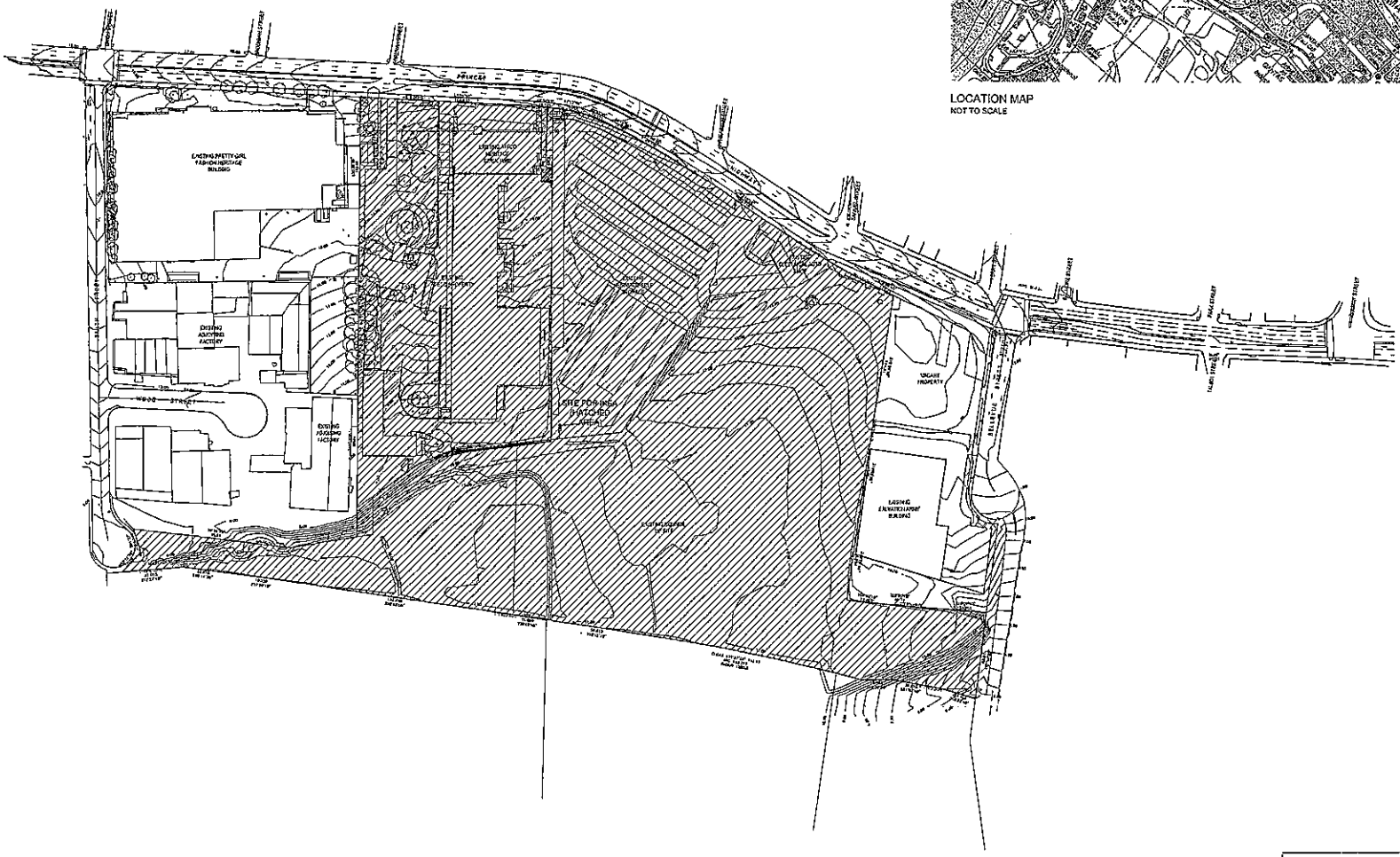

DETAIL SITE SURVEY BY
ESO SURVEYORS 48 Palomar
Parade Ph. 99392761
DATED: 28-02-07

ISSUE FOR PART 3A APPLICATION

CHECK ALL DIMENSIONS ON SITE, REFER ANY DISCREPANCIES TO THE SUPERINTENDENT'S REPLY PROCEEDING WITH SHOP WORK

No.	Description	Date
A	Issue for Part 3A Application	10.05.07
B	Issue for Part 3A Application	18.05.07
C	Issue for Part 3A Application	22.05.07

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VALAD PROPERTY GROUP

KRAUS TAYLOR RETAIL

TEMPE IKEA

PRINCESS HIGHWAY
TEMPE, SYDNEY

EXISTING SITE PLAN
ANALYSIS PLAN
LOCATION MAP

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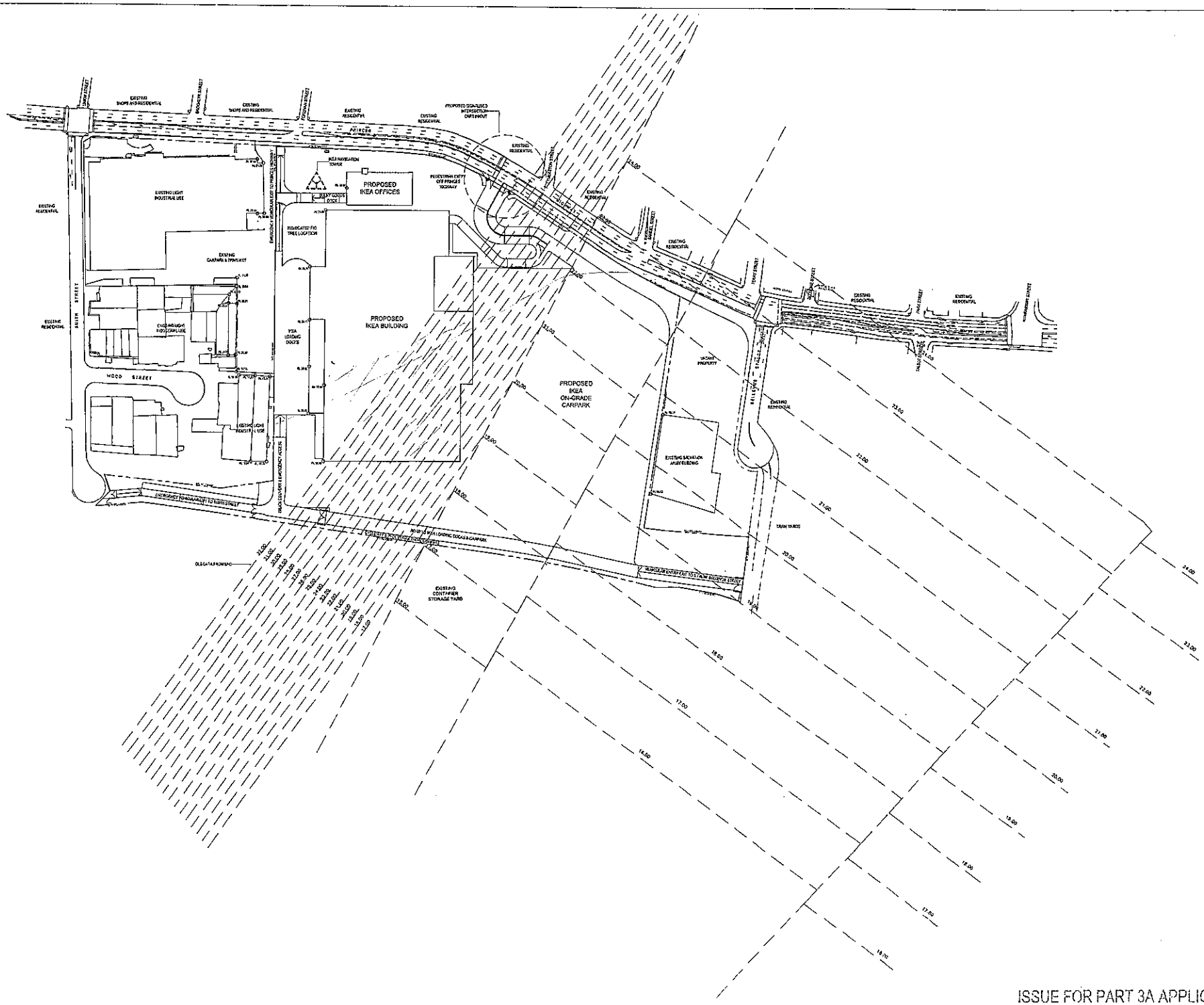

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VALAD PROPERTY GROUP

TEMPE IKEA
PRINCESS HIGHWAY
TEMPE, SYDNEY

PROPOSED SITE ANALYSIS PLAN

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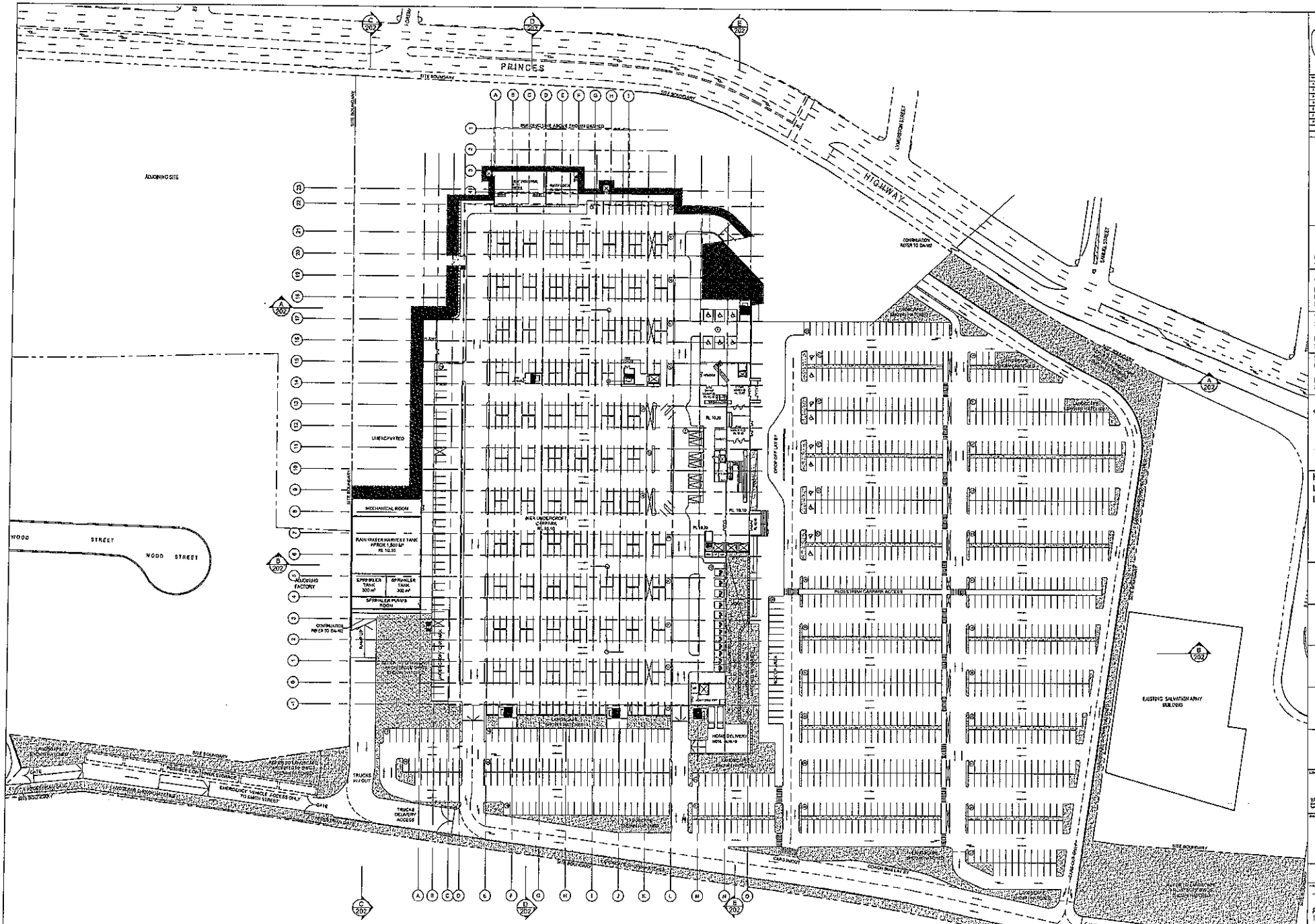

ISSUE FOR PART 3A APPLICATION

CHECK ALL DIMENSIONS ON SITE. REPORT ANY DISCREPANCIES TO THE SUPERINTENDENT BEFORE PROCEEDING WITH THE WORK.

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C	ISSUE FOR PART 3A APPLICATION	16.05.07
D	ISSUE FOR PART 3A APPLICATION	16.06.07
E	ISSUE FOR PART 3A APPLICATION	16.07.07
F	ISSUE FOR PART 3A APPLICATION	16.08.07
G	ISSUE FOR PART 3A APPLICATION	16.10.07

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KEY PLAN
LOWER GROUND LEVEL

VALAD
VALAD PROPERTY GROUP

TEMPE IKEA
PRINCESS HIGHWAY
TEMPE, SYDNEY

LOWER GROUND FLOOR GENERAL ARRANGEMENT

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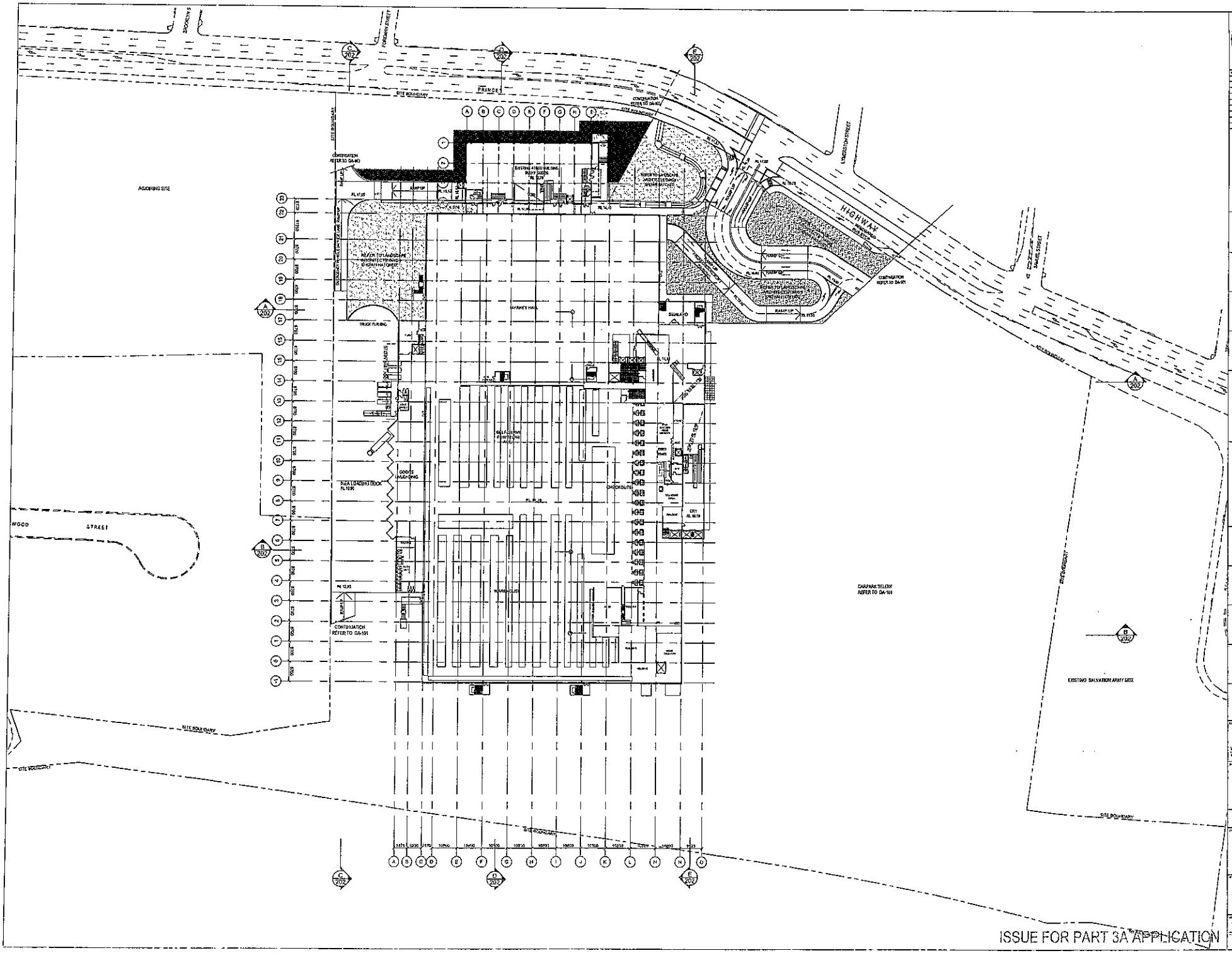
JOB NO. 07/0	DRAWING NO. DA-101	REVISION G	



ISSUE FOR PART 3A APPLICATION

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KEY PLAN
GROUND LEVEL

VALAD PROPERTY GROUP

JOHN HOOPER RETAIL
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SYDNEY NSW 2000
PH 9262 6222 FAX 9262 6333

TEMPE IKEA
PRINCESS HIGHWAY
TEMPE, SYDNEY

GROUND FLOOR
GENERAL ARRANGEMENT

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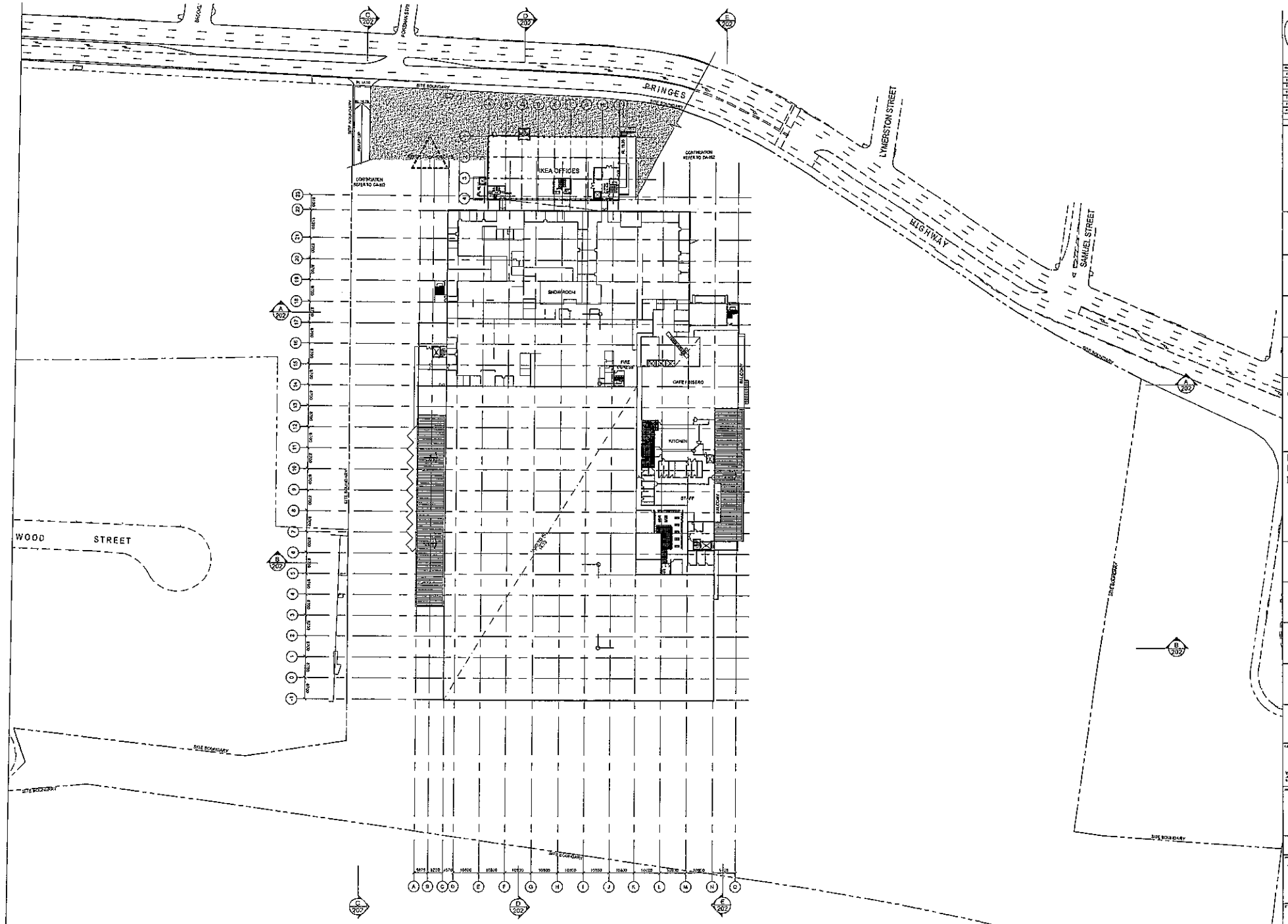

ISSUE FOR PART 3A APPLICATION

STRUCTURAL ENGINEER
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KEY PLAN
UPPER GROUND LEVEL

VALAD PROPERTY GROUP

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TEMPE IKEA
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UPPER GROUND FLOOR
GENERAL ARRANGEMENT

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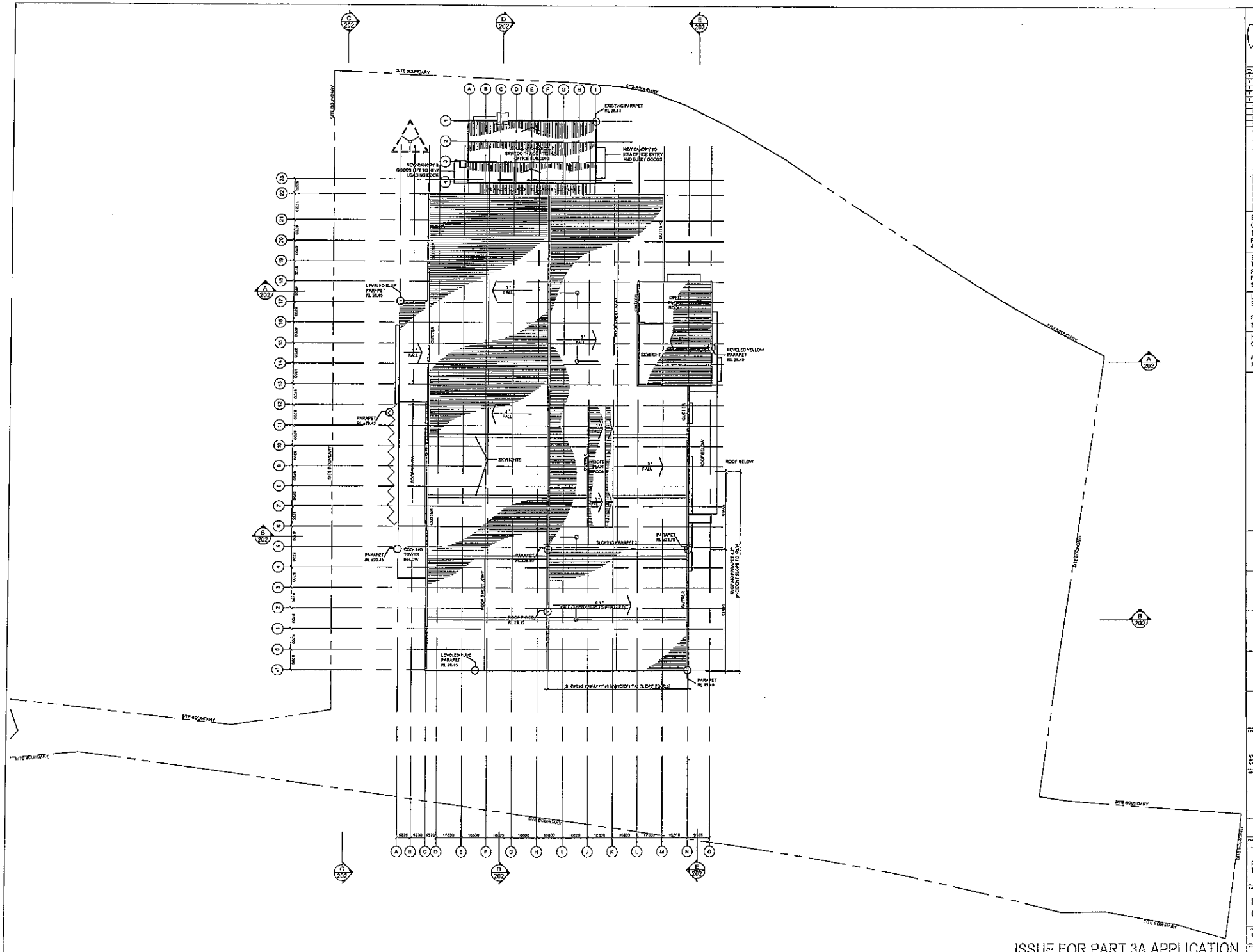

ISSUE FOR PART 3A APPLICATION

STRUCTURAL ENGINEER
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VALAD
VALAD PROPERTY GROUP

ARKIS TAYLOR RETAIL

TEMPE IKEA
PRINCESS HIGHWAY
TEMPE, SYDNEY

ROOF
GENERAL ARRANGEMENT

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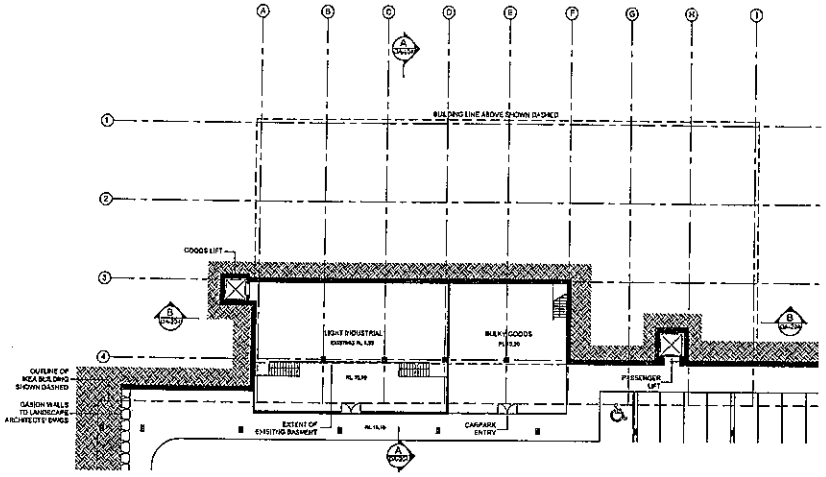

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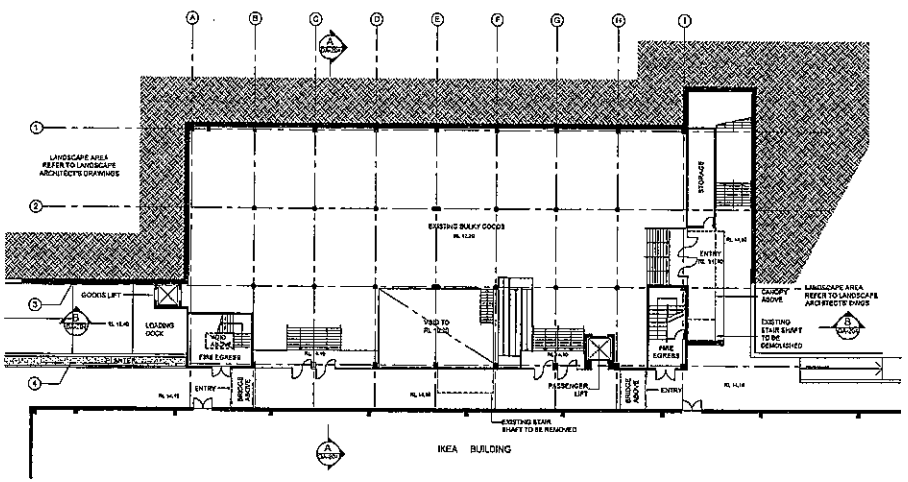
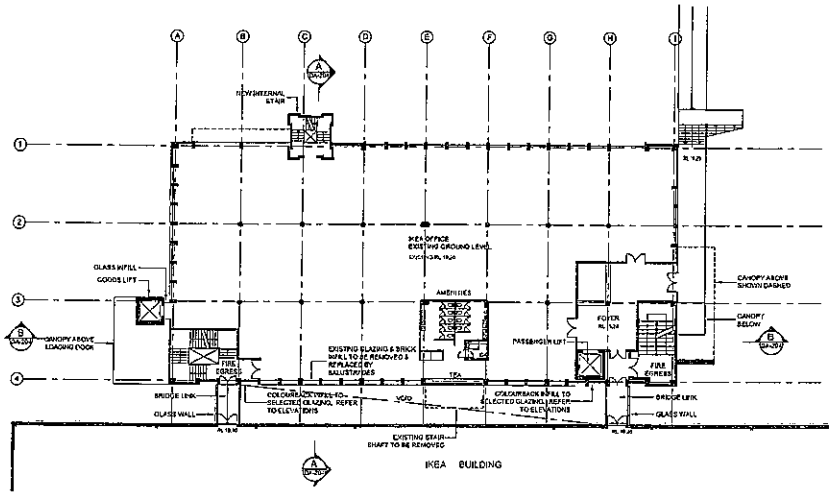
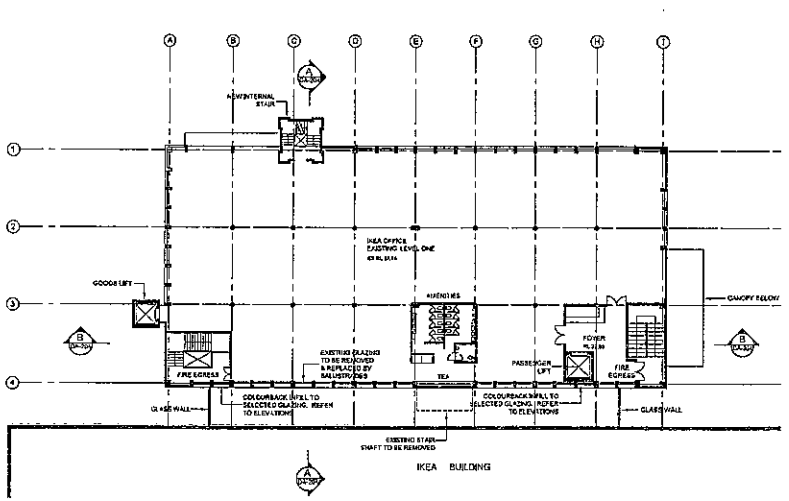


2 LOWER GROUND FLOOR PLAN



3 UPPER GROUND FLOOR PLAN



4 LEVEL ONE FLOOR PLAN

ISSUE FOR PART 3A APPLICATION

CHECK ALL DIMENSIONS ON SITE. REFER ANY DISCREPANCIES TO THE RESPONSIBLE CONSULTANT BEFORE PROCEEDING WITH ANY WORK.

No.	Description	Date
A	PRELIMINARY	09.08.07
B	ISSUE FOR REVIEW	16.08.07
C	ISSUE FOR REVIEW	23.08.07
D	ISSUE FOR REVIEW	30.08.07
E	ISSUE FOR PART 3A APPLICATION	06.09.07

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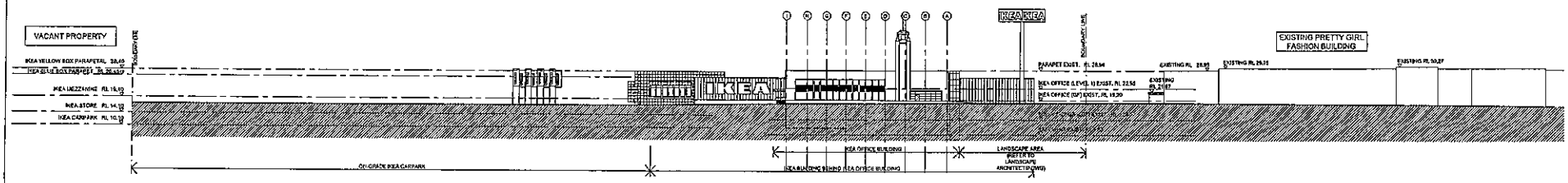
TEMPE, SYDNEY

IKEA OFFICE BUILDING PLANS

SCALE	DATE	DRAWN	CHECKED
1:200@A1	06.09.07	LC	JW/AM

JOB NO.	DWG NO.	REV
07C	DA-111	E



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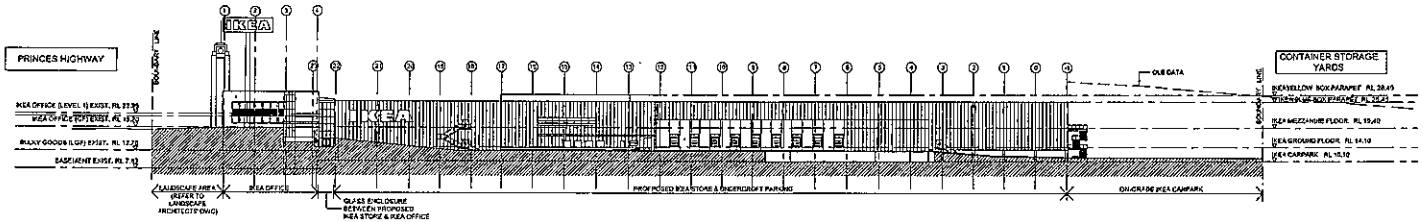

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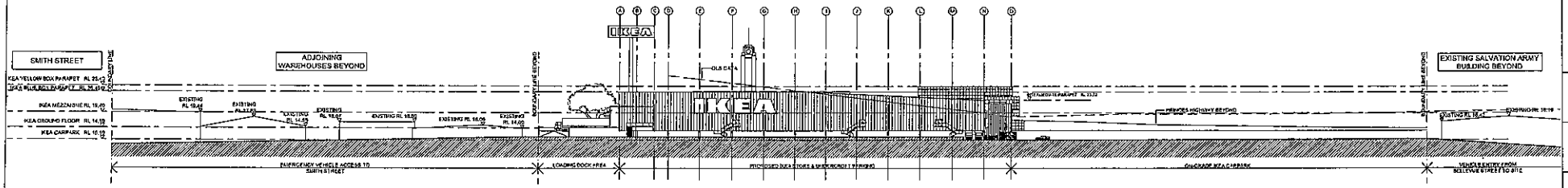

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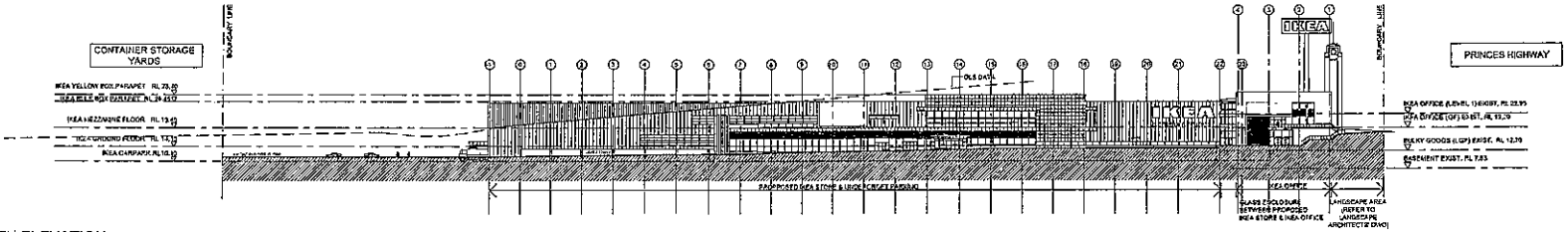

4 NORTH ELEVATION

FOR MORE DETAIL REFER DWG DA-200 AND DA-204

ISSUE FOR PART 3A APPLICATION

	CHECK ALL DIMENSIONS ON SITE, REPORT DISCREPANCIES TO THE SUPERINTENDENT BEFORE PROCEEDING WITH THE WORK
	© Hassell Pty Ltd and Ingham Planning Pty Ltd ABN 57 003 973 765 and Ingham Planning Pty Ltd ABN 57 003 973 765

No.	Description	Date
1		
2		
3		
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5		
6		
7		

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PROJECT
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PRINCESS HIGHWAY
TEMPE, SYDNEY

DRAWING
OVERALL SITE ELEVATIONS

SCALE	DATE	DRAWN	CHECKED
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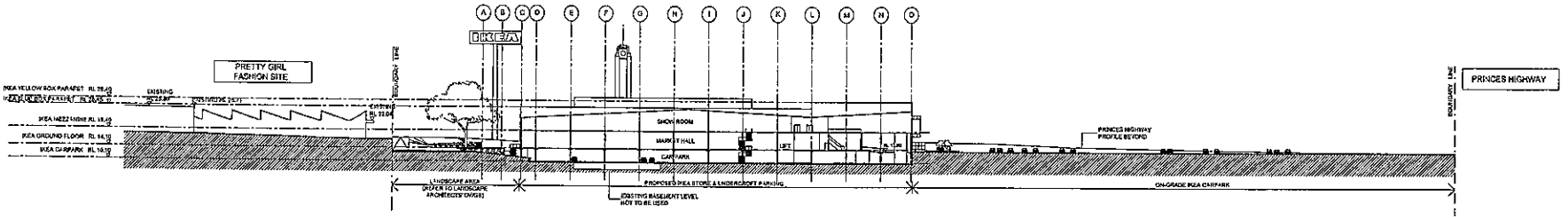
JOB NO.	DRAWING NO.	REVISION
07C	DA-201	F



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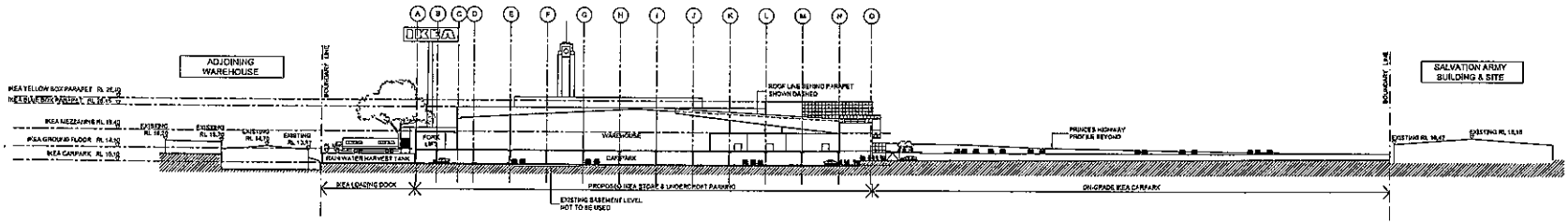

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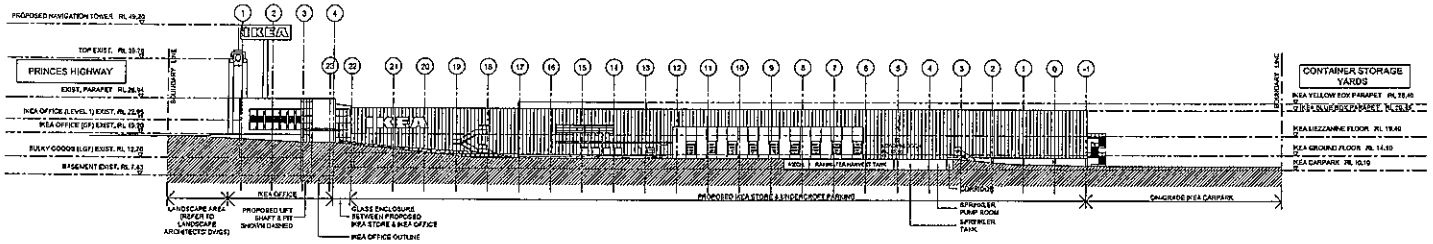

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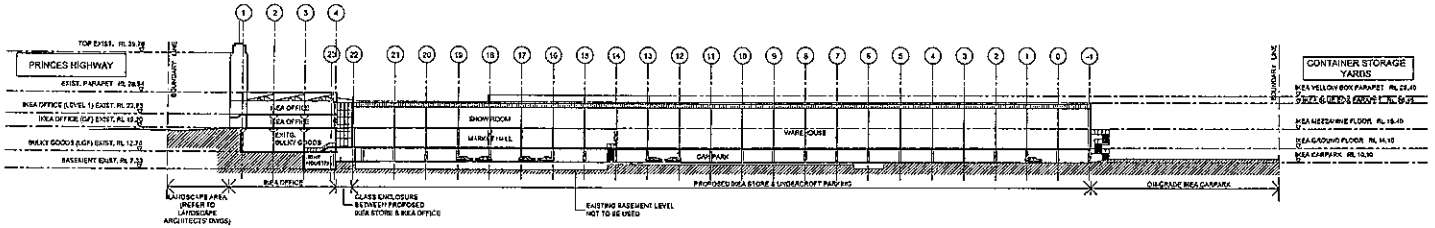

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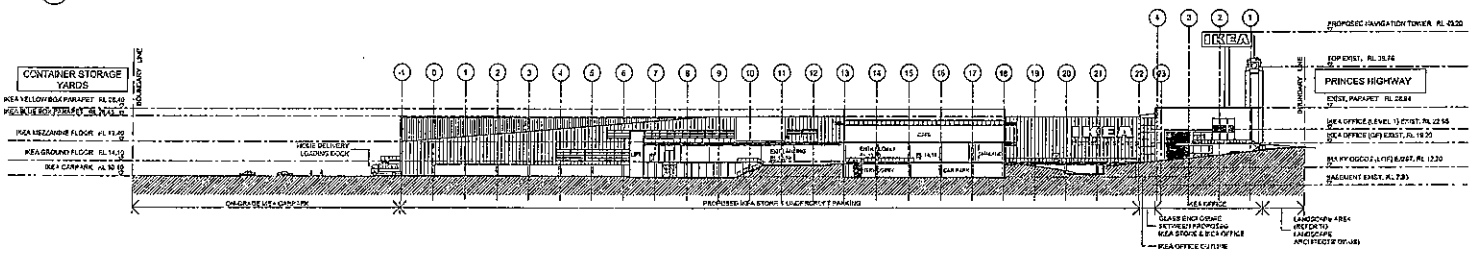

5 SITE SECTION E

ISSUE FOR PART 3A APPLICATION

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VALAD PROPERTY GROUP

TEMPE IKEA
PRINCESS HIGHWAY
TEMPE, SYDNEY

OVERALL SITE SECTIONS

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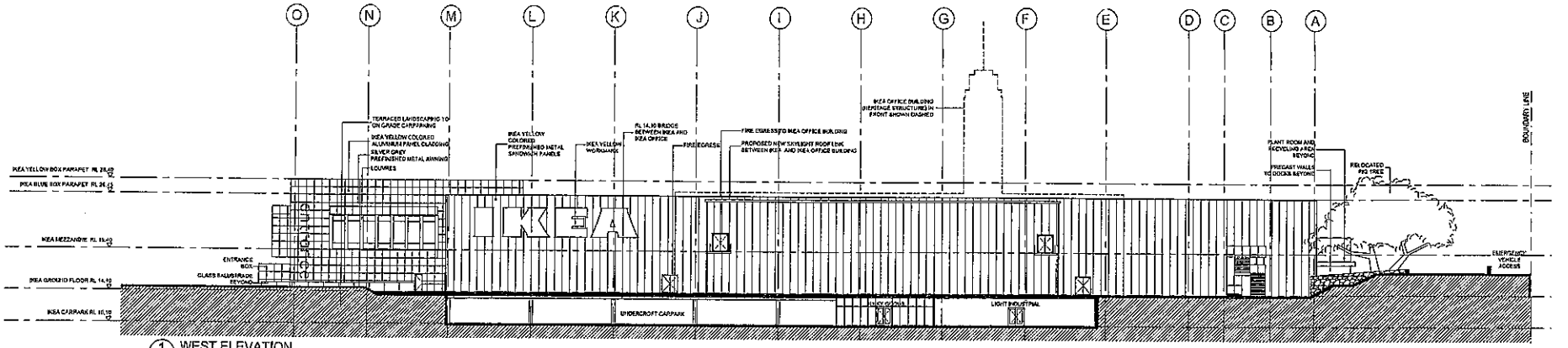
07C	DA-202		D



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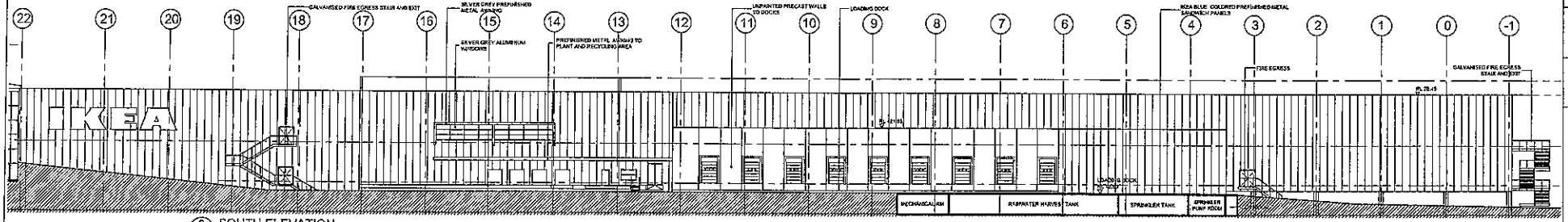

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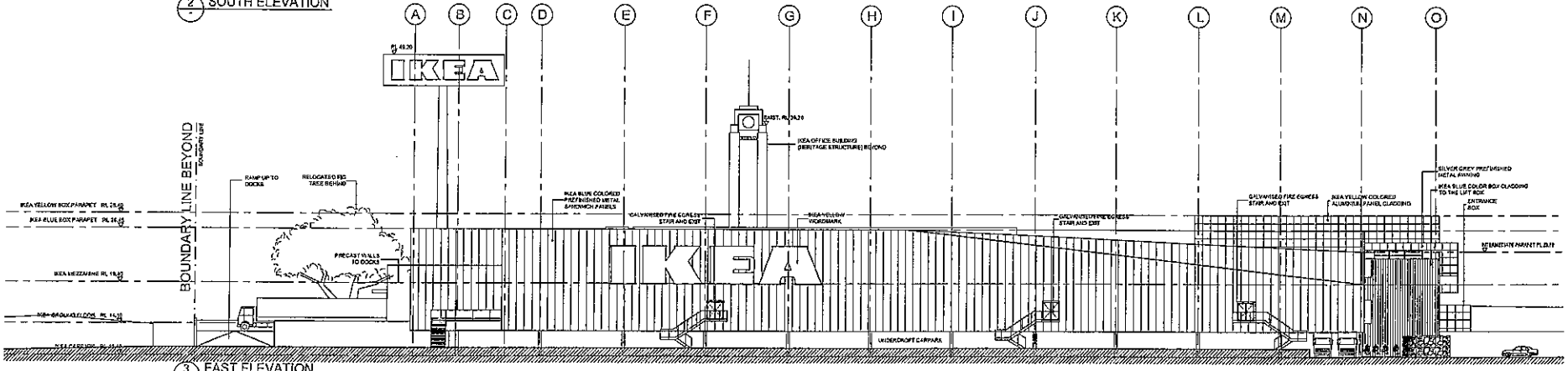

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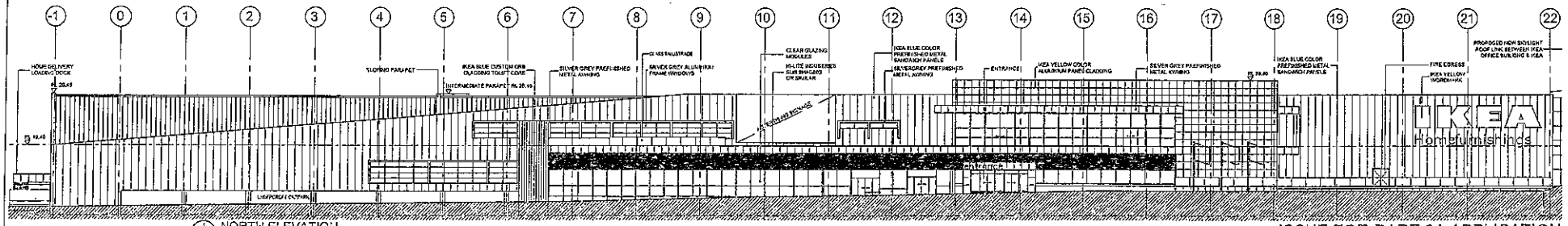

4 NORTH ELEVATION

ISSUE FOR PART 3A APPLICATION

CHECK ALL DRAWINGS ON SITE. REPORT ANY DISCREPANCIES TO THE SUPERINTENDENT BEFORE PROCEEDING WITH THE WORK

No.	Description	Date
1		
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VALAD
VALAD PROPERTY GROUP

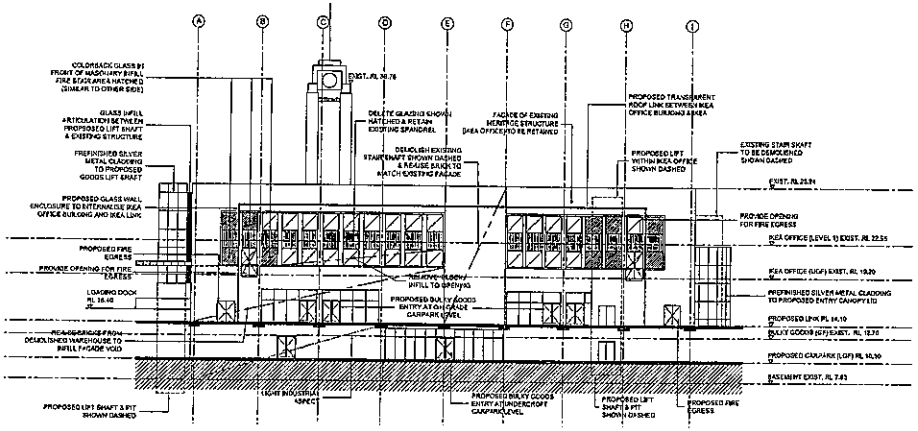
KINGS TAYLER RETAIL

TEMPE IKEA
PRINCESS HIGHWAY
TEMPE, SYDNEY

IKEA BUILDING ELEVATIONS

SCALE	DATE	DRAWN	JOB NUM
1:200@A0	16.07.08	AP/MH	7470AM

DRAWING NUMBER	REVISION
07C	DA-203	F



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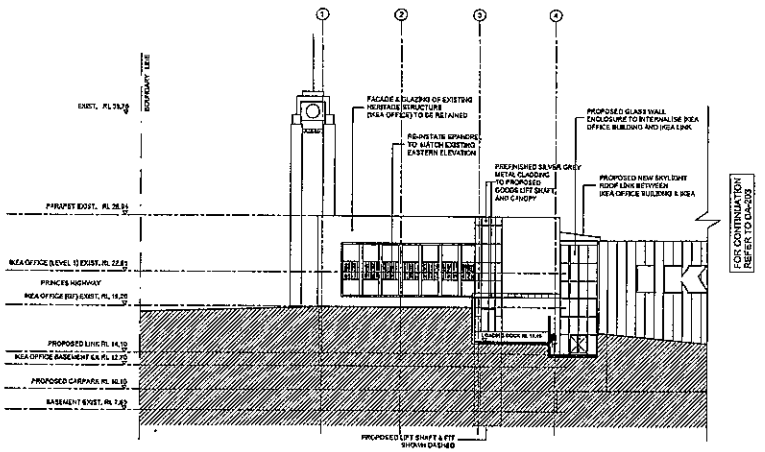

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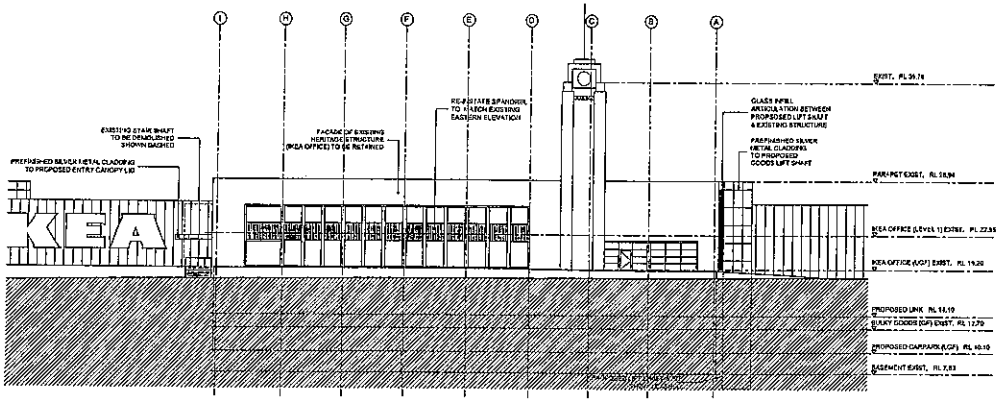

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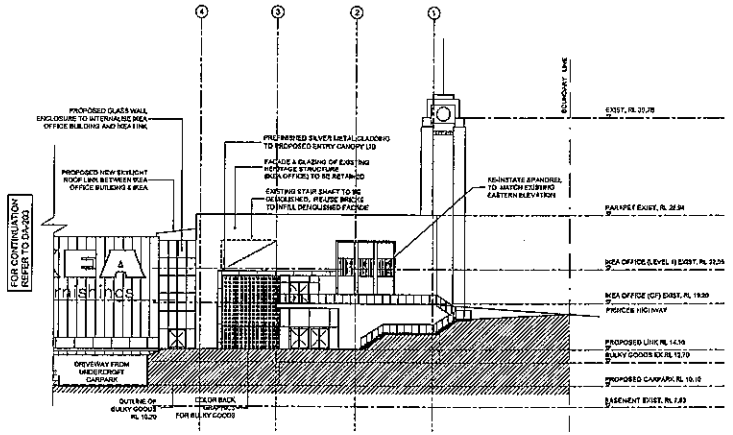

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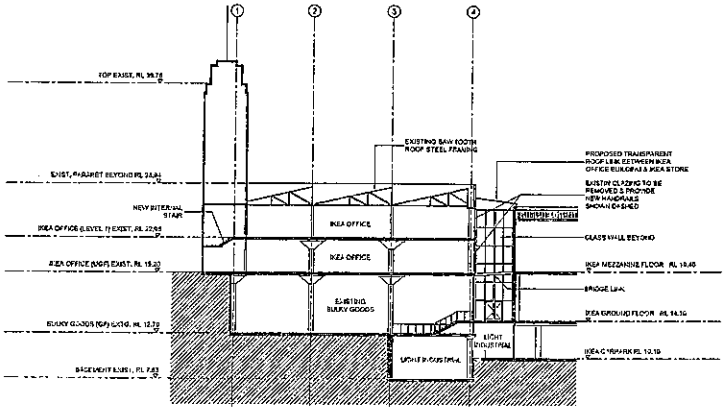

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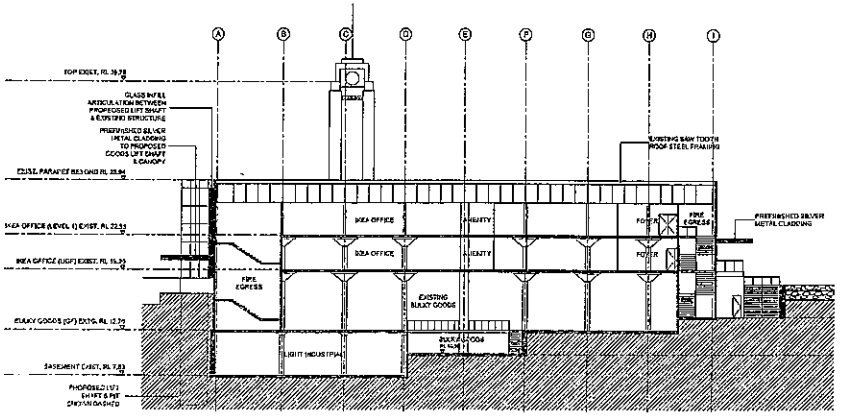

6 SECTION B

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TEMPE IKEA
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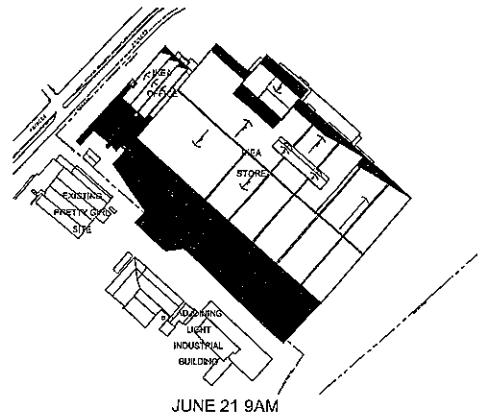
IKEA OFFICE BUILDING ELEVATIONS

SCALE	DATE	APPROVED	DRAWN
1:200@A0	18.07.08	LC/AH	JV/PAM
JOB No. 07C	DRAWING No. DA-204	REVISION E	



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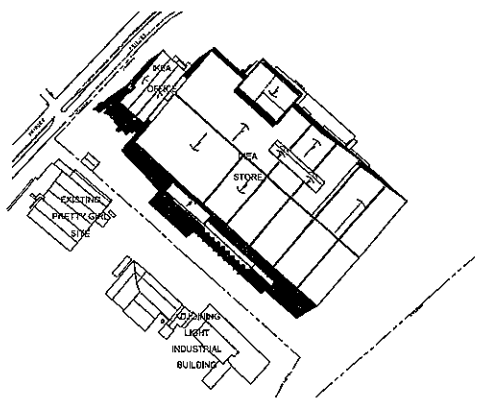

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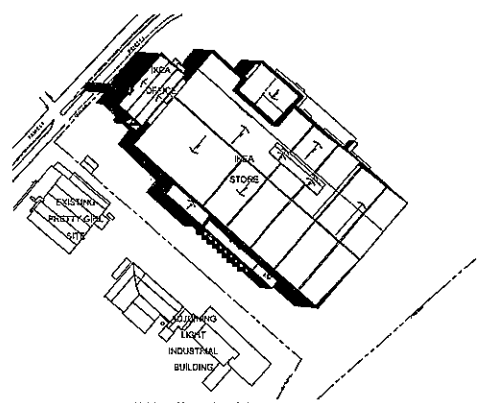

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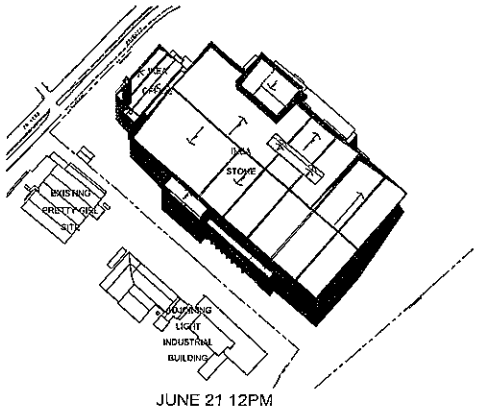

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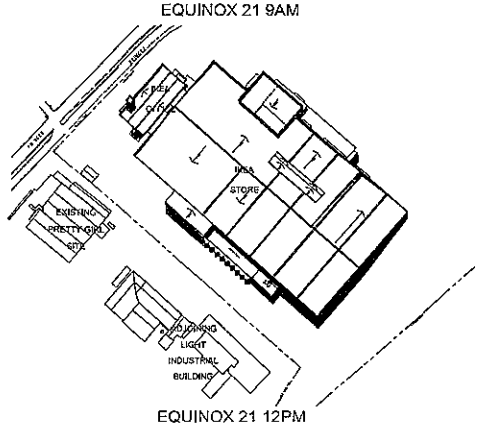

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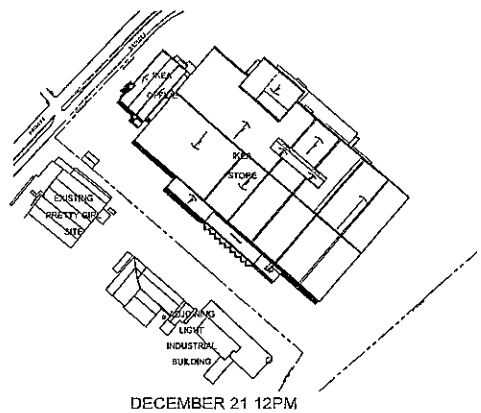

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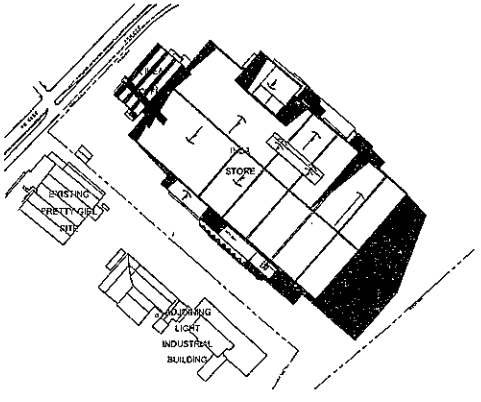

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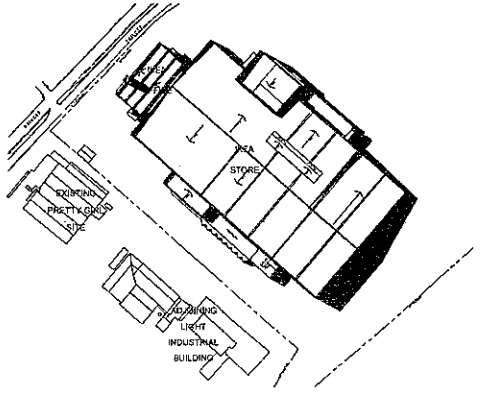

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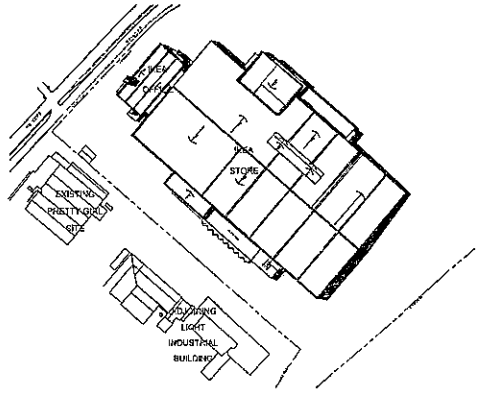

DECEMBER 21 3PM

ISSUE FOR PART 3A APPLICATION

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VALAD PROPERTY GROUP

TEMPE IKEA
PRINCESS HIGHWAY
TEMPE, SYDNEY

SHADOW DIAGRAM STUDY

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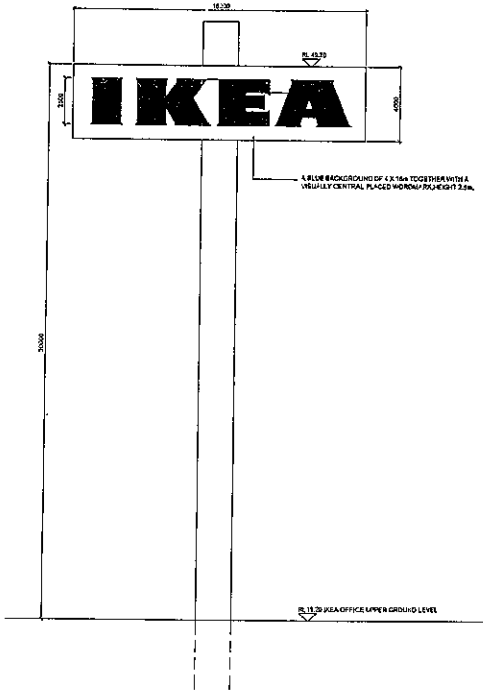
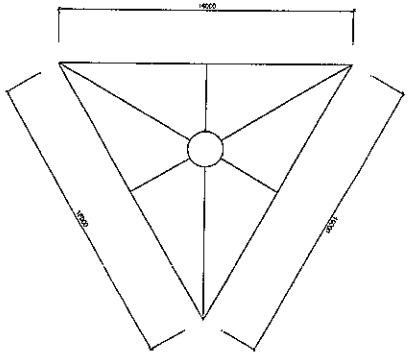
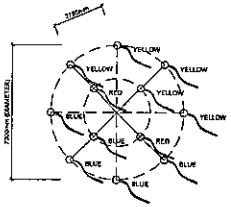
07C	DA-401		B



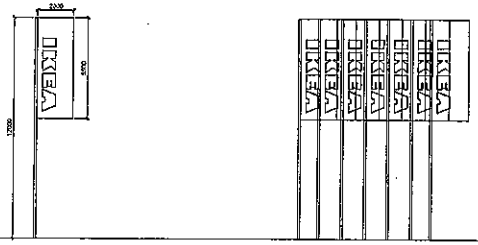
2 PYLON SIGNAGE ELEVATION



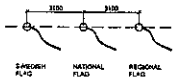
1 PYLON SIGNAGE PLAN



3 IKEA FLAGS - CIRCULAR CONFIGURATION PLAN



4 IKEA FLAGS - CIRCULAR CONFIGURATION ELEVATION



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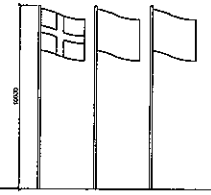

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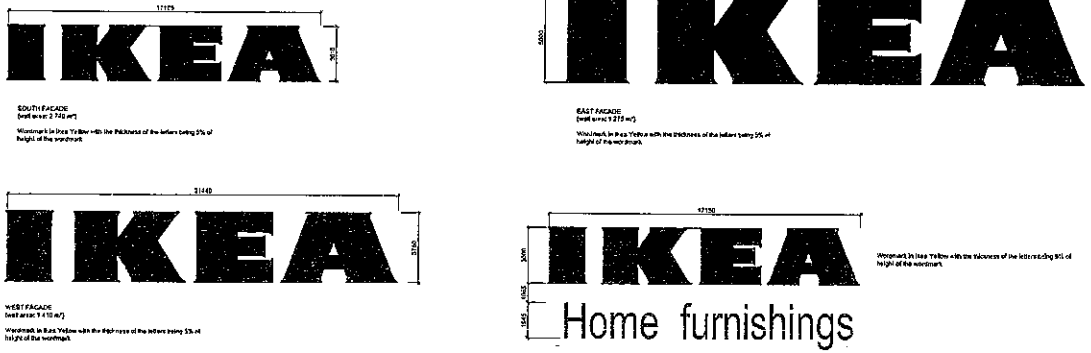

7 WALL SIGNAGES ELEVATION

ISSUE FOR PART 3A APPLICATION

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VALAD PROPERTY GROUP

KENNS TAYLER RETAIL

TEMPE IKEA
PRINCESS HIGHWAY
TEMPE, SYDNEY

SIGNAGE DETAILS

SCALE	DATE	DRN	CHK
1:100@A0	16.09.08	AM	JWPAM

DWG	REV
07C	DA-402	B

Appendix B
Previous Investigation Results

Remedial Action Plan
630 - 726 Princes Highway and Areas 1A & 1B Tempe Lands

Table LR1 Laboratory Results
Kennards Storage Facility, Princes Hwy Tempe
Job: Valad Property Group
ENVILCOV00315AH

Field_ID	BH2_0.5-0.8	BH2_1.5-1.7	BH3 0.5-0.7	BH3_1.0-1.2	BH3_1.4-1.5	BH3_2.5-2.7	BH4_0.5-0.7	BH4_1.5-1.7	BH4_2.5-2.7	BH5 0.3-0.5	BH5 1.0-1.2	BH5 1.3-1.5	BH5 2.5-2.7	BH6_0.5-0.7	BH6 1.0-1.2	BH6_1.5-1.7	BH6_4.5-4.7	BH6_7.0-7.2	BH7_0.5-0.7	BH7_1.0-1.2	BH7_2.5-2.7
Sampled_	20/05/2008	20/05/2008	19/05/2008	19/05/2008	19/05/2008	19/05/2008	20/05/2008	20/05/2008	20/05/2008	23/05/2008	23/05/2008	23/05/2008	23/05/2008	19/05/2008	19/05/2008	19/05/2008	19/05/2008	19/05/2008	20/05/2008	20/05/2008	20/05/2008
Sample Or	FILL	RESIDUAL	FILL	FILL	FILL	RESIDUAL	FILL	FILL	RESIDUAL	FILL	FILL	FILL	RESIDUAL	FILL	FILL	FILL	RESIDUAL	RESIDUAL	FILL	FILL	FILL

Group	Chemical I	Units	EQL	NEPM 1999 HIL F	WASTE CLASSIFICATION General Solid [2]		Restricted Solid [2]																			
Metals	Arsenic	mg/kg	5	**500**		**500**		**2000**	6	14	-	10	9	9	8	7	10	9	8	<5	12	7	-	9	11	<5	8	17	13
	Cadmium	mg/kg	1	**100**		**100**		**400**	<1	<1	-	<1	<1	<1	<1	<1	<1	<1	6	<1	<1	<1	-	<1	<1	<1	<1	<1	<1
	Chromium	mg/kg	2			**1900**		**7600**	7	15	-	9	14	10	15	8	9	10	10	6	10	8	-	15	14	9	9	4	46
	Copper	mg/kg	5	**5000**					12	14	-	54	15	24	37	24	30	70	38	14	26	32	-	14	36	74	50	14	24
	Lead	mg/kg	5	**1500**		**1500**		**6000**	8	10	-	24	16	9	94	24	10	53	42	8	9	35	-	20	9	8	28	11	26
	Mercury	mg/kg	0.1	**75**		**50**		**200**	<0.1	<0.1	-	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Nickel	mg/kg	2	**3000**		**1050**		**4200**	5	<2	-	6	<2	<2	26	6	5	26	13	4	3	18	-	4	<2	18	13	15	8
	Zinc	mg/kg	5	**35000**					43	<5	-	71	36	8	193	1330	28	248	341	80	20	68	-	36	12	67	82	26	368
TPH	TPH C 6 - C	mg/kg	10	**65** [1]		**650** [3]		**2600** [3]	<10	<10	-	<10	<10	<10	<10	<10	<10	<10	<10	14	<10	<10	-	<10	<10	<10	<10	<10	<10
	TPH C10 -	mg/kg	50						<50	<50	-	<50	<50	<50	<50	<50	<50	<50	110	2060	<50	<50	-	<50	<50	<50	<50	<50	<50
	TPH C15 -	mg/kg	100						<100	<100	-	180	<100	<100	<100	<100	<100	130	890	4380	<100	<100	-	<100	<100	<100	<100	<100	<100
	TPH C29-C	mg/kg	100						<100	<100	-	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	-	<100	<100	<100	<100	<100	<100
	TPH+C10 -	mg/kg		**1000** [1]		**10000** [3]		**40000** [3]	<250	<250	-	255	<250	<250	<250	<250	<250	205	1050	6490	<250	<250	-	<250	<250	<250	<250	<250	<250
BTEX	Benzene	mg/kg	0.2	**1** [1]		**10** [3]		**40** [3]	<0.2	<0.2	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	Ethylbenze	mg/kg	0.5	**50** [1]		**600** [3]		**2400** [3]	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Toluene	mg/kg	0.5	**130** [1]		**288** [3]		**1152** [3]	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Xylene (m	mg/kg	0.5						<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Xylene (o)	mg/kg	0.5						<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Xylene Tot	mg/kg		**25** [1]		**1000** [3]		**4000** [3]	<1	<1	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<1	<1	<1	<1	<1	<1
PAH	Acenaphth	mg/kg	0.5						<0.5	-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	-	<0.5	-	<0.5	<0.5	-	<0.5	-	<0.5
	Acenaphth	mg/kg	0.5						<0.5	-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	-	<0.5	-	<0.5	<0.5	-	<0.5	-	<0.5
	Anthracene	mg/kg	0.5						<0.5	-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	-	<0.5	-	<0.5	<0.5	-	<0.5	-	<0.5
	Benz(a)ant	mg/kg	0.5						<0.5	-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	-	<0.5	-	<0.5	<0.5	-	<0.5	-	<0.5
	Benzo(a) p	mg/kg	0.5	**5**		**0.8** [3]		**3.2** [3]	<0.5	-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	-	<0.5	-	<0.5	<0.5	-	<0.5	-	<0.5
	Benzo(b)flu	mg/kg	0.5						<0.5	-	-	0.5	-	-	<0.5	-	-	<0.5	-	-	-	<0.5	-	<0.5	<0.5	-	<0.5	-	<0.5
	Benzo(g,h,	mg/kg	0.5						<0.5	-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	-	<0.5	-	<0.5	<0.5	-	<0.5	-	<0.5
	Benzo(k)flu	mg/kg	0.5						<0.5	-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	-	<0.5	-	<0.5	<0.5	-	<0.5	-	<0.5
	Chrysene	mg/kg	0.5						<0.5	-	-	0.9	-	-	<0.5	-	-	<0.5	-	-	-	<0.5	-	<0.5	<0.5	-	<0.5	-	<0.5
	Dibenz(a,h	mg/kg	0.5						<0.5	-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	-	<0.5	-	<0.5	<0.5	-	<0.5	-	<0.5
	Fluoranthe	mg/kg	0.5						<0.5	-	-	0.9	-	-	<0.5	-	-	<0.5	-	-	-	<0.5	-	<0.5	<0.5	-	<0.5	-	<0.5
	Fluorene	mg/kg	0.5						<0.5	-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	-	<0.5	-	<0.5	<0.5	-	<0.5	-	<0.5
	Indeno(1,2	mg/kg	0.5						<0.5	-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	-	<0.5	-	<0.5	<0.5	-	<0.5	-	<0.5
	Naphthaler	mg/kg	0.5						<0.5	-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	-	<0.5	-	<0.5	<0.5	-	<0.5	-	<0.5
	Phenanthre	mg/kg	0.5						<0.5	-	-	2.4	-	-	<0.5	-	-	<0.5	-	-	-	<0.5	-	<0.5	<0.5	-	<0.5	-	<0.5
	Pyrene	mg/kg	0.5						<0.5	-	-	0.9	-	-	<0.5	-	-	<0.5	-	-	-	<0.5	-	<0.5	<0.5	-	<0.5	-	<0.5
	Total PAH	mg/kg				**200**		**800**	-	-	-	5.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OCP	4,4-DDE	mg/kg	0.05						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	a-BHC	mg/kg	0.05						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Aldrin	mg/kg	0.05						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Aldrin + Die	mg/kg		**50**					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	b-BHC	mg/kg	0.05						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	cis-Chlorda	mg/kg	0.05						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	d-BHC	mg/kg	0.05						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	DDD	mg/kg	0.05						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	DDT	mg/kg	0.2						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	DDT+DDE+	mg/kg		**1000**					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Dieldrin	mg/kg	0.05						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Endosulfan	mg/kg	0.05						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Endosulfan	mg/kg	0.05						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Endosulfan	mg/kg	0.05			**60** [3]		**240** [3]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Endrin	mg/kg	0.05						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Endrin alde	mg/kg	0.05						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Endrin keto	mg/kg	0.05						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	g-BHC (Lin	mg/kg	0.05						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Heptachlor	mg/kg	0.05	**50**					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Heptachlor	mg/kg	0.05						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Hexachloro	mg/kg	0.05						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Methoxychl	mg/kg	0.2						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	trans-chlor	mg/kg	0.05						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PCB	PCBs (Sun	mg/kg	0.1	**50**					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Asbestos		na	na	**Detected**					-	-	ND	-	-	-	ND	-	-	ND	-	-	-	-	ND	-	-	-	ND	-	-
Leachable Metals by ICPAES (mg/L)																												
	Arsenic	mg/L	0.1		**5**		**20**		-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Cadmium	mg/L	0.05		**1**		**4**		-	-	-	-	-	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chromium	mg/L	0.1		**5**		**20**		-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Copper	mg/L	0.1						-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Lead	mg/L	0.1		**5**		**20**		-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mercury	mg/L	0.001		**0.2**		**0.8**		-	-	-	-	-	-	<0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Nickel	mg/L	0.1		**2**		**8**		-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Zinc	mg/L	0.1						-	-	-	-	-	-	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-

[1] NSW EPA (1994) Guidelines for Assessing Service Station Sites, Table 3
[2] Maximum values from Table 2 of the Waste Classification Guidelines (DECC
[3] Maximum values from Table 1 of the Waste Classification Guidelines (DECC

BH7 4.0-4.2	BH7 6.8-7.0	BH8 0.5-0.7	BH8 2.5-2.7	BH9 1.0-1.2	BH9 2.5-2.7	BH9 4.2-4.4	BH10 0.5-0.7	BH10 1.0-1.2	BH10 5.5-5.7	BH10 10.0-10	BH11 0.5-0.7	BH11 1.5-1.7	BH11 3.3-3.5	BH12 0.3-0.5	BH12 0.7-1.0	BH12 1.5-1.7	BH12 3.8-4.0	BH13 0.3-0.5	BH13 1.5-1.7	BH13 2.5-2.7	BH17 1.0-1.2	BH18 1.0-1.2	BH20 0.5-0.7	BH20 1.0-1.2	BH21 0.5-0.7	BH21 1.0-1.2	BH21 1.5-1.7
20/05/2008	20/05/2008	23/05/2008	23/05/2008	19/05/2008	19/05/2008	19/05/2008	20/05/2008	20/05/2008	20/05/2008	20/05/2008	23/05/2008	23/05/2008	23/05/2008	23/05/2008	23/05/2008	23/05/2008	23/05/2008	23/05/2008	23/05/2008	23/05/2008	21/05/2008	21/05/2008	23/05/2008	23/05/2008	21/05/2008	21/05/2008	21/05/2008
FILL	FILL	FILL	FILL	FILL	FILL	FILL	FILL	FILL	FILL	FILL	FILL	FILL	FILL	FILL	FILL	FILL	FILL	FILL	FILL	FILL	FILL	FILL	RESIDUAL	RESIDUAL	FILL	FILL	RESIDUAL
8	8	6	6	7	8	18	8	8	7	28	7	13	7	-	8	9	12	7	8	6	-	7	9	8	6	6	12
<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	9	<1	<1	<1	-	<1	<1	<1	<1	<1	<1	-	<1	<1	<1	<1	<1	<1
13	11	10	8	16	16	18	9	9	9	148	6	14	11	-	10	8	9	6	5	5	-	12	20	12	7	10	16
8	38	39	37	53	32	185	48	42	46	759	19	16	61	-	46	66	37	25	47	26	-	58	8	8	32	37	22
24	159	27	31	27	93	232	22	22	19	835	30	57	59	-	25	21	24	7	19	12	-	78	21	16	60	51	<5
<0.1	0.2	<0.1	<0.1	<0.1	0.2	<0.1	0.1	<0.1	<0.1	4.6	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
<2	4	28	9	43	6	32	25	33	30	77	10	8	9	-	40	20	19	16	18	12	-	10	12	4	7	9	<2
12	225	77	50	94	119	181	87	116	119	3770	79	79	150	-	220	132	97	32	81	63	-	136	13	<5	70	42	12
<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	-	<10	<10	<10	<10	<10	<10	-	<10	<10	<10	<10	<10	<10
<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	240	<50	<50	<50	-	<50	<50	<50	<50	<50	<50	-	<50	<50	<50	<50	<50	<50
<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	2370	<100	<100	130	-	<100	<100	<100	<100	130	<100	-	<100	<100	<100	<100	<100	<100
<100	200	<100	<100	<100	<100	<100	<100	<100	<100	2400	<100	<100	<100	-	<100	<100	<100	<100	<100	<100	-	<100	<100	<100	<100	<100	<100
<250	275	<250	<250	<250	<250	<250	<250	<250	<250	5010	<250	<250	205	-	<250	<250	<250	<250	205	<250	-	<250	<250	<250	<250	<250	<250
<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<1	<1	<1	<1	<1	<1	-	<1	<1	<1	<1	<1	<1
-	<0.5	<0.5	-	<0.5	-	-	-	<0.5	-	-	<0.5	-	-	-	<0.5	-	-	-	-	<0.5	-	<0.5	-	-	-	<0.5	-
-	<0.5	<0.5	-	<0.5	-	-	-	<0.5	-	-	<0.5	-	-	-	<0.5	-	-	-	-	<0.5	-	<0.5	-	-	-	<0.5	-
-	<0.5	<0.5	-	<0.5	-	-	-	<0.5	-	-	<0.5	-	-	-	<0.5	-	-	-	-	<0.5	-	<0.5	-	-	-	<0.5	-
-	0.7	<0.5	-	<0.5	-	-	-	<0.5	-	-	<0.5	-	-	-	<0.5	-	-	-	-	<0.5	-	1.1	-	-	-	<0.5	-
-	0.7	<0.5	-	<0.5	-	-	-	<0.5	-	-	<0.5	-	-	-	<0.5	-	-	-	-	<0.5	-	1.2	-	-	-	<0.5	-
-	0.9	<0.5	-	<0.5	-	-	-	<0.5	-	-	<0.5	-	-	-	<0.5	-	-	-	-	<0.5	-	1.2	-	-	-	<0.5	-
-	0.6	<0.5	-	<0.5	-	-	-	<0.5	-	-	<0.5	-	-	-	<0.5	-	-	-	-	<0.5	-	0.7	-	-	-	<0.5	-
-	<0.5	<0.5	-	<0.5	-	-	-	<0.5	-	-	<0.5	-	-	-	<0.5	-	-	-	-	<0.5	-	<0.5	-	-	-	<0.5	-
-	0.7	<0.5	-	<0.5	-	-	-	<0.5	-	-	<0.5	-	-	-	<0.5	-	-	-	-	<0.5	-	1	-	-	-	<0.5	-
-	<0.5	<0.5	-	<0.5	-	-	-	<0.5	-	-	<0.5	-	-	-	<0.5	-	-	-	-	<0.5	-	<0.5	-	-	-	<0.5	-
-	1.2	<0.5	-	<0.5	-	-	-	<0.5	-	-	<0.5	-	-	-	<0.5	-	-	-	-	<0.5	-	1.7	-	-	-	<0.5	-
-	<0.5	<0.5	-	<0.5	-	-	-	<0.5	-	-	<0.5	-	-	-	<0.5	-	-	-	-	<0.5	-	<0.5	-	-	-	<0.5	-
-	<0.5	<0.5	-	<0.5	-	-	-	<0.5	-	-	<0.5	-	-	-	<0.5	-	-	-	-	<0.5	-	0.6	-	-	-	<0.5	-
-	<0.5	<0.5	-	<0.5	-	-	-	<0.5	-	-	<0.5	-	-	-	<0.5	-	-	-	-	<0.5	-	<0.5	-	-	-	<0.5	-
-	0.6	<0.5	-	<0.5	-	-	-	<0.5	-	-	<0.5	-	-	-	<0.5	-	-	-	-	<0.5	-	0.6	-	-	-	<0.5	-
-	1.2	<0.5	-	<0.5	-	-	-	<0.5	-	-	<0.5	-	-	-	<0.5	-	-	-	-	<0.5	-	1.7	-	-	-	<0.5	-
-	6.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.8	-	-	-	-	-
-	-	-	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
-	-	-	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
-	-	-	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
-	-	-	-	0.105	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-
-	-	-	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
-	-	-	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
-	-	-	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
-	-	-	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
-	-	-	-	<0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.2	-	-
-	-	-	-	<0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.3	-	-
-	-	-	-	0.08	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
-	-	-	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
-	-	-	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
-	-	-	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
-	-	-	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
-	-	-	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
-	-	-	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
-	-	-	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
-	-	-	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
-	-	-	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
-	-	-	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
-	-	-	-	<0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.2	-	-
-	-	-	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-
-	-	ND	-	ND	-	-	ND	-	-	-	ND	-	-	ND	-	-	-	ND	-	-	ND	ND	ND	-	ND	-	-
-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-
-	-	-	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-	-	-	-
-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-
-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-
-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-
-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	-	-	-	-	-
-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-
-	-	-	-	0.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	-	-	-	-	-

BH22 0.5-0.7	BH22 1.5-1.7	BH23 0.5-0.7	BH23 2.5-2.7	BH24 1.0-1.2	BH24 2.5-2.7	MW2 D1 0.5	MW2 D2 1.0	MW2 D3 1.5	MW2 D4 2.5	MW4 0.3-0.5	MW4 1.3-1.5	MW6 0.5-0.7	MW6 1.0-1.2	MW6 1.5-1.7	MW6 2.5-2.7	MW6 4.5-4.7	MW6 7.5-7.7
21/05/2008	21/05/2008	21/05/2008	21/05/2008	21/05/2008	21/05/2008	19/05/2008	19/05/2008	19/05/2008	19/05/2008	26/05/2008	26/05/2008	20/05/2008	20/05/2008	20/05/2008	20/05/2008	20/05/2008	20/05/2008
FILL	RESIDUAL	FILL	RESIDUAL	FILL	RESIDUAL	FILL	FILL	RESIDUAL	RESIDUAL	RESIDUAL	RESIDUAL	FILL	FILL	FILL	FILL	FILL	RESIDUAL
-	10	11	11	7	13	6	-	9	<5	14	11	8	-	7	10	10	6
-	<1	<1	<1	<1	<1	<1	-	<1	<1	<1	<1	<1	-	<1	<1	3	<1
-	7	11	6	8	10	13	-	7	4	9	25	8	-	8	7	28	8
-	19	28	13	30	23	13	-	15	10	17	19	42	-	40	32	165	11
-	7	32	<5	22	<5	46	-	12	11	9	17	26	-	30	26	267	16
-	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	0.5	<0.1
-	<2	14	<2	7	<2	3	-	<2	<2	4	<2	16	-	20	14	25	<2
-	7	127	<5	121	20	85	-	6	<5	14	6	86	-	174	88	553	11
-	<10	<10	<10	<10	<10	<10	-	<10	<10	<10	<10	<10	-	<10	<10	<10	<10
-	<50	<50	<50	<50	<50	<50	-	<50	<50	<50	<50	<50	-	<50	<50	<50	<50
-	<100	<100	<100	<100	<100	<100	-	<100	<100	<100	<100	<100	-	<100	<100	<100	<100
-	<100	<100	<100	<100	<100	<100	-	<100	<100	<100	<100	<100	-	<100	<100	<100	<100
-	<250	<250	<250	<250	<250	<250	-	<250	<250	<250	<250	<250	-	<250	<250	<250	<250
-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2	<0.2	<0.2	<0.2
-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5
-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5
-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5
-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5
-	<1	<1	<1	<1	<1	<1	-	<1	<1	<1	<1	<1	-	<1	<1	<1	<1
-	-	-	-	<0.5	-	<0.5	-	-	-	<0.5	-	<0.5	-	<0.5	-	-	-
-	-	-	-	<0.5	-	<0.5	-	-	-	<0.5	-	<0.5	-	<0.5	-	-	-
-	-	-	-	<0.5	-	<0.5	-	-	-	<0.5	-	<0.5	-	<0.5	-	-	-
-	-	-	-	<0.5	-	<0.5	-	-	-	<0.5	-	<0.5	-	<0.5	-	-	-
-	-	-	-	<0.5	-	<0.5	-	-	-	<0.5	-	<0.5	-	<0.5	-	-	-
-	-	-	-	<0.5	-	<0.5	-	-	-	<0.5	-	<0.5	-	<0.5	-	-	-
-	-	-	-	<0.5	-	<0.5	-	-	-	<0.5	-	<0.5	-	<0.5	-	-	-
-	-	-	-	<0.5	-	<0.5	-	-	-	<0.5	-	<0.5	-	<0.5	-	-	-
-	-	-	-	<0.5	-	<0.5	-	-	-	<0.5	-	<0.5	-	<0.5	-	-	-
-	-	-	-	<0.5	-	<0.5	-	-	-	<0.5	-	<0.5	-	<0.5	-	-	-
-	-	-	-	<0.5	-	<0.5	-	-	-	<0.5	-	<0.5	-	<0.5	-	-	-
-	-	-	-	<0.5	-	<0.5	-	-	-	<0.5	-	<0.5	-	<0.5	-	-	-
-	-	-	-	<0.5	-	<0.5	-	-	-	<0.5	-	<0.5	-	<0.5	-	-	-
-	-	-	-	<0.5	-	<0.5	-	-	-	<0.5	-	<0.5	-	<0.5	-	-	-
-	-	-	-	<0.5	-	<0.5	-	-	-	<0.5	-	<0.5	-	<0.5	-	-	-
-	-	-	-	<0.5	-	<0.5	-	-	-	<0.5	-	<0.5	-	<0.5	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	<0.05	-	-	-	-	-	-	-	-	-	<0.05	-	-	-	-	-
-	-	<0.05	-	-	-	-	-	-	-	-	-	<0.05	-	-	-	-	-
-	-	<0.05	-	-	-	-	-	-	-	-	-	<0.05	-	-	-	-	-
-	-	<0.1	-	-	-	-	-	-	-	-	-	0.075	-	-	-	-	-
-	-	<0.05	-	-	-	-	-	-	-	-	-	<0.05	-	-	-	-	-
-	-	<0.05	-	-	-	-	-	-	-	-	-	<0.05	-	-	-	-	-
-	-	<0.05	-	-	-	-	-	-	-	-	-	<0.05	-	-	-	-	-
-	-	<0.05	-	-	-	-	-	-	-	-	-	<0.05	-	-	-	-	-
-	-	<0.2	-	-	-	-	-	-	-	-	-	<0.2	-	-	-	-	-
-	-	<0.3	-	-	-	-	-	-	-	-	-	<0.3	-	-	-	-	-
-	-	<0.05	-	-	-	-	-	-	-	-	-	0.05	-	-	-	-	-
-	-	<0.05	-	-	-	-	-	-	-	-	-	<0.05	-	-	-	-	-
-	-	<0.05	-	-	-	-	-	-	-	-	-	<0.05	-	-	-	-	-
-	-	<0.05	-	-	-	-	-	-	-	-	-	<0.05	-	-	-	-	-
-	-	<0.05	-	-	-	-	-	-	-	-	-	<0.05	-	-	-	-	-
-	-	<0.05	-	-	-	-	-	-	-	-	-	<0.05	-	-	-	-	-
-	-	<0.05	-	-	-	-	-	-	-	-	-	<0.05	-	-	-	-	-
-	-	<0.05	-	-	-	-	-	-	-	-	-	<0.05	-	-	-	-	-
-	-	<0.05	-	-	-	-	-	-	-	-	-	<0.05	-	-	-	-	-
-	-	<0.05	-	-	-	-	-	-	-	-	-	<0.05	-	-	-	-	-
-	-	<0.05	-	-	-	-	-	-	-	-	-	<0.05	-	-	-	-	-
-	-	<0.2	-	-	-	-	-	-	-	-	-	<0.2	-	-	-	-	-
-	-	<0.05	-	-	-	-	-	-	-	-	-	<0.05	-	-	-	-	-
-	-	<0.1	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-
ND	-	ND	-	**Detected**	-	-	ND	-	-	ND	-	ND	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	-	-	-	-

Table LR1 Laboratory Results
ATECO, Princes Hwy Tempe
Job: Valad Property Group
ENVILCOV00315AH

								Field_ID	BH25 0.5-0.7	BH25 1.0-1.2	BH25 2.5-2.7	BH26 0.5-0.7	BH26 1.5-1.7	BH27 0.5-0.7	BH27 1.0-1.2	BH28 0.5-0.7	BH29 0.5-0.7	BH29 1.5-1.7	BH30 0.5-0.7	BH30 2.5-2.7	BH31 0.5-0.7	BH31 1.0-1.2	BH32 1.5-1.7	BH33 0.5-0.7
								Sample Date	26/05/2008	26/05/2008	26/05/2008	30/05/2008	30/05/2008	28/05/2008	28/05/2008	26/05/2008	26/05/2008	26/05/2008	26/05/2008	26/05/2008	26/05/2008	26/05/2008	29/05/2008	26/05/2008
								Sample Origin	FILL	FILL	RESIDUAL	FILL	RESIDUAL	FILL	FILL	RESIDUAL	RESIDUAL	RESIDUAL	FILL	RESIDUAL	FILL	RESIDUAL	RESIDUAL	FILL
Group	**Chemical Name**	**Units**	**EQL**	**NEPM 1999 HIL F**	**WASTE CLASSIFICATION**																			
					General Solid [2]		**Restricted Solid [2]**																	
Metals	Arsenic	mg/kg	5	**500**		**500**		**2000**	-	8	9	7	12	-	7	11	12	10	7	11	7	<5	7	-
	Cadmium	mg/kg	1	**100**		**100**		**400**	-	<1	<1	<1	<1	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
	Chromium (total)	mg/kg	2			**1900**		**7600**	-	12	9	11	10	-	12	15	22	13	55	12	16	7	13	-
	Copper	mg/kg	5	**5000**					-	14	<5	16	<5	-	<5	16	<5	15	26	12	<5	<5	<5	-
	Lead	mg/kg	5	**1500**		**1500**		**6000**	-	98	19	891	16	-	15	14	20	17	328	14	23	11	16	-
	Mercury	mg/kg	0.1	**75**		**50**		**200**	-	0.1	<0.1	0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	-
	Nickel	mg/kg	2	**3000**		**1050**		**4200**	-	<2	<2	3	<2	-	<2	<2	<2	<2	33	<2	<2	<2	<2	-
	Zinc	mg/kg	5	**35000**					-	51	6	185	<5	-	18	<5	<5	<5	146	<5	5	<5	<5	-
TPH	TPH C 6 - C 9 Fraction	mg/kg	10	**65 [1]**		**650 [3]**		**2600 [3]**	-	<10	<10	<10	<10	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	-
	TPH C10 - C14 Fraction	mg/kg	50						-	<50	<50	<50	<50	-	<50	<50	<50	<50	<50	<50	<50	<50	<50	-
	TPH C15 - C28 Fraction	mg/kg	100						-	<100	<100	<100	<100	-	<100	<100	<100	<100	120	<100	<100	<100	<100	-
	TPH C29-C36 Fraction	mg/kg	100						-	<100	<100	<100	<100	-	<100	<100	<100	<100	<100	<100	<100	<100	<100	-
	TPH+C10 - C36 (Sum of total)	mg/kg		**1000 [1]**		**10000 [3]**		**40000 [3]**	-	<250	<250	<250	<250	-	<250	<250	<250	<250	195	<250	<250	<250	<250	-
BTEX	Benzene	mg/kg	0.2	**1 [1]**		**10 [3]**		**40 [3]**	-	<0.2	<0.2	<0.2	<0.2	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-
	Ethylbenzene	mg/kg	0.5	**50 [1]**		**600 [3]**		**2400 [3]**	-	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
	Toluene	mg/kg	0.5	**130 [1]**		**288 [3]**		**1152 [3]**	-	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
	Xylene (m & p)	mg/kg	0.5						-	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
	Xylene (o)	mg/kg	0.5						-	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
	Xylene Total	mg/kg		**25 [1]**		**1000 [3]**		**4000 [3]**	-	<1	<1	<1	<1	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
PAH	Acenaphthene	mg/kg	0.5						-	<0.5	-	-	-	-	<0.5	-	<0.5	-	-	-	-	-	-	-
	Acenaphthylene	mg/kg	0.5						-	<0.5	-	-	-	-	<0.5	-	<0.5	-	-	-	-	-	-	-
	Anthracene	mg/kg	0.5						-	<0.5	-	-	-	-	<0.5	-	<0.5	-	-	-	-	-	-	-
	Benz(a)anthracene	mg/kg	0.5						-	<0.5	-	-	-	-	<0.5	-	<0.5	-	-	-	-	-	-	-
	Benzo(a) pyrene	mg/kg	0.5	**5**		**0.8 [3]**		**3.2 [3]**	-	<0.5	-	-	-	-	<0.5	-	<0.5	-	-	-	-	-	-	-
	Benzo(b)fluoranthene	mg/kg	0.5						-	<0.5	-	-	-	-	<0.5	-	<0.5	-	-	-	-	-	-	-
	Benzo(g,h,i)perylene	mg/kg	0.5						-	<0.5	-	-	-	-	<0.5	-	<0.5	-	-	-	-	-	-	-
	Benzo(k)fluoranthene	mg/kg	0.5						-	<0.5	-	-	-	-	<0.5	-	<0.5	-	-	-	-	-	-	-
	Chrysene	mg/kg	0.5						-	<0.5	-	-	-	-	<0.5	-	<0.5	-	-	-	-	-	-	-
	Dibenz(a,h)anthracene	mg/kg	0.5						-	<0.5	-	-	-	-	<0.5	-	<0.5	-	-	-	-	-	-	-
	Fluoranthene	mg/kg	0.5						-	<0.5	-	-	-	-	<0.5	-	<0.5	-	-	-	-	-	-	-
	Fluorene	mg/kg	0.5						-	<0.5	-	-	-	-	<0.5	-	<0.5	-	-	-	-	-	-	-
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.5						-	<0.5	-	-	-	-	<0.5	-	<0.5	-	-	-	-	-	-	-
	Naphthalene	mg/kg	0.5						-	<0.5	-	-	-	-	<0.5	-	<0.5	-	-	-	-	-	-	-
	Phenanthrene	mg/kg	0.5						-	<0.5	-	-	-	-	<0.5	-	<0.5	-	-	-	-	-	-	-
	Pyrene	mg/kg	0.5						-	<0.5	-	-	-	-	<0.5	-	<0.5	-	-	-	-	-	-	-
	Total PAH	mg/kg				**200**		**800**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OCP	4,4-DDE	mg/kg	0.05						-	-	-	<0.05	-	-	-	-	<0.05	-	-	-	-	-	-	<0.05
	a-BHC	mg/kg	0.05						-	-	-	<0.05	-	-	-	-	<0.05	-	-	-	-	-	-	<0.05
	Aldrin	mg/kg	0.05						-	-	-	<0.05	-	-	-	-	<0.05	-	-	-	-	-	-	<0.05
	Aldrin + Dieldrin	mg/kg		**50**					-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	<0.1
	b-BHC	mg/kg	0.05						-	-	-	<0.05	-	-	-	-	<0.05	-	-	-	-	-	-	<0.05
	cis-Chlordane	mg/kg	0.05						-	-	-	<0.05	-	-	-	-	<0.05	-	-	-	-	-	-	<0.05
	d-BHC	mg/kg	0.05						-	-	-	<0.05	-	-	-	-	<0.05	-	-	-	-	-	-	<0.05
	DDD	mg/kg	0.05						-	-	-	<0.05	-	-	-	-	<0.05	-	-	-	-	-	-	<0.05
	DDT	mg/kg	0.2						-	-	-	<0.2	-	-	-	-	<0.2	-	-	-	-	-	-	<0.2
	DDT+DDE+DDD	mg/kg		**1000**					-	-	-	<0.3	-	-	-	-	<0.3	-	-	-	-	-	-	<0.3
	Dieldrin	mg/kg	0.05						-	-	-	<0.05	-	-	-	-	<0.05	-	-	-	-	-	-	<0.05
	Endosulfan I	mg/kg	0.05						-	-	-	<0.05	-	-	-	-	<0.05	-	-	-	-	-	-	<0.05
	Endosulfan II	mg/kg	0.05						-	-	-	<0.05	-	-	-	-	<0.05	-	-	-	-	-	-	<0.05
	Endosulfan sulphate	mg/kg	0.05			**60 [3]**		**240 [3]**	-	-	-	<0.05	-	-	-	-	<0.05	-	-	-	-	-	-	<0.05
	Endrin	mg/kg	0.05						-	-	-	<0.05	-	-	-	-	<0.05	-	-	-	-	-	-	<0.05
	Endrin aldehyde	mg/kg	0.05						-	-	-	<0.05	-	-	-	-	<0.05	-	-	-	-	-	-	<0.05
	Endrin ketone	mg/kg	0.05						-	-	-	<0.05	-	-	-	-	<0.05	-	-	-	-	-	-	<0.05
	g-BHC (Lindane)	mg/kg	0.05						-	-	-	<0.05	-	-	-	-	<0.05	-	-	-	-	-	-	<0.05
	Heptachlor	mg/kg	0.05	**50**					-	-	-	<0.05	-	-	-	-	<0.05	-	-	-	-	-	-	<0.05
	Heptachlor epoxide	mg/kg	0.05						-	-	-	<0.05	-	-	-	-	<0.05	-	-	-	-	-	-	<0.05
	Hexachlorobenzene	mg/kg	0.05						-	-	-	<0.05	-	-	-	-	<0.05	-	-	-	-	-	-	<0.05
	Methoxychlor	mg/kg	0.2						-	-	-	<0.2	-	-	-	-	<0.2	-	-	-	-	-	-	<0.2
	trans-chlordane	mg/kg	0.05						-	-	-	<0.05	-	-	-	-	<0.05	-	-	-	-	-	-	<0.05
PCB	PCBs (Sum of total)	mg/kg	0.1	**50**					-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	<0.1
Asbestos		na	na	**Detected**					ND	-	-	ND	-	ND	-	ND	-	-	**Detected**	-	ND	-	-	ND
Leachable Metals by ICPAES (mg/L)																								
	Arsenic	mg/L	0.1		**5**		**20**		-	-	-	-	-	-	-	<0.1	-	-	<0.1	-	-	-	-	-
	Cadmium	mg/L	0.05		**1**		**4**		-	-	-	-	-	-	-	<0.05	-	-	<0.05	-	-	-	-	-
	Chromium	mg/L	0.1		**5**		**20**		-	-	-	-	-	-	-	<0.1	-	-	<0.1	-	-	-	-	-
	Copper	mg/L	0.1						-	-	-	-	-	-	-	<0.1	-	-	<0.1	-	-	-	-	-
	Lead	mg/L	0.1		**5**		**20**		-	-	-	-	-	-	-	<0.1	-	-	0.4	-	-	-	-	-
	Mercury	mg/L	0.001		**0.2**		**0.8**		-	-	-	-	-	-	-	<0.0001	-	-	<0.001	-	-	-	-	-
	Nickel	mg/L	0.1		**2**		**8**		-	-	-	-	-	-	-	<0.1	-	-	<0.1	-	-	-	-	-
	Zinc	mg/L	0.1						-	-	-	-	-	-	-	<0.1	-	-	0.9	-	-	-	-	-

[1] NSW EPA (1994) Guidelines for Assessing Service Station Sites, Table 3
[2] Maximum values from Table 2 of the Waste Classification Guidelines (DECC 2008)
[3] Maximum values from Table 1 of the Waste Classification Guidelines (DECC 2008)

BH33 1.0-1.2	BH33 2.32.4	BH34 0.5-0.7	BH35 0.5-0.7	BH36 0.3-0.4	BH36 1.5-1.7	BH37 0.5-0.7	BH37 1.5-1.7	BH37 2.5-2.7	BH38 0.5-0.7	BH38 2.5-2.7	BH38 3.9-4.0	BH39 _0.5-0.7	BH39 _2.5-2.7	BH40 _0.5-0.7	BH40 _1.3-1.4	BH41 0.5-0.7	BH41_1.5-1.7	BH42 0.5-0.7	BH42 1.0-1.2	BH44 0.5-0.7	BH44 1.5-1.7	BH45 0.5-0.7	BH45 1.5-1.7
26/05/2008	26/05/2008	26/05/2008	26/05/2008	28/05/2008	28/05/2008	26/05/2008	26/05/2008	26/05/2008	26/05/2008	26/05/2008	26/05/2008	29/05/2008	29/05/2008	30/05/2008	30/05/2008	30/05/2008	30/05/2008	29/05/2008	29/05/2008	30/05/2008	30/05/2008	26/05/2008	26/05/2008
FILL	FILL	FILL	FILL	FILL	RESIDUAL	FILL	FILL	RESIDUAL	FILL	FILL	RESIDUAL	FILL	RESIDUAL	FILL	FILL	FILL	RESIDUAL	RESIDUAL	RESIDUAL	RESIDUAL	RESIDUAL	FILL	RESIDUAL
8	6	7	6	<5	9	<5	10	6	8	5	9	9	10	<5	10	6	10	7	6	<5	5	5	7
<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
19	9	99	26	10	24	155	26	15	14	17	12	14	27	12	29	12	10	19	25	8	6	10	19
34	6	26	9	8	<5	42	<5	<5	8	39	7	23	<5	12	<5	<5	9	<5	<5	53	12	16	<5
208	11	35	97	24	18	<5	21	28	36	47	15	64	19	41	20	14	14	16	16	9	19	26	15
0.8	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
6	<2	79	16	4	<2	131	<2	<2	3	4	<2	19	4	6	<2	5	<2	<2	<2	44	<2	4	<2
46	<5	75	31	40	<5	64	<5	<5	43	69	6	95	6	36	<5	10	<5	6	<5	19	<5	92	<5
<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250
<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
<0.5	-	-	-	<0.5	-	<0.5	-	-	-	-	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-
<0.5	-	-	-	<0.5	-	<0.5	-	-	-	-	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-
<0.5	-	-	-	<0.5	-	<0.5	-	-	-	-	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-
<0.5	-	-	-	<0.5	-	<0.5	-	-	-	-	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-
<0.5	-	-	-	<0.5	-	<0.5	-	-	-	-	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-
<0.5	-	-	-	<0.5	-	<0.5	-	-	-	-	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-
<0.5	-	-	-	<0.5	-	<0.5	-	-	-	-	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-
<0.5	-	-	-	<0.5	-	<0.5	-	-	-	-	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-
<0.5	-	-	-	<0.5	-	<0.5	-	-	-	-	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-
<0.5	-	-	-	<0.5	-	<0.5	-	-	-	-	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-
0.7	-	-	-	<0.5	-	<0.5	-	-	-	-	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-
<0.5	-	-	-	<0.5	-	<0.5	-	-	-	-	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-
<0.5	-	-	-	<0.5	-	<0.5	-	-	-	-	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-
<0.5	-	-	-	<0.5	-	<0.5	-	-	-	-	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-
<0.5	-	-	-	<0.5	-	<0.5	-	-	-	-	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-
0.7	-	-	-	<0.5	-	<0.5	-	-	-	-	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-
1.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	<0.05	-	<0.05	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-
-	-	<0.05	-	<0.05	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-
-	-	<0.05	-	<0.05	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-
-	-	<0.1	-	0.085	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-
-	-	<0.05	-	<0.05	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-
-	-	<0.05	-	<0.05	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-
-	-	<0.05	-	<0.05	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-
-	-	<0.05	-	<0.05	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-
-	-	<0.2	-	<0.2	-	<0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.2	-
-	-	<0.3	-	<0.3	-	<0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.3	-
-	-	<0.05	-	0.06	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-
-	-	<0.05	-	<0.05	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-
-	-	<0.05	-	<0.05	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-
-	-	<0.05	-	<0.05	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-
-	-	<0.05	-	<0.05	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-
-	-	<0.05	-	<0.05	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-
-	-	<0.05	-	<0.05	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-
-	-	<0.05	-	<0.05	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-
-	-	<0.05	-	<0.05	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-
-	-	<0.05	-	<0.05	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-
-	-	<0.05	-	<0.05	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-
-	-	<0.2	-	<0.2	-	<0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.2	-
-	-	<0.05	-	<0.05	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-
-	-	<0.1	-	<0.1	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-
-	-	ND	ND	ND	-	ND	-	-	ND	-	-	-	-	ND	-	ND	-	ND	-	ND	ND	ND	-
<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

BH46 _0.5-0.7	MW9 0.5-0.7	MW9 1.0-1.2	MW9 2.5-2.7	MW10 1.9-2.0	MW11 0.5-0.7	MW11 1.5-1.7	MW11 3.9-4.0	MW12 0.5-0.7	MW12 1.0-1.2	MW12 3.4-3.5	MW13 0.5-0.7	MW13 2.5-2.7	MW14 0.5-0.7	MW14 1.0-1.2	MW14 2.5-2.7	MW15 0.5-0.7	MW15 1.5-1.7	MW15 4.5-4.7	MW16 0.5-0.7	MW16 1.0-1.2	MW16 2.5-2.7
30/05/2008	30/05/2008	30/05/2008	30/05/2008	28/05/2008	27/05/2008	27/05/2008	27/05/2008	27/05/2008	27/05/2008	27/05/2008	29/05/2008	29/05/2008	28/05/2008	28/05/2008	28/05/2008	27/05/2008	27/05/2008	27/05/2008	28/05/2008	28/05/2008	28/05/2008
FILL	FILL	FILL	RESIDUAL	RESIDUAL	FILL	FILL	RESIDUAL	FILL	FILL	RESIDUAL	FILL	RESIDUAL	FILL	FILL	RESIDUAL	FILL	FILL	RESIDUAL	FILL	FILL	RESIDUAL
7	5	<5	<5	<5	9	6	<5	11	10	12	8	10	-	5	8	8	13	32	6	6	10
<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	2	<1	<1	<1	<1	<1	<1	<1
13	8	7	4	18	43	17	9	21	15	9	79	14	-	22	28	16	23	19	11	14	28
53	32	<5	32	<5	16	<5	26	6	<5	<5	21	6	-	280	<5	6	7	5	<5	<5	<5
233	48	12	11	14	85	21	10	27	26	10	21	13	-	240	17	27	36	16	11	13	23
0.2	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	0.6	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
22	<2	<2	<2	3	22	<2	<2	3	<2	<2	56	<2	-	81	<2	<2	<2	<2	<2	2	<2
218	26	21	10	6	68	8	<5	14	9	<5	51	<5	-	992	<5	9	19	<5	<5	<5	<5
<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	-	<10	<10	<10	<10	<10	<10	<10	<10
<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	-	<50	<50	<50	<50	<50	<50	<50	<50
<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	-	190	<100	<100	<100	<100	<100	<100	<100
<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	-	220	<100	<100	<100	<100	<100	<100	<100
<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	-	435	<250	<250	<250	<250	<250	<250	<250
<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<1	<1	<1	<1	<1	<1	<1	<1
-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	-	-	<0.5	-	-	<0.5	-	-
-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	-	-	<0.5	-	-	<0.5	-	-
-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	-	-	<0.5	-	-	<0.5	-	-
-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	-	-	<0.5	-	-	<0.5	-	-
-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	-	-	<0.5	-	-	<0.5	-	-
-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	-	-	<0.5	-	-	<0.5	-	-
-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	-	-	<0.5	-	-	<0.5	-	-
-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	-	-	<0.5	-	-	<0.5	-	-
-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	-	-	<0.5	-	-	<0.5	-	-
-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	-	-	<0.5	-	-	<0.5	-	-
-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	-	-	<0.5	-	-	<0.5	-	-
-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	-	-	<0.5	-	-	<0.5	-	-
-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	-	-	<0.5	-	-	<0.5	-	-
-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	-	-	<0.5	-	-	<0.5	-	-
-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	-	-	<0.5	-	-	<0.5	-	-
-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	-	-	<0.5	-	-	<0.5	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.2	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.3	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.2	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-
-	ND	-	-	-	ND	-	-	ND	-	-	-	-	ND	-	-	ND	-	-	ND	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table LR1 Laboratory Results
KAS Automotive, Princes Hwy Tempe
Job: Valad Property Group
ENVILCOV00315AH

Field_ID								BH47_0.2-0.3	BH47_1.0-1.2	BH51_0.5-0.7	BH52_0.2-0.3	BH52_1.0-1.2	MW17_0.5-0.7	MW17_1.5-1.7	MW18_0.5-0.7	MW18_1.5-1.7	MW18_4.3-4.4	MW19_0.5-0.7	BH51_0.5-0.7	MW20 0.5-0.7	MW20 1.0-1.2	MW20 1.9-2.0
Sample Date								31/05/2008	31/05/2008	31/05/2008	31/05/2008	31/05/2008	31/05/2008	31/05/2008	31/05/2008	31/05/2008	31/05/2008	31/05/2008	31/05/2008	3/06/2008	3/06/2008	3/06/2008
Sample Origin								FILL	RESIDUAL	FILL	FILL	RESIDUAL	FILL	FILL	FILL	FILL	FILL	RESIDUAL	FILL	FILL	RESIDUAL	RESIDUAL
Group	**Chemical Name**	**Units**	**EQL**	**NEPM 1999 HIL F**	**WASTE CLASSIFICATION**																		
					General Solid [2]		**Restricted Solid [2]**																	
Metals	Arsenic	mg/kg	5	**500**		**500**		**2000**	12	<5	6	<5	5	5	<5	<5	7	8	<5	6	6	7	7
	Cadmium	mg/kg	1	**100**		**100**		**400**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Chromium (total)	mg/kg	2			**1900**		**7600**	25	7	16	6	5	9	3	175	64	37	12	16	20	15	12
	Copper	mg/kg	5	**5000**					14	27	1010	12	12	53	13	32	26	53	20	1010	17	17	12
	Lead	mg/kg	5	**1500**		**1500**		**6000**	27	38	352	34	13	26	188	18	20	803	19	352	32	32	12
	Mercury	mg/kg	0.1	**75**		**50**		**200**	<0.1	<0.1	4.4	<0.1	0.6	<0.1	<0.1	<0.1	<0.1	0.4	<0.1	4.4	<0.1	<0.1	<0.1
	Nickel	mg/kg	2	**3000**		**1050**		**4200**	<2	3	15	<2	<2	30	2	9	3	13	<2	15	2	<2	<2
	Zinc	mg/kg	5	**35000**					6	18	333	42	<5	97	43	25	13	248	6	333	93	61	6
TPH	TPH C 6 - C 9 Fraction	mg/kg	10	**65 [1]**		**650 [3]**		**2600 [3]**	<10	<10	<10	<10	<10	18	<10	<10	<10	<10	<10	<10	<10	<10	<10
	TPH C10 - C14 Fraction	mg/kg	50						<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
	TPH C15 - C28 Fraction	mg/kg	100						<100	<100	140	<100	<100	<100	2210	<100	<100	310	<100	140	<100	<100	<100
	TPH C29-C36 Fraction	mg/kg	100						<100	<100	110	<100	<100	<100	370	<100	<100	170	<100	110	<100	<100	<100
	TPH+C10 - C36 (Sum of total)	mg/kg		**1000 [1]**		**10000 [3]**		**40000 [3]**	<250	<250	275	<250	<250	<250	2605	<250	<250	505	<250	275	<250	<250	<250
BTEX	Benzene	mg/kg	0.2	**1 [1]**		**10 [3]**		**40 [3]**	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	Ethylbenzene	mg/kg	0.5	**50 [1]**		**600 [3]**		**2400 [3]**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Toluene	mg/kg	0.5	**130 [1]**		**288 [3]**		**1152 [3]**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Xylene (m & p)	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Xylene (o)	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Xylene Total	mg/kg		**25 [1]**		**1000 [3]**		**4000 [3]**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PAH	Acenaphthene	mg/kg	0.5						<0.5	-	<0.5	-	-	<0.5	<0.5	<0.5	-	-	-	<0.5	<0.5	-	-
	Acenaphthylene	mg/kg	0.5						<0.5	-	<0.5	-	-	<0.5	1.7	<0.5	-	-	-	<0.5	<0.5	-	-
	Anthracene	mg/kg	0.5						<0.5	-	<0.5	-	-	<0.5	3.5	<0.5	-	-	-	<0.5	<0.5	-	-
	Benz(a)anthracene	mg/kg	0.5						<0.5	-	1.1	-	-	<0.5	4.1	<0.5	-	-	-	1.1	0.6	-	-
	Benzo(a) pyrene	mg/kg	0.5	**5**		**0.8 [3]**		**3.2 [3]**	<0.5	-	1.1	-	-	<0.5	2.8	<0.5	-	-	-	1.1	0.6	-	-
	Benzo(b)fluoranthene	mg/kg	0.5						<0.5	-	1.2	-	-	<0.5	3.2	<0.5	-	-	-	1.2	0.5	-	-
	Benzo(g,h,i)perylene	mg/kg	0.5						<0.5	-	0.6	-	-	<0.5	1.2	<0.5	-	-	-	0.6	<0.5	-	-
	Benzo(k)fluoranthene	mg/kg	0.5						<0.5	-	<0.5	-	-	<0.5	1.4	<0.5	-	-	-	<0.5	<0.5	-	-
	Chrysene	mg/kg	0.5						<0.5	-	0.9	-	-	<0.5	3.1	<0.5	-	-	-	0.9	0.6	-	-
	Dibenz(a,h)anthracene	mg/kg	0.5						<0.5	-	<0.5	-	-	<0.5	<0.5	<0.5	-	-	-	<0.5	<0.5	-	-
	Fluoranthene	mg/kg	0.5						<0.5	-	2.1	-	-	<0.5	9	<0.5	-	-	-	2.1	1.4	-	-
	Fluorene	mg/kg	0.5						<0.5	-	<0.5	-	-	<0.5	2	<0.5	-	-	-	<0.5	<0.5	-	-
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.5						<0.5	-	0.5	-	-	<0.5	1.1	<0.5	-	-	-	0.5	<0.5	-	-
	Naphthalene	mg/kg	0.5						<0.5	-	<0.5	-	-	<0.5	<0.5	<0.5	-	-	-	<0.5	<0.5	-	-
	Phenanthrene	mg/kg	0.5						<0.5	-	1	-	-	<0.5	9.6	<0.5	-	-	-	1	0.8	-	-
	Pyrene	mg/kg	0.5						<0.5	-	2	-	-	<0.5	7.2	<0.5	-	-	-	2	1.3	-	-
	Total PAH	mg/kg				**200**		**800**	-	-	10.5	-	-	-	49.9	-	-	-	-	10.5	5.8	-	-
OCP	4,4-DDE	mg/kg	0.05						-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
	a-BHC	mg/kg	0.05						-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
	Aldrin	mg/kg	0.05						-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
	Aldrin + Dieldrin	mg/kg		**50**					-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-
	b-BHC	mg/kg	0.05						-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
	cis-Chlordane	mg/kg	0.05						-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
	d-BHC	mg/kg	0.05						-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
	DDD	mg/kg	0.05						-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
	DDT	mg/kg	0.2						-	-	-	-	-	-	-	-	-	-	-	-	<0.2	-	-
	DDT+DDE+DDD	mg/kg		**1000**					-	-	-	-	-	-	-	-	-	-	-	-	<0.3	-	-
	Dieldrin	mg/kg	0.05						-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
	Endosulfan I	mg/kg	0.05						-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
	Endosulfan II	mg/kg	0.05						-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
	Endosulfan sulphate	mg/kg	0.05			**60 [3]**		**240 [3]**	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
	Endrin	mg/kg	0.05						-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
	Endrin aldehyde	mg/kg	0.05						-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
	Endrin ketone	mg/kg	0.05						-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
	g-BHC (Lindane)	mg/kg	0.05						-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
	Heptachlor	mg/kg	0.05	**50**					-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
	Heptachlor epoxide	mg/kg	0.05						-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
	Hexachlorobenzene	mg/kg	0.05						-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
	Methoxychlor	mg/kg	0.2						-	-	-	-	-	-	-	-	-	-	-	-	<0.2	-	-
	trans-chlordane	mg/kg	0.05						-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-
PCB	PCBs (Sum of total)	mg/kg	0.1	**50**					-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-
Asbestos		na	na	**Detected**					-	-	-	**Detected**	-	ND	-	ND	-	-	ND	-	ND	-	-
Leachable Metals by ICPAES (mg/L)																							
	Arsenic	mg/L	0.1		**5**		**20**		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Cadmium	mg/L	0.05		**1**		**4**		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chromium	mg/L	0.1		**5**		**20**		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Copper	mg/L	0.1						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Lead	mg/L	0.1		**5**		**20**		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mercury	mg/L	0.001		**0.2**		**0.8**		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Nickel	mg/L	0.1		**2**		**8**		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Zinc	mg/L	0.1						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

[1] NSW EPA (1994) Guidelines for Assessing Service Station Sites, Table 3
[2] Maximum values from Table 2 of the Waste Classification Guidelines (DECC 2008)
[3] Maximum values from Table 1 of the Waste Classification Guidelines (DECC 2008)

coffey environments
SPECIALISTS IN LIVING AND WORKING PLACES

Table LR2 - Groundwater Results
630 - 726 Princes Hwy Environmental Assessment

				THRESHOLD CONCENTRATIONS																				
				Marine water		Recreational		Other		Field_ID	MW20	MW19	MW2	MW4	MW7	MW6	MW8	MW9	MW10	MW11	MW12	MW14	MW15	MW16	MW13
										Sample_Date-Time	05/06/2008	05/06/2008	05/06/2008	05/06/2008	05/06/2008	05/06/2008	05/06/2008	05/06/2008	05/06/2008	06/06/2008	06/06/2008	06/06/2008	06/06/2008	06/06/2008	06/06/2008
										Sample Origin	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Group	Chemical Name	Units	EQL																					
Metals	Arsenic	µg/L	1	2.3	2	50	3				<1	**3**	<1	**4**	<1	1	**16**	**92**	<1	2	<1	<1	<1	<1	<1
	Cadmium	µg/L	0.1	0.7	1	5	3				**0.8**	<0.1	<0.1	<0.1	0.2	0.2	0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2
	Chromium (as Cr III)	µg/L	1	27.4	1	50	3				<1	<1	<1	<5	<1	<1	<5	<1	<1	<1	<1	<1	<1	<1	<1
	Copper	µg/L	1	1.3	1	1000	3				1	1	**3**	1	**20**	**2**	<5	**3**	**4**	**3**	**4**	**6**	**3**	**3**	**5**
	Lead	µg/L	1	4.4	1	50	3				<1	1	<1	<1	**6**	<1	**160**	<1	<1	3	<1	<1	<1	<1	<1
	Mercury (inorganic)	µg/L	0.1	0.1	1	1	3				<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**0.2**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Nickel	µg/L	1	7	1	100	3				<1	**7**	4	3	**29**	**23**	**12**	**53**	1	2	4	4	5	2	4
	Zinc	µg/L	5	15	1	5000	3				10	**19**	**31**	**27**	**144**	**143**	**262**	**47**	**39**	**71**	**45**	**19**	**38**	13	**48**
TPH	C6 - C9 Fraction	µg/L	20	20	4						<20	**130**	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
	C10 - C14 Fraction	µg/L	50	50	4						<50	**360**	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
	C15 - C28 Fraction	µg/L	100	100	4						<100	<100	<100	<100	<100	<100	**200**	<100	<100	<100	<100	<100	<100	<100	<100
	C29 - C36 Fraction	µg/L	50	50	4						<50	<50	<50	<50	<50	<50	**100**	<50	<50	<50	<50	<50	<50	<50	<50
	Total C10 - C36	µg/L						375	5		0	490	0	0	0	0	300	0	0	0	0	0	0	0	0
BTEX	Benzene	µg/L	1	500	1	10	3				<1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Toluene	µg/L	2	180	2						<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
	Ethylbenzene	µg/L	2	80	2						<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
	meta & para-Xylene	µg/L	2								<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
	ortho-Xylene	µg/L	2								<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
	Total Xylenes	µg/L	4	75	2						<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
PAH	Naphthalene	µg/L	1	50	1						<1	1.1	<1	-	-	-	<1	-	-	-	<1	<1	-	<1	<1
	Acenaphthylene	µg/L	1								<1	<1	<1	-	-	-	<1	-	-	-	<1	<1	-	<1	<1
	Acenaphthene	µg/L	1								<1	<1	<1	-	-	-	<1	-	-	-	<1	<1	-	<1	<1
	Fluorene	µg/L	1								<1	<1	<1	-	-	-	<1	-	-	-	<1	<1	-	<1	<1
	Phenanthrene	µg/L	1	0.6	2						<1	<1	<1	-	-	-	<1	-	-	-	<1	<1	-	<1	<1
	Anthracene	µg/L	1	0.01	2						<1	<1	<1	-	-	-	<1	-	-	-	<1	<1	-	<1	<1
	Fluoranthene	µg/L	1	1	2						<1	<1	<1	-	-	-	<1	-	-	-	<1	<1	-	<1	<1
	Pyrene	µg/L	1								<1	<1	<1	-	-	-	<1	-	-	-	<1	<1	-	<1	<1
	Benza[a]anthracene	µg/L	1								<1	<1	<1	-	-	-	<1	-	-	-	<1	<1	-	<1	<1
	Chrysene	µg/L	1								<1	<1	<1	-	-	-	<1	-	-	-	<1	<1	-	<1	<1
	Benzo[b]fluoranthene	µg/L	1								<1	<1	<1	-	-	-	<1	-	-	-	<1	<1	-	<1	<1
	Benzo[k]fluoranthene	µg/L	1								<1	<1	<1	-	-	-	<1	-	-	-	<1	<1	-	<1	<1
	Benzo[a]pyrene	µg/L	0.5	0.1	2	0.01	3				<0.5	<0.5	<0.5	-	-	-	<0.5	-	-	-	<0.5	<0.5	-	<0.5	<0.5
	Indeno[123-cd]pyrene	µg/L	1								<1	<1	<1	-	-	-	<1	-	-	-	<1	<1	-	<1	<1
	Dibenzo[ah]anthracene	µg/L	1								<1	<1	<1	-	-	-	<1	-	-	-	<1	<1	-	<1	<1
	Benzo[ghi]perylene	µg/L	1								<1	<1	<1	-	-	-	<1	-	-	-	<1	<1	-	<1	<1
Phenols	Phenol	µg/L	1	400	1						<1.0	<1.0	<1.0	-	-	-	<1.0	-	-	-	<1.0	<1.0	-	<1.0	<1.0
	2-Chlorophenol	µg/L	1	340	2						<1.0	<1.0	<1.0	-	-	-	<1.0	-	-	-	<1.0	<1.0	-	<1.0	<1.0
	2-Methylphenol	µg/L	1								<1.0	<1.0	<1.0	-	-	-	<1.0	-	-	-	<1.0	<1.0	-	<1.0	<1.0
	3,4-Methylphenol	µg/L	2								<1.0	<1.0	<1.0	-	-	-	<1.0	-	-	-	<1.0	<1.0	-	<1.0	<1.0
	2-Nitrophenol	µg/L	1	2	2						<1.0	<1.0	<1.0	-	-	-	<1.0	-	-	-	<1.0	<1.0	-	<1.0	<1.0
	2,4-Dimethylphenol	µg/L	1	2	2						<1.0	<1.0	<1.0	-	-	-	<1.0	-	-	-	<1.0	<1.0	-	<1.0	<1.0
	2,4-Dichlorophenol	µg/L	1	120	2						<1.0	<1.0	<1.0	-	-	-	<1.0	-	-	-	<1.0	<1.0	-	<1.0	<1.0
	2,6-Dichlorophenol	µg/L	1	34	2						<1.0	<1.0	<1.0	-	-	-	<1.0	-	-	-	<1.0	<1.0	-	<1.0	<1.0
	4 Chloro 3 Methylphenol	µg/L	1								<1.0	<1.0	<1.0	-	-	-	<1.0	-	-	-	<1.0	<1.0	-	<1.0	<1.0
	2,4,6-Trichlorophenol	µg/L	1	3	2	10	3				<1.0	<1.0	<1.0	-	-	-	<1.0	-	-	-	<1.0	<1.0	-	<1.0	<1.0
	2,4,5-Trichlorophenol	µg/L	1	4	2	1	3				<1.0	<1.0	<1.0	-	-	-	<1.0	-	-	-	<1.0	<1.0	-	<1.0	<1.0
	Pentachlorophenol	µg/L	2	22	1	10	3				<2.0	<2.0	<2.0	-	-	-	<2.0	-	-	-	<2.0	<2.0	-	<2.0	<2.0
Ammonia	Ammonia (sampled 13/6/2008)	µg/L	0.010	0.91		0.010					-	-	<0.010	-	**2.31**	**0.243**	**78.1**	-	-	-	-	<0.010	<0.010	<0.010	<0.020
	Ammonia (sampled 18/6/2008)	µg/L	0.010	0.91		0.010					<0.050	<0.050	<0.050	<0.050	**1.86**	**0.285**	**73.9**	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050

Notes:

Concentration exceeds Marine Water Guidelines

Concentration exceeds ANZECC Recreational Use Guidelines

Concentration exceeds Dutch Intervention Values

[1] Based on ANZECC (2000) Marine Guidelines for protection of 95% species

[2] Based on ANZECC (2000) Low Reliability Trigger Values for Marine Water

[3] Based on ANZECC (2000) guideline for recreational water quality and aesthetics

[4] Based on LORs in accordance with the DECC (2007) Guidelines for the Assessment and Management of Groundwater Contamination

[5] Based on Dutch Intervention Values

- Not Analysed

ND Not Detected

1/3 Rider Boulevard
Rhodes, NSW 2138
Ph: 02 8083 1600

coffey environments

Table LR3 - Soil Duplicate RPDs
630-726 Princes Hwy Environmental Assessment

Results in mg/kg unless otherwise specified

Sample ID	BH9 2.5-2.7	DUP 1	RPD %	BH2 0.5-0.8	DUP 2	RPD%	BH2 0.5-0.8	DUP 2a	RPD%	BH23 0.5-0.7	DUP 4	RPD%	BH21 1.0-1.2	DUP 5	RPD%	BH21 1.0-1.2	DUP 5a	RPD%	BH18 1.0-1.2	DUP 6	RPD%	BH11 1.5-1.7
Duplicate	19/05/2008	19/05/2008		20/05/2008	20/05/2008		20/05/2008	20/05/2008		21/05/2008	21/05/2008		21/05/2008	21/05/2008		21/05/2008	21/05/2008		21/05/2008	21/05/2008		23/05/2008
Date of Sampling	FILL			FILL			FILL			FILL			FILL			FILL			FILL			FILL
HEAVY METALS																						
Arsenic	8	9	12	6	8	29	6	6	0	11	8	32	6	9	40	6	6	0	7	6	15	13
Cadmium	<1	<1	ND	<1	<1	ND	<1	<0.1	ND	<1	<1	ND	<1	<1	ND	<1	0	NC	<1	<1	ND	<1
Chromium (total)	16	19	17	7	8	13	7	5	33	11	13	17	10	15	40	10	8	22	12	13	8	14
Copper	32	30	6	12	18	40	12	10	18	28	26	7	37	62	51	37	24	43	58	46	23	16
Lead	93	97	4	8	8	0	8	6	29	32	36	12	51	66	26	51	31	49	78	427	138	57
Mercury	0.2	0.1	67	<0.1	<0.1	ND	<0.1	-	NC	<0.1	<0.1	ND	<0.1	<0.1	ND	<0.1	-	NC	0.1	<0.1	ND	<0.1
Nickel	6	6	0	5	5	0	5	3	50	14	14	0	9	9	0	9	5	57	10	6	50	8
Zinc	119	118	1	43	55	24	43	36	18	127	120	6	42	49	15	42	39	7	136	86	45	79
TOTAL PETROLEUM HYDROCARBONS																						
C6 - C9 Fraction	<10	<10	ND	<10	<10	ND	<10	-	NC	<10	<10	ND	<10	<10	ND	<10	-	NC	<10	<10	ND	<10
C10 - C14 Fraction	<50	<50	ND	<50	<50	ND	<50	<50	ND	<50	<50	ND	<50	<50	ND	<50	<50	ND	<50	<50	ND	<50
C15 - C28 Fraction	<100	<100	ND	<100	<100	ND	<100	<100	ND	<100	<100	ND	<100	<100	ND	<100	<100	ND	<100	<100	ND	<100
C29 - C36 Fraction	<100	<100	ND	<100	<100	ND	<100	<100	ND	<100	<100	ND	<100	<100	ND	<100	<100	ND	<100	<100	ND	<100
Total C6-C36	<250	<250	ND	<250	<250	ND	<250	-	NC	<250	<250	ND	<250	<250	ND	<250	-	NC	<250	<250	ND	<250
BTEX																						
Benzene	<0.2	<0.2	ND	<0.2	<0.2	ND	<0.2	<0.2	ND	<0.2	<0.2	ND	<0.2	<0.2	ND	<0.2	<0.2	ND	<0.2	<0.2	ND	<0.2
Toluene	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5
Ethylbenzene	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5
meta & para-Xylene	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<1	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<1	ND	<0.5	<0.5	ND	<0.5
ortho-Xylene	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5
Total Xylenes	<1	<1	ND	<1	<1	ND	<1	-	NC	<1	<1	ND	<1	<1	ND	<1	-	NC	<1	<1	ND	<1
POLYCYCLIC AROMATIC HYDROCARBONS																						
Acenaphthene	-	-	-	<0.5	<0.5	ND	<0.5	<0.5	ND	-	-	-	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	-	NC	-
Acenaphthylene	-	-	-	<0.5	<0.5	ND	<0.5	<0.5	ND	-	-	-	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	-	NC	-
Anthracene	-	-	-	<0.5	<0.5	ND	<0.5	<0.5	ND	-	-	-	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	-	NC	-
Benz(a)anthracene	-	-	-	<0.5	<0.5	ND	<0.5	<0.5	ND	-	-	-	<0.5	<0.5	ND	<0.5	<0.5	ND	1.1	-	NC	-
Benzo(a) pyrene	-	-	-	<0.5	<0.5	ND	<0.5	<0.5	ND	-	-	-	<0.5	<0.5	ND	<0.5	<0.5	ND	1.2	-	NC	-
Benzo(b)fluoranthene	-	-	-	<0.5	<0.5	ND	<0.5	<1	ND	-	-	-	<0.5	<0.5	ND	<0.5	<1	ND	1.2	-	NC	-
Benzo(g,h,i)perylene	-	-	-	<0.5	<0.5	ND	<0.5	<0.5	ND	-	-	-	<0.5	<0.5	ND	<0.5	<0.5	ND	0.7	-	NC	-
Benzo(k)fluoranthene	-	-	-	<0.5	<0.5	ND	<0.5	<1	ND	-	-	-	<0.5	<0.5	ND	<0.5	<1	ND	<0.5	-	NC	-
Chrysene	-	-	-	<0.5	<0.5	ND	<0.5	<0.5	ND	-	-	-	<0.5	<0.5	ND	<0.5	<0.5	ND	1	-	NC	-
Dibenz(a,h)anthracene	-	-	-	<0.5	<0.5	ND	<0.5	<0.5	ND	-	-	-	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	-	NC	-
Fluoranthene	-	-	-	<0.5	<0.5	ND	<0.5	<0.5	ND	-	-	-	<0.5	<0.5	ND	<0.5	<0.5	ND	1.7	-	NC	-
Fluorene	-	-	-	<0.5	<0.5	ND	<0.5	<0.5	ND	-	-	-	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	-	NC	-
Indeno(1,2,3-c,d)pyrene	-	-	-	<0.5	<0.5	ND	<0.5	<0.5	ND	-	-	-	<0.5	<0.5	ND	<0.5	<0.5	ND	0.6	-	NC	-
Naphthalene	-	-	-	<0.5	<0.5	ND	<0.5	<0.5	ND	-	-	-	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	-	NC	-
Phenanthrene	-	-	-	<0.5	<0.5	ND	<0.5	<0.5	ND	-	-	-	<0.5	<0.5	ND	<0.5	<0.5	ND	0.6	-	NC	-
Pyrene	-	-	-	<0.5	<0.5	ND	<0.5	<0.5	ND	-	-	-	<0.5	<0.5	ND	<0.5	<0.5	ND	1.7	-	NC	-
Total PAH	-	-	-	-	-	ND	-	-	-	-	-	-	-	-	ND	-	-	-	9.8	-	NC	-
ORGANOCHLORINE PESTICIDES																						
4,4-DDE	-	-	-	-	-	-	-	-	-	<0.05	-	NC	-	-	-	-	-	-	-	-	-	-
a-BHC	-	-	-	-	-	-	-	-	-	<0.05	-	NC	-	-	-	-	-	-	-	-	-	-
Aldrin	-	-	-	-	-	-	-	-	-	<0.05	-	NC	-	-	-	-	-	-	-	-	-	-
Aldrin + Dieldrin	-	-	-	-	-	-	-	-	-	<0.1	-	NC	-	-	-	-	-	-	-	-	-	-
b-BHC	-	-	-	-	-	-	-	-	-	<0.05	-	NC	-	-	-	-	-	-	-	-	-	-
cis-Chlordane	-	-	-	-	-	-	-	-	-	<0.05	-	NC	-	-	-	-	-	-	-	-	-	-
d-BHC	-	-	-	-	-	-	-	-	-	<0.05	-	NC	-	-	-	-	-	-	-	-	-	-
DDD	-	-	-	-	-	-	-	-	-	<0.05	-	NC	-	-	-	-	-	-	-	-	-	-
DDT	-	-	-	-	-	-	-	-	-	<0.2	-	NC	-	-	-	-	-	-	-	-	-	-
DDT+DDE+DDD	-	-	-	-	-	-	-	-	-	<0.3	-	NC	-	-	-	-	-	-	-	-	-	-
Dieldrin	-	-	-	-	-	-	-	-	-	<0.05	-	NC	-	-	-	-	-	-	-	-	-	-
Endosulfan I	-	-	-	-	-	-	-	-	-	<0.05	-	NC	-	-	-	-	-	-	-	-	-	-
Endosulfan II	-	-	-	-	-	-	-	-	-	<0.05	-	NC	-	-	-	-	-	-	-	-	-	-
Endosulfan sulphate	-	-	-	-	-	-	-	-	-	<0.05	-	NC	-	-	-	-	-	-	-	-	-	-
Endrin	-	-	-	-	-	-	-	-	-	<0.05	-	NC	-	-	-	-	-	-	-	-	-	-
Endrin aldehyde	-	-	-	-	-	-	-	-	-	<0.05	-	NC	-	-	-	-	-	-	-	-	-	-
Endrin ketone	-	-	-	-	-	-	-	-	-	<0.05	-	NC	-	-	-	-	-	-	-	-	-	-
g-BHC (Lindane)	-	-	-	-	-	-	-	-	-	<0.05	-	NC	-	-	-	-	-	-	-	-	-	-
Heptachlor	-	-	-	-	-	-	-	-	-	<0.05	-	NC	-	-	-	-	-	-	-	-	-	-
Heptachlor epoxide	-	-	-	-	-	-	-	-	-	<0.05	-	NC	-	-	-	-	-	-	-	-	-	-
Hexachlorobenzene	-	-	-	-	-	-	-	-	-	<0.05	-	NC	-	-	-	-	-	-	-	-	-	-
Methoxychlor	-	-	-	-	-	-	-	-	-	<0.2	-	NC	-	-	-	-	-	-	-	-	-	-
trans-chlordane	-	-	-	-	-	-	-	-	-	<0.05	-	NC	-	-	-	-	-	-	-	-	-	-
PCBs			-																			
Total PCBs	-	-	-	-	-	-	-	-	-	<0.1	-	NC	-	-	-	-	-	-	-	-	-	-

Notes:

	RPD exceeds contol limit of 50%
ND	Both primary and duplicate samples were not detected
NC	RPD not calculated as primary sample was not detected, while the duplicate sample produced values above detection limits, or vice versa
-	Sample not analysed or one of either primary or duplicate sample were not analysed

1/3 Rider Boulevard
Rhodes, NSW 2138
Ph: 02 8083 1600

coffey environments

Table LR3 - Soil Duplicate RPDs
630-726 Princes Hwy Environmental Assessment

Results in mg/kg unless otherwise specified

Sample ID	DUP7	RPD%	BH13 1.5-1.7	DUP8	RPD%	BH13 1.5-1.7	DUP8a	RPD%	BH5 1.0-1.2	DUP10	RPD%	BH5 1.3-1.5	DUP11	RPD%	BH5 1.3-1.5	DUP11a	RPD%	MW11 0.5-0.7	DUPZ 6	RPD%	MW15 1.5-1.7	DUPZ 7
Duplicate	23/05/2008		23/05/2008	23/05/2008		23/05/2008	23/05/2008		23/05/2008	23/05/2008		23/05/2008	23/05/2008		23/05/2008	23/05/2008		27/05/2008	27/05/2008		27/05/2008	27/05/2008
Date of Sampling			FILL			FILL			FILL			FILL			FILL			FILL			FILL	
HEAVY METALS																						
Arsenic	10	26	8	9	12	8	7	13	8	10	22	<5	<5	ND	<5	4	NC	9	10	11	13	6
Cadmium	<1	ND	<1	<1	ND	<1	0	NC	6	4	40	<1	<1	ND	<1	1	NC	<1	<1	ND	<1	<1
Chromium (total)	10	33	5	5	0	5	4	22	10	11	10	6	6	0	6	6	0	43	49	13	23	14
Copper	16	0	47	55	16	47	41	14	38	31	20	14	10	33	14	16	13	16	16	0	7	7
Lead	42	30	19	17	11	19	15	24	42	48	13	8	9	12	8	22	93	85	61	33	36	34
Mercury	<0.1	ND	<0.1	<0.1	ND	<0.1	-	NC	<0.1	<0.1	ND	<0.1	<0.1	ND	<0.1	-	NC	<0.1	<0.1	ND	<0.1	<0.1
Nickel	10	22	18	18	0	18	13	32	13	10	26	4	3	29	4	5	22	22	28	24	<2	<2
Zinc	79	0	81	70	15	81	70	15	341	346	1	80	80	0	80	153	63	68	56	19	19	19
TOTAL PETROLEUM HYDROCARBONS																						
C6 - C9 Fraction	<10	ND	<10	<10	ND	<10	-	NC	<10	<10	ND	14	<10	NC	14	-	NC	<10	<10	ND	<10	<10
C10 - C14 Fraction	<50	ND	<50	<50	ND	<50	<50	ND	110	160	37	2060	3180	43	2060	2030	1	<50	<50	ND	<50	<50
C15 - C28 Fraction	<100	ND	130	<100	NC	130	<100	NC	890	860	3	4380	5020	14	4380	3860	13	<100	<100	ND	<100	<100
C29 - C36 Fraction	<100	ND	<100	<100	ND	<100	110	NC	<100	<100	ND	<100	<100	ND	<100	<100	ND	<100	<100	ND	<100	<100
Total C6-C36	<250	ND	205	<250	NC	205	-	NC	1050	1070	2	6490	8250	24	6490	-	NC	<250	<250	ND	<250	<250
BTEX																						
Benzene	<0.2	ND	<0.2	<0.2	ND	<0.2	<0.2	ND	<0.2	<0.2	ND	<0.2	<0.2	ND	<0.2	<0.2	ND	<0.2	<0.2	ND	<0.2	<0.2
Toluene	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5
Ethylbenzene	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5
meta & para-Xylene	<0.5	ND	<0.5	<0.5	ND	<0.5	<1	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<1	ND	<0.5	<0.5	ND	<0.5	<0.5
ortho-Xylene	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5
Total Xylenes	<1	ND	<1	<1	ND	<1	-	NC	<1	<1	ND	<1	<1	ND	<1	-	NC	<1	<1	ND	<1	<1
POLYCYCLIC AROMATIC HYDROCARBONS																						
Acenaphthene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	-	NC	-	-
Acenaphthylene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	-	NC	-	-
Anthracene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	-	NC	-	-
Benz(a)anthracene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	-	NC	-	-
Benzo(a) pyrene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	-	NC	-	-
Benzo(b)fluoranthene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	-	NC	-	-
Benzo(g,h,i)perylene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	-	NC	-	-
Benzo(k)fluoranthene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	-	NC	-	-
Chrysene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	-	NC	-	-
Dibenz(a,h)anthracene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	-	NC	-	-
Fluoranthene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	-	NC	-	-
Fluorene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	-	NC	-	-
Indeno(1,2,3-c,d)pyrene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	-	NC	-	-
Naphthalene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	-	NC	-	-
Phenanthrene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	-	NC	-	-
Pyrene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	-	NC	-	-
Total PAH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ORGANOCHLORINE PESTICIDES																						
4,4-DDE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
a-BHC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aldrin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aldrin + Dieldrin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
b-BHC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
cis-Chlordane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
d-BHC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DDD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DDT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DDT+DDE+DDD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dieldrin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Endosulfan I	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Endosulfan II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Endosulfan sulphate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Endrin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Endrin aldehyde	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Endrin ketone	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
g-BHC (Lindane)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Heptachlor	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Heptachlor epoxide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexachlorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Methoxychlor	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
trans-chlordane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PCBs																						
Total PCBs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

1/3 Rider Boulevard
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Table LR3 - Soil Duplicate RPDs
630-726 Princes Hwy Environmental Assessment

Results in mg/kg unless otherwise specified

Sample ID	RPD%	BH27 1.0-1.2	DUPZ 8	RPD%	MW16 1.0-1.2	DUPZ 9	RPD%	MW13 0.5-0.7	DUPZ 10	RPD%	BH39 _0.5-0.7	DUPZ 11	RPD%	BH41 0.5-0.7	DUPZ 12	RPD%	MW20 1.0-1.2	DUP Z13	RPD%	MW20 1.0-1.2	DUP Z13a	RPD%
Duplicate		28/05/2008	28/05/2008		28/05/2008	28/05/2008		29/05/2008	29/05/2008		29/05/2008	29/05/2008		30/05/2008	30/05/2008		3/06/2008	3/06/2008		3/06/2008	3/06/2008	
Date of Sampling		FILL			FILL			FILL			FILL			FILL			RESIDUAL			RESIDUAL		
HEAVY METALS																						
Arsenic	74	7	6	15	6	6	0	8	7	13	9	<5	NC	6	7	15	7	9	25	7	7	0
Cadmium	ND	<1	<1	ND	<1	<1	ND	<1	<1	ND	<1	<1	ND	<1	<1	ND	<1	<1	ND	<1	<0.1	ND
Chromium (total)	49	12	10	18	14	14	0	79	28	95	14	10	33	12	13	8	15	17	13	15	15	0
Copper	0	<5	6	NC	<5	<5	ND	21	9	80	23	28	20	<5	<5	ND	17	20	16	17	16	6
Lead	6	15	21	33	13	15	14	21	30	35	64	59	8	14	12	15	32	24	29	32	24	29
Mercury	ND	<0.1	<0.1	ND	<0.1	<0.1	ND	<0.1	<0.1	ND	0.2	0.1	67	<0.1	<0.1	ND	<0.1	<0.1	ND	<0.1	-	NC
Nickel	ND	<2	2	NC	2	<2	NC	56	11	134	19	7	92	5	<2	NC	<2	<2	ND	<2	1	NC
Zinc	0	18	136	153	<5	<5	ND	51	20	87	95	87	9	10	<5	NC	61	42	37	61	34	57
TOTAL PETROLEUM HYDROCARBONS																						
C6 - C9 Fraction	ND	<10	<10	ND	<10	<10	ND	<10	<10	ND	<10	<10	ND	<10	<10	ND	<10	<10	ND	<10	-	NC
C10 - C14 Fraction	ND	<50	<50	ND	<50	<50	ND	<50	<50	ND	<50	<50	ND	<50	<50	ND	<50	<50	ND	<50	<50	ND
C15 - C28 Fraction	ND	<100	<100	ND	<100	<100	ND	<100	<100	ND	<100	<100	ND	<100	<100	ND	<100	<100	ND	<100	<100	ND
C29 - C36 Fraction	ND	<100	<100	ND	<100	<100	ND	<100	<100	ND	<100	<100	ND	<100	<100	ND	<100	<100	ND	<100	<100	ND
Total C6-C36	ND	<250	<250	ND	<250	<250	ND	<250	<250	ND	<250	<250	ND	<250	<250	ND	<250	<250	ND	<250	-	NC
BTEX																						
Benzene	ND	<0.2	<0.2	ND	<0.2	<0.2	ND	<0.2	<0.2	ND	<0.2	<0.2	ND	<0.2	<0.2	ND	<0.2	<0.2	ND	<0.2	<0.2	ND
Toluene	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND
Ethylbenzene	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND
meta & para-Xylene	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<1	ND
ortho-Xylene	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.5	1	NC
Total Xylenes	ND	<1	<1	ND	<1	<1	ND	<1	<1	ND	<1	<1	ND	<1	<1	ND	<1	<1	ND	<1	1	NC
POLYCYCLIC AROMATIC HYDROCARBONS																						
Acenaphthene	-	<0.5	-	NC	-	-	-	<0.5	-	NC	<0.5	<0.5	ND	<0.5	<0.5	ND	-	-	-	-	-	-
Acenaphthylene	-	<0.5	-	NC	-	-	-	<0.5	-	NC	<0.5	<0.5	ND	<0.5	<0.5	ND	-	-	-	-	-	-
Anthracene	-	<0.5	-	NC	-	-	-	<0.5	-	NC	<0.5	<0.5	ND	<0.5	<0.5	ND	-	-	-	-	-	-
Benz(a)anthracene	-	<0.5	-	NC	-	-	-	<0.5	-	NC	<0.5	<0.5	ND	<0.5	<0.5	ND	-	-	-	-	-	-
Benzo(a) pyrene	-	<0.5	-	NC	-	-	-	<0.5	-	NC	<0.5	<0.5	ND	<0.5	<0.5	ND	-	-	-	-	-	-
Benzo(b)fluoranthene	-	<0.5	-	NC	-	-	-	<0.5	-	NC	<0.5	<0.5	ND	<0.5	<0.5	ND	-	-	-	-	-	-
Benzo(g,h,i)perylene	-	<0.5	-	NC	-	-	-	<0.5	-	NC	<0.5	<0.5	ND	<0.5	<0.5	ND	-	-	-	-	-	-
Benzo(k)fluoranthene	-	<0.5	-	NC	-	-	-	<0.5	-	NC	<0.5	<0.5	ND	<0.5	<0.5	ND	-	-	-	-	-	-
Chrysene	-	<0.5	-	NC	-	-	-	<0.5	-	NC	<0.5	<0.5	ND	<0.5	<0.5	ND	-	-	-	-	-	-
Dibenz(a,h)anthracene	-	<0.5	-	NC	-	-	-	<0.5	-	NC	<0.5	<0.5	ND	<0.5	<0.5	ND	-	-	-	-	-	-
Fluoranthene	-	<0.5	-	NC	-	-	-	<0.5	-	NC	<0.5	<0.5	ND	<0.5	<0.5	ND	-	-	-	-	-	-
Fluorene	-	<0.5	-	NC	-	-	-	<0.5	-	NC	<0.5	<0.5	ND	<0.5	<0.5	ND	-	-	-	-	-	-
Indeno(1,2,3-c,d)pyrene	-	<0.5	-	NC	-	-	-	<0.5	-	NC	<0.5	<0.5	ND	<0.5	<0.5	ND	-	-	-	-	-	-
Naphthalene	-	<0.5	-	NC	-	-	-	<0.5	-	NC	<0.5	<0.5	ND	<0.5	<0.5	ND	-	-	-	-	-	-
Phenanthrene	-	<0.5	-	NC	-	-	-	<0.5	-	NC	<0.5	<0.5	ND	<0.5	<0.5	ND	-	-	-	-	-	-
Pyrene	-	<0.5	-	NC	-	-	-	<0.5	-	NC	<0.5	<0.5	ND	<0.5	<0.5	ND	-	-	-	-	-	-
Total PAH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ORGANOCHLORINE PESTICIDES																						
4,4-DDE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
a-BHC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aldrin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aldrin + Dieldrin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
b-BHC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
cis-Chlordane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
d-BHC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DDD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DDT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DDT+DDE+DDD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dieldrin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Endosulfan I	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Endosulfan II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Endosulfan sulphate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Endrin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Endrin aldehyde	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Endrin ketone	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
g-BHC (Lindane)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Heptachlor	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Heptachlor epoxide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexachlorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Methoxychlor	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
trans-chlordane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PCBs																						
Total PCBs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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Table LR3 - Soil Duplicate RPDs
630-726 Princes Hwy Environmental Assessment

Results in mg/kg unless otherwise specified

Sample ID	BH51_0.5-0.7	DUPZ 14	RPD%
Duplicate	31/05/2008	31/05/2008	
Date of Sampling	FILL		
HEAVY METALS			
Arsenic	6	7	15
Cadmium	<1	<1	ND
Chromium (total)	16	20	22
Copper	1010	1320	27
Lead	352	906	88
Mercury	4.4	4	10
Nickel	15	16	6
Zinc	333	413	21
TOTAL PETROLEUM HYDROCARBONS			
C6 - C9 Fraction	<10	<10	ND
C10 - C14 Fraction	<50	<50	ND
C15 - C28 Fraction	140	460	107
C29 - C36 Fraction	110	280	87
Total C6-C36	275	765	94
BTEX			
Benzene	<0.2	<0.2	ND
Toluene	<0.5	<0.5	ND
Ethylbenzene	<0.5	<0.5	ND
meta & para-Xylene	<0.5	<0.5	ND
ortho-Xylene	<0.5	<0.5	ND
Total Xylenes	<1	<1	ND
POLYCYCLIC AROMATIC HYDROCARBONS			
Acenaphthene	<0.5	-	NC
Acenaphthylene	<0.5	-	NC
Anthracene	<0.5	-	NC
Benz(a)anthracene	1.1	-	NC
Benzo(a) pyrene	1.1	-	NC
Benzo(b)fluoranthene	1.2	-	NC
Benzo(g,h,i)perylene	0.6	-	NC
Benzo(k)fluoranthene	<0.5	-	NC
Chrysene	0.9	-	NC
Dibenz(a,h)anthracene	<0.5	-	NC
Fluoranthene	2.1	-	NC
Fluorene	<0.5	-	NC
Indeno(1,2,3-c,d)pyrene	0.5	-	NC
Naphthalene	<0.5	-	NC
Phenanthrene	1	-	NC
Pyrene	2	-	NC
Total PAH	10.5	-	NC
ORGANOCHLORINE PESTICIDES			
4,4-DDE	-	-	-
a-BHC	-	-	-
Aldrin	-	-	-
Aldrin + Dieldrin	-	-	-
b-BHC	-	-	-
cis-Chlordane	-	-	-
d-BHC	-	-	-
DDD	-	-	-
DDT	-	-	-
DDT+DDE+DDD	-	-	-
Dieldrin	-	-	-
Endosulfan I	-	-	-
Endosulfan II	-	-	-
Endosulfan sulphate	-	-	-
Endrin	-	-	-
Endrin aldehyde	-	-	-
Endrin ketone	-	-	-
g-BHC (Lindane)	-	-	-
Heptachlor	-	-	-
Heptachlor epoxide	-	-	-
Hexachlorobenzene	-	-	-
Methoxychlor	-	-	-
trans-chlordane	-	-	-
PCBs			
Total PCBs	-	-	-

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Table LR4 - Groundwater Duplicate RPDs
630-726 Princes Hwy Environmental Assessment

Results in µg/L unless otherwise specified

Sample ID	MW2	QC1	RPD %	MW2	QC1A	RPD%
Duplicate	Groundwater	Intra-lab		Groundwater	Inter-lab	
Date of Sampling	01-May-08	01-May-08		01-May-08	01-May-08	
HEAVY METALS (mg/L)						
Arsenic	1	<1	NC	1	<1	NC
Cadmium	0.2	0.2	0	0.2	<0.1	NC
Chromium (as Cr III)	<1	<1	ND	<1	<1	ND
Copper	<1	<1	ND	<1	<1	ND
Lead	<1	<1	ND	<1	<1	ND
Mercury (Inorganic)	<0.1	<0.1	ND	<0.1	<0.1	NC
Nickel	2	2	0	2	<1	NC
Zinc	<5	8	NC	<5	<1	NC
CYANIDE (mg/L)						
Free Cyanide	<0.0040	<0.0040	ND	<0.0040	0.016	NC
Total Cyanide	1.07	1.02	5	1.07	0.66	47
AMMONIA (mg/L)						
Ammonia as N	0.214	0.193	10	0.214	0.25	16
TOTAL PETROLEUM HYDROCARBONS (mg/L)						
C6 - C9 Fraction	<0.02	<0.02	ND	<20	<40	ND
C10 - C14 Fraction	0.23	0.22	4	230	<100	NC
C15 - C28 Fraction	0.4	0.4	0	400	<200	NC
C29 - C36 Fraction	0.06	0.07	15	60	<200	NC
Total C6-C36	0.69	0.69	0	690	<540	NC
BTEX						
Benzene	5	6	18	5	7	33
Toluene	<5	<5	ND	<5	3	ND
Ethylbenzene	<2	<2	ND	<2	<1	ND
meta & para-Xylene	<2	<2	ND	<2	-	-
ortho-Xylene	<2	<2	ND	<2	-	-
Total Xylenes	<4	<4	ND	<4	3	NC
POLYCYCLIC AROMATIC HYDROCARBONS						
Naphthalene	70.3	68.3	3	70.3	45	44
Acenaphthylene	6	5.9	2	6	5.8	3
Acenaphthene	1.4	1.4	0	1.4	1.6	13
Fluorene	4.7	4.6	2	4.7	4.7	0
Phenanthrene	10.3	9.9	4	10.3	9.4	9
Anthracene	9.9	4.6	73	9.9	4.2	81
Fluoranthene	3.2	3.2	0	3.2	3.6	12
Pyrene	0.3	2.7	160	0.3	3	164
Benza[a]anthracene	0.3	0.3	0	0.3	<0.5	NC
Chrysene	0.2	<0.2	NC	0.2	<0.5	NC
Benzo[b,k]fluoranthene	<0.4	<0.4	ND	<0.4	<1.0	ND
Benzo[a]pyrene	<0.2	<0.2	ND	<0.2	<0.5	ND
Indeno[123-cd]pyrene	<0.2	<0.2	ND	<0.2	<0.5	ND
Dibenzo[ah]anthracene	<0.2	<0.2	ND	<0.2	<0.5	ND
Benzo[ghi]perylene	<0.2	<0.2	ND	<0.2	<0.5	ND
Total PAH's	106.6	100.9	5	106.6	<81.80	NC
Phenolic Compounds						
Phenol	<1.0	<1.0	ND	<1.0	<0.01	ND
Chlorophenol D2	<1.0	<1.0	ND	<1.0	-	-
Methylphenol 2	<1.0	<1.0	ND	<1.0	-	-
Methylphenol 3,4	<2.0	<2.0	ND	<2.0	-	-
Nitrophenol 2	<1.0	<1.0	ND	<1.0	-	-
Dimethylphenol 2,4	<1.0	<1.0	ND	<1.0	-	-
Dichlorophenol 2,4	<1.0	<1.0	ND	<1.0	-	-
Dichlorophenol 2,6	<1.0	<1.0	ND	<1.0	-	-
4 Chloro 3 Methylphenol	<1.0	<1.0	ND	<1.0	-	-
Trichlorophenol 2,4,6	<1.0	<1.0	ND	<1.0	-	-
Trichlorophenol 2,4,5	<1.0	<1.0	ND	<1.0	-	-
Pentachlorophenol	<2.0	<2.0	ND	<2.0	-	-
Chlorinated Hydrocarbons						
1.3-Dichlorobenzene	<2	<2	ND	<2	-	-
1.4-Dichlorobenzene	<2	<2	ND	<2	-	-
1.2-Dichlorobenzene	<2	<2	ND	<2	-	-
Hexachloroethane	<2	<2	ND	<2	-	-
1.2.4-Trichlorobenzene	<2	<2	ND	<2	-	-
Hexachloropropylene	<2	<2	ND	<2	-	-
Hexachlorobutadiene	<2	<2	ND	<2	-	-
Hexachlorocyclopentadiene	<10	<10	ND	<10	-	-
Pentachlorobenzene	<2	<2	ND	<2	-	-
Hexachlorobenzene (HCB)	<4	<4	ND	<4	-	-

Notes:

RPD exceeds contol limit of 50%

ND Both primary and duplicate samples were not detected

NC RPD not calculated as primary sample was not detected, while the duplicate sample produced values above detection limits, or vice versa

- Sample not analysed or one of either primary or duplicate sample were not analysed

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Table LR5 - Soil Trip/Spike Data
630-726 Princes Hwy Environmental Assessment

Results in mg/kg unless otherwise specified

Sample ID	TRIPSPIKE	TRIPBLANK
Matrix	Soil	Soil
Date of Sampling	22/05/2008	22/05/2008
BTEX		
Benzene	0.4	<0.2
Toluene	8.7	<0.5
Ethylbenzene	1.3	<0.5
meta & para-Xylene	7.2	<0.5
ortho-Xylene	2.9	<0.5
TOTAL PETROLEUM HYDROCARBONS (mg/L)		
C6 - C9 Fraction	21	<10

Table LR6 - Water Trip/Spike Data
630-726 Princes Hwy Environmental Assessment

Results in ug/L unless otherwise specified

Sample ID	TRIPSPIKE	TRIPBLANK
Matrix	Water	Water
Date of Sampling	1/05/2008	1/05/2008
BTEX		
Benzene	80%	<1
Toluene	80%	<5
Ethylbenzene	80%	<2
meta & para-Xylene	95%	<2
ortho-Xylene	95%	<2
TOTAL PETROLEUM HYDROCARBONS (mg/L)		
C6 - C9 Fraction	95%	<0.02

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Appendix C
Guidance for Management of Asbestos During Development

Remedial Action Plan
630 - 726 Princes Highway and Areas 1A & 1B Tempe Lands

1. INTRODUCTION

Previous assessments by Coffey indicated that portions of the Tempe Site are underlain by potentially large volumes of uncontrolled fill. Testing of the fill did not generally indicate significant contamination. However, given the age of the fill, the uncontrolled nature of the fill placement and the amount of anthropogenic material within the fill, it was considered that as yet undetected contamination could be present within the fill. This included the potential for asbestos, particularly in the form of asbestos cement sheeting fragments, to be present within the fill.

Due to the potential for contamination including asbestos to be present in the fill material, a remedial strategy has been developed for the Princes Way properties and Tempe Lands property (presented in Coffey remedial action plan ENVILCOV00315AH-R03) which involves removing localised contamination areas or capping any areas where fill material remains after completion of earthworks either with building slabs, pavement or clean soil.

While this strategy is expected to make the site suitable for use following completion of construction (subject to implementation of a long term site management plan), it does not address potential health and safety issues during construction should asbestos actually be present within the fill.

This document provides guidance on procedures to be followed in the event that potential asbestos containing materials are identified during earthworks on the site.

It is important to note that the procedures in this document are presented as a guide only and the Contractor will need to ensure that the works are undertaken safely and in accordance with relevant guidelines and legislation.

2. GUIDANCE FOR MANAGEMENT OF UNEARTHED ASBESTOS IN REMEDIAL ACTION PLAN FOR VALAD TEMPE COMMERCIAL DEVELOPMENT AT 630 - 726 PRINCES HIGHWAY AND AREAS 1A &1B TEMPE LANDS, TEMPE

2.1 GENERAL

Any works involving the handling of asbestos containing material must be undertaken under the supervision of an AS1 WorkCover licensed asbestos contractor and must be performed in accordance with the following documents:

- *NSW Occupational Health and Safety Act, 2000*;
- *NSW Occupational Health and Safety Regulation, 2001*;
- *The Code of Practice for the Safe Removal of Asbestos 2nd Edition [NOHSC: 2002 (2005)],* produced by the National Occupational Health and Safety Commission;
- *NSW DECC Waste Classification Guidelines: Part 1 – Classifying Waste (2008);*
- *Enhealth (2005) Guidelines for Management of Asbestos in the Non-Occupational Environment*

In the case of conflict between the procedures in this section and any Regulation or Act, then the more stringent requirement shall apply. The procedures in this document are a guide only and do not override the requirements of legislation and accepted minimum standards, which apply for work involving removal of hazardous materials.

Personnel handling asbestos impacted soil or material or working within potentially impacted areas must have the appropriate training and experience for handling asbestos materials and the required decontamination procedures. Only the licensed asbestos removal contractor will be allowed to physically (by hand) remove asbestos containing materials.

The AS1 Contractor is to notify the NSW WorkCover Authority of the intention to undertake asbestos work prior to the commencement of such work. A copy of the Notification with stamped WorkCover permit is to be displayed on site for the duration of the works. It is recommended that WorkCover be notified prior to commencement of earthworks to avoid delays in obtaining permits in the event that asbestos is encountered.

A health and safety plan for the works must be developed by the Contractor to ensure employee and public health and safety. All contractors involved in the removal work must also develop a safe work method statement for the job task they will be undertaking addressing hazards associated with asbestos and any other hazards that may be encountered on the site.

The procedures in the following sections are for if asbestos cement fragments are encountered on the surface or within soil on the site. In the event that potential asbestos containing material which may be friable (other than asbestos cement) are encountered, all personnel are to cease work in the vicinity of the suspect materials until the suspect materials are assessed and a comprehensive full friable asbestos removal procedure is designed and implemented.

2.2 Procedures if Localised Asbestos Containing Materials Encountered

In the event that potential asbestos containing materials in a localised area are identified, the following procedures should be implemented:

1. Temporarily stop work in that part of the site. An exclusion zone should be set up around the area where potential asbestos has been identified extending to a minimum of 10m beyond the potentially impacted area. Barricades should be placed around the perimeter of the exclusion zone to prevent access. Warning signs to be affixed to the barriers in accordance with the Asbestos Code of Practice. For example – “Asbestos Removal Work Area – No Unauthorised Access;
2. Contact Coffey to advise that potential asbestos material had been encountered. Then either:
   (a) Direct Coffey to collect samples to confirm whether the suspect material actually contains asbestos. If the sampling confirms the suspect material is not asbestos then remove barricades and proceed with work. If the sampling confirms the material contains asbestos, proceed with the procedure below; or
   (b) Assume that the suspect material contains asbestos and proceed with procedure below.
3. The area within the exclusion zone as defined in Point 1 will be designated as the ‘Designated Work Area’. The barriers and signage around the Designated Work Area should be maintained during the works;
4. Only authorised and appropriately trained personal as described in Section 2.1 should be allowed to enter the Designated Work Area;
5. Appropriate PPE should be provided to all personnel working in the Designated Work Area. Minimum PPE to be worn in the Designated Work Area to address the potential asbestos hazard should include a Class P2 or higher class respirator, disposable overalls, steel capped boots and

gloves. Any other PPE required for the site should also be worn. The designated PPE should be compulsory and should be worn by all personnel entering the work area. PPE should be removed whenever any employee leaves the designated work area;

6. A Decontamination Area should be established for the use of the personnel conducting the asbestos clean-up works. The decontamination area should comprise a segregated area where the contaminated work clothing and respirators are removed and discarded. This area should be connected to the Designated Work Area and all access to and from the Designated Work Area should be done via this 'change room' area. This area should not be used for purposes other than decontamination;
7. All personnel working within the Designated Work Areas with or in any other way being affected by asbestos contaminated material should decontaminate at the end of each work shift (i.e. before morning tea, lunch and afternoon tea) and at the end of the work day as well as any other time they leave the Designated Work Area. Personnel should remove disposable protective clothing and should check that no asbestos soiled clothes or PPE leave the decontamination area;
8. All soiled PPE should be placed into 0.2 mm polyethylene low density plastic bags labelled as 'Asbestos Waste' and disposed of as contaminated waste. Bags should be filled to no more than 1/2 full, sealed, placed into a second bag and sealed for appropriate disposal to a licensed landfill. All other items used in the Designated Work Area should be washed to remove any potential contamination prior to removal from the work area;
9. Site personnel, the public, adjacent neighbours and the environment need to be protected from the effects of dust created during the works. The works should be conducted, and dust suppression techniques shall be employed, such that there shall be no visible generation of dust. The site and open working areas used by machinery should be dampened down periodically to reduce dust generation.

   Some key factors that contribute to dust generation include:

   (a) Wind blowing across an exposed area;

   (b) Loose stockpiled material; and

   (c) The movement of machinery over the loose open surface of the working site.

   The following are some methods which could be employed to minimise dust generation and distribution:

   (a) Dampening the surface of the site and stockpiles with a water cart, hoses or similar. In some cases setting up a sprinkler type system may be required;

   (b) Surrounding work area and stockpile areas by wind brakes;

   (c) Covering stockpiles with plastic or similar when not in use. Consideration could also be given to covering work areas when not in use;

   (d) Ceasing work in strong winds.

   Other dust control measures may be required if these are not effective

10. Stockpiles of asbestos contaminated should only be established in designated areas which would require the same controls as other potentially asbestos containing areas. Stockpiles should be

underlain by a double layer of minimum 0.2 mm plastic. Appropriate environmental controls should be implemented to prevent generation of dust and runoff of impacted water or sediment from the stockpiles.

11. The asbestos containing material along with any impacted soil should be excavated until there is no further visual evidence of asbestos present;
12. At completion of the excavation work, Coffey should visually check the excavation to assess whether the asbestos has been adequately removed to an acceptable standard. Coffey may also collect validation samples and subject them to analysis for asbestos.
13. The excavated material should either be placed in an asbestos waste bag, a waste bin lined with 0.2 mm black plastic or a stockpile depending on the nature of volume of the impacted material. Depending on the nature and volume and of the excavated material it could then either be:
    (a) Disposed of as asbestos waste to an appropriately licensed landfill. The material would need to be waste classified in accordance with NSW DECC Guidelines and approval obtained from the landfill prior to disposal. Waste disposal documentation would be required to be submitted to Coffey; or
    (b) Stockpiled in a designated controlled area for future placement beneath a cap in another part of the site.
14. Air monitoring for airborne asbestos fibres should be carried out for the duration of the works by Coffey or another appropriately experienced consultant in areas adjoining the Designated Work Area. The required frequency of air monitoring and number of monitoring locations will be assessed by Coffey based on initial results and other factors;
15. Prior to dismantling of any boundaries or barriers, clearance air monitoring for airborne asbestos fibres should be carried out by Coffey or another appropriately experienced consultant within the Designated Work Area;
16. Upon receipt of validation results indicating that asbestos has been adequately removed from the area and air clearance results below the recommended standards and guidelines, the restriction on entry to the Designated Work Area may be removed, the barriers can be dismantled and the area may be entered by all personnel. If validation results indicate that asbestos remains then repeat from Point 11;
17. Transport of asbestos waste material should be done in plastic lined leak-proof vehicles that are covered so that no spillage or dispersal of the waste to the atmosphere occurs;
18. The movement and stockpiling of asbestos contaminated materials needs to be carefully managed and monitored to prevent cross-contamination of soils and potential exposure to asbestos. The management and tracking of stockpiled materials on site shall be the responsibility of the contractor. The management and tracking of stockpiled materials should be recorded on a site diagram and daily site logs. These documents should be updated daily and kept in the site office. The daily site log should record the area in which work was conducted for that day, general description of the works completed, movement of materials on-site, movement of materials off-site, etc. The site diagram should record the locations and types of the stockpiled materials.

2.3 PROCEDURES IF WIDESPREAD ASBESTOS CONTAINING MATERIALS ENCOUNTERED

As described in Section 2.2, in the event that localised asbestos is detected at the site, then that area would be likely to be able to be contained allowing work in other areas to continue.

However, in the event that asbestos is found to be widespread within the fill, large portions if not all of the site could become a ‘Designated Work Area’ which could pose significant disruption to construction works.

If such widespread asbestos were identified across the sites then an addendum to the RAP would be prepared describing the remediation and validation procedures.

2.4 CONCLUDING REMARKS

It should be noted that the procedures in this document are presented as a guide only and the Contractor will need to ensure that the works are undertaken safely and in accordance with relevant guidelines and legislation.

Appendix D
Imported Fill Validation Plan

Remedial Action Plan
630 - 726 Princes Highway and Areas 1A & 1B Tempe Lands

FILL IMPORTATION VALIDATION PROCEDURE

1 INTRODUCTION

This following document presents procedures for validation of fill material to be imported to proposed development site at Princes Highway, Tempe.

The purpose of this procedure is to ensure specified fill procurement and processing requirements are realised and the imported fill to the site meets the site remediation criteria.

It is intended that material imported to the site classify as virgin excavated natural material (VENM) in accordance with the NSW DECC (2008) *Waste Classification Guidelines, Part 1: Classifying Waste*. This document only includes procedures for validation of VENM.

Any non-VENM material proposed to be imported to the site would need to classify as general solid waste (non-putrescible) and would only be imported with prior site auditor approval. Procedures for validation of inert waste would be assessed on a case by case basis in consultation with the site auditor.

2 IMPORTED FILL VALIDATION PROCEDURES

2.1 Identification and Verification of Fill Sources

The process of approving a fill source site will involve the following:

- Potential Fill Suppliers shall complete an application form and questionnaire regarding the environmental properties of the fill and supply the application form, questionnaire and any consultant's reports on the potential source site to the Contractor;
- Coffey shall visit the potential source site to confirm application form, questionnaire details and complete a checklist. At this time Coffey would also collect a limited number of soil samples from the proposed material to be imported;
- Coffey shall then assess the available information and establish whether the material should be accepted, rejected, or to ascertain what procedure should be followed to enable the material to be accepted or rejected (see Table 1 and Figure 1).

Once a site is an approved source site, fill originating from that site will be subject to ongoing assessment including observation, sampling and testing.

Figure 1 provides a data assessment flow chart from a contamination perspective to be followed by Coffey when assessing proposed source sites.

The first step in the flow chart is for Coffey to assess whether the available data is sufficient to assess whether the material is virgin excavated natural material (VENM).

The following sub-sections discuss the level of information that would be required in order for Coffey to conclude that sufficient information is available to assess whether the material is VENM and further investigations that would need to be undertaken by Coffey where such information was not available.

2.1.1 Level of information that would be required in order for Coffey to conclude that sufficient information is available to assess whether material is VENM

In order for the Coffey to be able to conclude that sufficient information is available to assess whether material is VENM, a report or reports will need to be supplied to Coffey which to the satisfaction of Coffey:

- Discusses the history of the subject area and identifies potential contaminating activities that may have been undertaken on the site as well as areas and chemicals of environmental concern;
- Provides and/or summarises previous investigations and any remediation activities on the subject area (if any);
- Provides test results to Coffey from the virgin material that is under consideration. The number of samples and analytical suite must be sufficient to demonstrate that the material is VENM. Concentrations must be below the validation criteria nominated in the Remediation Action Plan;
- Provides a plan clearly showing areas where material has been validated as VENM and any areas where non-VENM material remains;
- Provides confirmation that VENM material has not and will not be mixed with any non-VENM material;
- Clearly states and justifies that material is VENM and is suitable, with respect to contamination, for use on a commercial / industrial site.

Providing such a report was available and of adequate completeness and quality, Coffey would be able to approve the source site based on a review of the report and a site walkover.

2.1.2 Further investigations which would be undertaken by Coffey where such information was not available

If the above information is not available or not of adequate completeness, further investigations would be required to be undertaken by Coffey to demonstrate the proposed source material was VENM. We anticipate that such additional investigations would include:

- A site history review adequate to identify potential areas and chemicals of concern on the site. This may include an aerial photograph review, a title search, interviews with people with knowledge of the site and a review of any previous available reports;
- A site walkover to confirm that material remaining on the site is consistent with virgin shale or sandstone;
- Collection of a limited number of soil samples from the proposed material to be imported to further check its waste classification. The analytical suite would be based on the more common and or persistent urban contaminants such as heavy metals, TPH, BTEX, PAH, asbestos, OCP, OPP and PCB plus any additional chemicals of concern identified during the site history review. The number of samples to be collected would be based on the size of the site and the results of the site history review. Concentrations must be below the validation criteria nominated in the Remediation Action Plan;
- Preparation of a brief letter report.

The approval will be in the form of a letter report providing our conclusions as to whether the material

classifies as VENM and providing any further steps required checking the material is VENM.

2.2 Fill Approval and Inspection Strategies

An Inspection and Test Plan (ITP) shall be implemented to control the entry of fill to the site from approved sources. Checks shall be made and records kept verifying that fill entering the site came from an approved source.

2.2.1 Inspections of Material as it Enters the Site

A checklist to be filled out for each truck load of fill material entering the site is attached along with explanatory notes.

An inspector nominated by the Contractor will observe each truck load of imported fill material and fill in the checklist. This will include visual inspection for foreign material, including materials that may contain asbestos.

2.2.2 Random Sampling of Imported Fill Material

Coffey will undertake random sampling and analysis of imported fill material entering the site to provide further quantitative evidence that the fill is clean, and to illustrate to the supplier that their fill is being tested with potential consequences for rejection. Coffey will collect a minimum of one sample per 500m^3 and a minimum of one sample per source site.

While the analytes to be tested will depend to a certain extent on the information provided by the supplier, the analysis will focus as a minimum on common persistent urban chemicals including heavy metals, petroleum hydrocarbons, polycyclic aromatic hydrocarbons, polychlorinated biphenyls and organochlorine pesticides.

To ensure data useability, quality assurance procedures will be carried out from sampling through to completion of laboratory analysis including:

- Chain of custody documentation;
- Conforming with appropriate sample holding times, preservation, transport and handling requirements as dictated by the analytical suite;
- The collection of quality control samples, including duplicate samples, trip blank and (for volatiles) trip spike samples;
- Other laboratory QA/QC requirements including laboratory blank samples, standard reference material, spike samples and laboratory duplicate samples, and
- The use of analytical laboratories that are NATA registered for the chemical tests performed.

Assessments carried out as part of ongoing validation testing may indicate that detailed sampling and analysis are required. Sampling and analysis at a nominated higher rate can be expected for fill sourced from some sites.

Fill from an Approved Source Site shall be rejected if on-site validation tests indicate that the fill does not meet the validation criteria nominated in the Remediation Action Plan or does not otherwise conform to the Specification.

2.2.3 Conditional Interim Approval of Fill Sources (Environmental)

Recognising the need to quickly approve source sites while at the same time ensuring only suitable fill is imported, the contractor may provide interim verbal approvals to commence importation of fill material in the following circumstances:

- Where the contractor has completed the assessment of the source site and have concluded that the material proposed to be imported from that site would classify as VENM the Design Consultant may issue a verbal approval and then follow up later with a formal letter;
- Where the contractor has completed he assessment of the source site (with the exception of check samples) and has concluded that the site is a low risk site and the material proposed to be imported from that site would be likely classify as VENM subject to receipt of check sample results. The contractor may provide interim conditional approvals for such low risks source sites to allow the Contractor to commence importation while awaiting the results. These interim conditional approvals are given on the basis that if the check sample results indicate the material is not VENM that the Contractor will remove the material from the site. The contractor will follow up with a formal letter once the results are received. Such material imported prior to receipt of the check samples must be tracked to ensure that it can be removed should the check sample results indicate this is necessary.

3 Unsuitable Material Management

In the event that unsuitable material is delivered to and tipped on site, material containment and removal becomes an important issue. The following points summarise the methodology that shall be employed should unsuitable material be tipped on site:

- The Contractor shall reject any truck arriving at site without the appropriate paperwork from an approved source site. If an unauthorised truck discharges fill, the Contractor shall notify Coffey immediately and the unapproved material shall be stockpiled separately from fill originating from approved sources.
- The Contractor, irrespective of whether the material is suitable, shall stockpile separately and remove fill originating from unapproved sources.
- Where unsuitable fill such as man made materials including tyres, household domestic waste, vegetative waste etc has been unloaded on site, the material shall be stockpiled in an area away from the main material stockpiles until it is promptly removed from site.
- Unloaded material that is suspected to be contaminated such as asbestos, acid sulphate soils, fuel containers etc shall be stored in an appropriately lined and bunded area until arrangements are made for its prompt removal. The bunding and lining shall be such that it prevents contaminates entering soil, rock, surface water and groundwater. Where necessary the material shall be kept moist or covered to minimise dust generation.

The Contractor shall be responsible for identifying and appropriately handling unsuitable material, for notifying Coffey and for documenting details including date, truck registration, type of non-contracted material and location of the temporary stockpile.

In response to the tipping of unsuitable material at the development site, the Contractor shall make certain that material pre-checking procedures are properly implemented and documented and shall report any deliveries of contaminated material to Coffey.

The Fill Supplier delivering unsuitable material shall be notified and subsequent deliveries halted, until

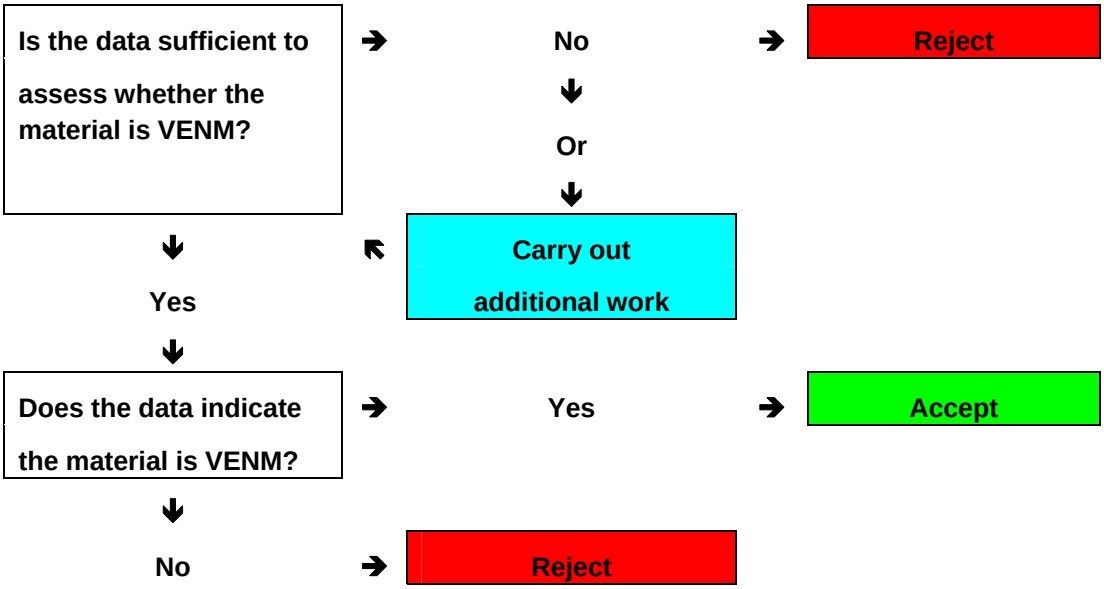
the supplier can provide sufficient evidence to show that the material is derived from the source that is claimed.

We trust that this meet your requirements at this time. If you have any questions, please call the undersigned on 9911 1000 or 0402 083 114.

TABLE 1: ASSESSMENT OF THE SUITABILITY OF POTENTIAL SOURCE SITE MATERIAL AS FILL

WORK SEQUENCE	**Action By**
• Completion of an Application Form & Questionnaire regarding environmental & geotechnical suitability of the fill from a potential source site.	Fill Supplier
• Obtain Fill Suppliers Application Form, Questionnaire &, where available Stage 1 & 2 Environmental Site Assessment Reports, Validation Reports, Site Audit Summary Reports & Site Audit Statements and geotechnical reports for potential source site. • Provide available information to the Coffey. • The contractor should reject the source site without passing information onto the Coffey if: – The material is not virgin excavated natural material (VENM); and – No Consultant's report is available stating that the site (or an area of the site specified by survey) will yield fill that is suitable for use from a contamination perspective and that the fill classifies as VENM; and – The Fill Supplier and/or Contractor do not wish to, or are not able to have such a report prepared.	Contractor
• Assess the potential source site and materials in accordance with the flow chart for data assessment provided below. • If a source site cannot be assessed based on available information either reject the site or carry out further Environmental Site Assessments to enable the source site to be evaluated.	Coffey

Figure 1: Data Assessment Flow Chart from contamination perspective to be followed by design consultant



Where third parties supply test results, additional tests may be specified and carried out by Coffey to audit both the supplied test results and compliance of the materials with the specifications.

FILL SUPPLY APPLICATION FORM AND QUESTIONNAIRE

Suppliers Name	Name:		Phone Number:
Questionnaire completed By:	Name: Signature:	_____ _____	Date: _____
What is the Source Address? Define Source Area by survey	(attach plan)		
What type of excavated material will be available?			
What is the total volume (m^3) of material that will be available from the site?	_____	_____	_____
What are the current and past land uses of the site?	Residential	Industrial/Commercial	Other (specify)
What is the land use of sites surrounding the site?	Residential	Industrial/Commercial	Other (specify)
Have any contamination reports been prepared for the site	Yes	No	Copy Attached? Yes / No
Is the site history known and documented?	Yes	No	Copy Attached? Yes / No
Has any remediation been undertaken on the site	Yes	No	Copy of Remediation and Validation Reports Attached? Yes / No
Has the waste classification of the material been assessed by a consultant including testing of proposed material	Yes	No	Copy of Waste Classification Reports Attached? Yes / No
Is there an environmental consultant who has been commissioned to validate the material for off site disposal?	Yes	No	Name and contact details? _____ _____
Is there a test plan for the ongoing validation of the material available from the site?	Yes	No	Copy Attached? Yes / No

PROCEDURES FOR FILL APPROVAL AND INSPECTION INCLUDING CHECKLIST FOR INSPECTING IMPORTED FILL MATERIAL AND NOTES ON THE CHECKLIST

The procedures for fill approval and inspection to be carried out for each truck load of fill material entering the site are as follows:

1. The Contractor will assign a 'fill inspector' to inspect each truck load prior to unloading. The fill inspector will be inducted on the Fill Validation Procedure by Coffey.
2. Prior to unloading of any truck, the 'fill inspector' shall fill in Columns A to J of the attached checklist including:
    a. Date
    b. Time
    c. The name of the fill inspector;
    d. Truck registration number;
    e. Source site of fill;
    f. Is the truck from an approved source site?
    g. Does truck have appropriate paperwork from source site?
    h. Truck Size
3. The truck will be allowed to unload the fill once Columns A to H of the checklist have been completed and are to follow the directions of the site supervisor.
4. If any of the above conditions are not met the truck will be not be allowed to unload and the fill inspector will immediately inform the Contractor's supervisor. The Contractor's supervisor shall notify the fill supplier delivering unsuitable material and subsequent deliveries from that supplier shall be halted until the supplier can provide sufficient evidence to show that the material is derived from the source that is claimed and that future material to be imported from that source site will meet specifications.
5. Once the load is tipped the fill inspector will visually check the load. In the event that the visual and olfactory inspection of the load in the base of the pit after tipping of the load reveals the presence of any non conforming material such as man made, potentially contaminated material, or any other material other than that approved for importation, the fill inspector shall immediately inform the Contractor's supervisor and then:
    - The Contractor's supervisor shall notify the fill supplier delivering unsuitable material and subsequent deliveries from that supplier shall be halted until the supplier can provide sufficient evidence to show that the material is derived from the source that is claimed and that future material to be imported from that source site will meet specifications;
    - The Contractor shall stockpile the material in an area away from the main material stockpiles until it is promptly removed from site. Where material is suspected to be contaminated (such as asbestos, acid sulphate soils, fuel odours etc) the material shall be stored in an appropriately lined and bunded area until arrangements are made for its prompt removal. The bunding and lining shall be such that it prevents contaminants entering soil, rock, surface water and groundwater. Where necessary the material shall be kept moist or covered to minimise dust

generation. The location of the temporary stockpile shall be documented.

The imported fill inspection checklist along with an explanation sheet to be printed on the reverse of the checklist are attached.

IKEA DEVELOPMENT, PRINCES HIGHWAY, TEMPE

A	B	C	D	E	F	G	H	I	J	K	L
Date	Time	Name of fill inspector	Truck registration	Source site of fill	Is truck from an approved source site	Does truck have appropriate paperwork from source site?	Truck size (m^3)	Type of material	Material is consistent with that approved	Inspection during truck offload OK	Comments

NOTES ON CHECKLIST FOR IMPORTED FILL MATERIAL FOR FILL INSPECTORS

REVISION A

STEP 1: fill inspector at top of pit to fill in columns A to H of the checklist for each truck prior to permitting truck to unload. Notes on these columns are presented in the following table.

STEP 2: once columns A to H have been filled in, and if the entries in columns F and G are all 'yes' then permit the truck to unload

STEP 3: columns I to L is to be filled in immediately following tipping of each load. Notes are also presented in the following table.

Column		Notes / Instructions
A	Date	Fill in the date of delivery in this column
B	Time	Fill in the time of the inspection in this column
C	Name of fill inspector	Fill in the name of the fill inspector in this column
D	Truck registration	Fill in the truck registration number in this column
E	Source site of fill	Fill in the address of the source site in this column
F	Is truck from an approved source site?	The fill inspector will be provided with a list of approved source sites. If the source site has been approved then write 'yes' in this column. If the source site has not been approved write 'no' in this column, refuse permission to tip and notify the site supervisor
G	Does truck have appropriate paperwork from source site?	All trucks delivering fill material to development site will be required to have paperwork from the source site stating that the truck has approval to deliver from that source site. The fill inspector is to sight the pass before writing 'yes' in this column. If the truck does not have a pass write 'no' in this column, refuse permission to tip and notify the site supervisor.
H	Truck size (m^3)	Fill in the size of the truck in the column
I	Type of material	Fill in the type of material within the truck in this column.
J	Material is consistent with that approved	The fill inspector will be provided with a list of approved source sites and the type of material that has been approved for importation from each source site. If the type of material is consistent with that approved for the source site then write 'yes' in this column. If the type of material is not consistent with that approved for the source site then write 'no' in this column, refuse permission to tip and notify the site supervisor
K	Inspection during truck offload OK	The fill inspector will carry out a visual and odour inspection of the load during tipping of the load for any non-conforming material such as man made, potentially contaminated material or any other material other than that approved for importation. If no evidence of non-conforming material is observed then type 'yes' in this column. If evidence of non-conforming material is observed then write 'no' in this column, immediately segregate the material as per procedures and notify the site supervisor.
L	Comments	Write any additional comments in this column.

Appendix E
Auditor Sign Off – areas 1A & 1B Tempe Landfill

Remedial Action Plan
630 - 726 Princes Highway and Areas 1A & 1B Tempe Lands

ENVIRON

26 321.06

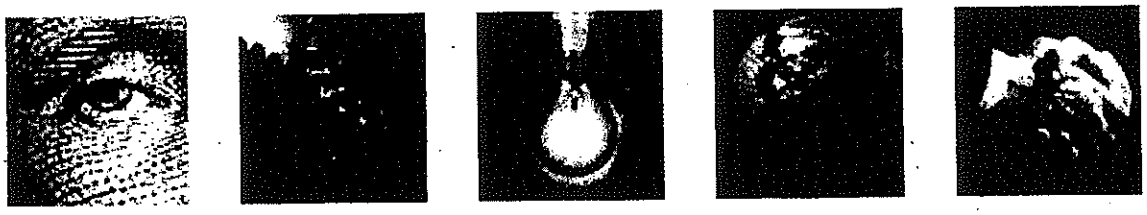
(17)

Site Audit Report

Validation of Remediation for Areas 1A and 1B of Tempe Lands

for

Marrickville Council



May 2006

Ref: 31-0024
Audit GN 35-1

ENVIRON

With Compliments

11/5/06 Attn: Anthony Fazio

Please find enclosed two copies of the SAR for Areas 1A & 1B at Tempe. Copies have also been sent to Ast Scan (% Freehills), Phillips Fox and Temix Projects.

Regards
Sharon Coley

Level 5, 60 Miller Street, North Sydney, NSW, 2060 • Tel +61 2 9954 8100 • Fax: +61 2 9954 8150 • www.environcorp.com

20321.00

ENVIRON

11 May 2006 Ref: 31-0024

Marrickville Council
Attn: Anthony Fazio
2 Fisher Street
Petersham NSW 2049

Aust Scan Pty Ltd
c/o Freehills
Attn: Judy Tomas
Level 38, MLC Centre
Martin Place
Sydney NSW 2000

Dear Sir/Madam,

Site Audit Report -
Validation of Remediation for Areas 1A and 1B of Tempe Lands

I have pleasure in submitting the Site Audit Report for the subject site. Site Audit Statement GN 35-1, produced in accordance with the NSW Contaminated Land Management Act 1997, follows this letter.

The Audit was commissioned by Marrickville Council to assess the suitability of the site for its intended commercial/industrial uses. This Site Audit Report is not currently required by regulation or legislation and therefore is an Audit for non-statutory purposes.

This work was conducted for Marrickville Council in accordance with ENVIRON's General Terms and Conditions. As set out in Section 11 of our Terms, we hereby give our written consent for this report to be relied upon by Aust Scan Pty Ltd as a "Third Party". Section 13, "Limitation of Liability", is also applicable to Aust Scan Pty Ltd.

If you require any further information, please contact the undersigned on 9954 8100.

Yours faithfully,
ENVIRON Australia Pty Ltd

Graeme Nyland
NSW EPA Accredited Auditor 9808

cc: *Phillips Fox – Attn: Virginia Briggs*
Tenix Projects – Attn: Peter Twomey

NSW Site Auditor Scheme
SITE AUDIT STATEMENT

Department of Environment and Conservation (NSW)

A site audit statement summarises the findings of a site audit. For full details of the site auditor's findings, evaluations and conclusions, refer to the associated site audit report.

This form was approved under the* Contaminated Land Management Act 1997 *on 21 February 2005. For more information about completing this form, go to Part IV.

PART I: Site audit identification

Site audit statement no. **GN 35-1**

This site audit is a ~~**statutory audit/**~~**non-statutory audit*** within the meaning of the *Contaminated Land Management Act 1997.*

Site auditor details (as accredited under the *Contaminated Land Management Act 1997*)

Name:	Graeme Nyland	Company:	Environ Australia Pty Ltd
Address:	Level 5, 60 Miller St (PO Box 560)		
	North Sydney NSW	Postcode:	2060
Phone:	02 9954 8100	Fax:	02 9954 8150

Site details

Address: Areas 1A and 1B of former Tempe Landfill, Bellevue Road, Tempe, NSW

Postcode: 2044

Property description *(attach a list if several properties are included in the site audit)*

- Lot A and Lot C DP 385209
- Lot F DP 385210
- Lot 40 DP 746918

A survey plan of proposed subdivision is attached at the end of Section 1 of this Statement. Area 1A is shown as Lot 201 and Area 1B as Lot 200.

Local Government Area: Marrickville

Area of site (e.g. hectares): 5.48 ha

Current zoning: arterial roads and arterial road widening

To the best of my knowledge, the site ~~**is/is not***~~ the subject of a declaration, order, agreement or notice under the *Contaminated Land Management Act 1997* or the *Environmentally Hazardous Chemicals Act 1985.*

Declaration/Order/Agreement/Notice* no(s): Areas 1A and 1B are part of the Tempe Lands site that is the subject of a Voluntary Remediation Agreement (Agreement No.26050) dated 19 March 2003. The VRA relates to offsite migration of contaminants in leachate and not to site suitability for any particular use, which is the subject of this audit.

Site audit commissioned by

Name: Anthony Fazio Company: Marrickville Council

Address: PO Box 14, Petersham, NSW

Postcode: 2049

Phone: 9335 2222 Fax: 9335 2029

Name and phone number of contact person (if different from above)

- Peter Twomey of Tenix Projects (Phone: 9935 2222)

Purpose of site audit

☑ A. To determine land use suitability *(please specify intended use[s])*

- Commercial / Industrial

~~**OR**~~

☐ ~~B(i) To determine the nature and extent of contamination, and/or~~

☐ ~~B(ii) To determine the appropriateness of an **investigation/remedial action/management plan***, and/or~~

☐ ~~B(iii) To determine if the land can be made suitable for a particular use or uses by implementation of a specified **remedial action plan/management plan*** *(please specify intended use[s])*~~

.....

Information sources for site audit

Consultancy(ies) which conducted the site investigation(s) and/or remediation

- Coffey Geosciences Pty Ltd (Coffey)
- Tenix Projects (Tenix)

Title(s) of report(s) reviewed:

- 'Remediation and Development of Tempe Lands, Reference 164CSA001 Remedial Action Plan (RAP)', 4 September 2003 by Coffey.
- 'Remediation and Development of Tempe Lands, Reference 164CSA001 Report on Fill Quality/Soil Gas Investigation, Areas 1A and 1B', Final Draft dated 21 November 2003 by Coffey.

- 'Remediation and Development of Tempe Lands, Reference 164CSA001 Report on Fill Quality/Soil Gas Investigation, Areas 1A and 1B', Final 29 June 2004 by Coffey.
- 'Remediation and Development of Tempe Lands, Reference 164CSA001 Landfill Gas Monitoring Plan, Tempe, NSW', 13 January 2005 by Coffey.
- 'Remediation and Development of Tempe Lands, Landfill Gas Investigation', 10 October 2005 by Coffey.
- 'Tempe Lands Remediation – Cap Validation Report, Areas 1A and 1B', draft dated 13 January 2006 by Coffey.
- 'Tempe Lands, Site Environmental Management Plan', 16 February 2006 by Tenix.
- 'Tempe Lands, Site Environmental Management Plan for Areas 1A and 1B', 19 April 2006 by Tenix.
- 'Tempe Lands Remediation – Cap Validation Report, Areas 1A and 1B', dated 10 May 2006 by Coffey.

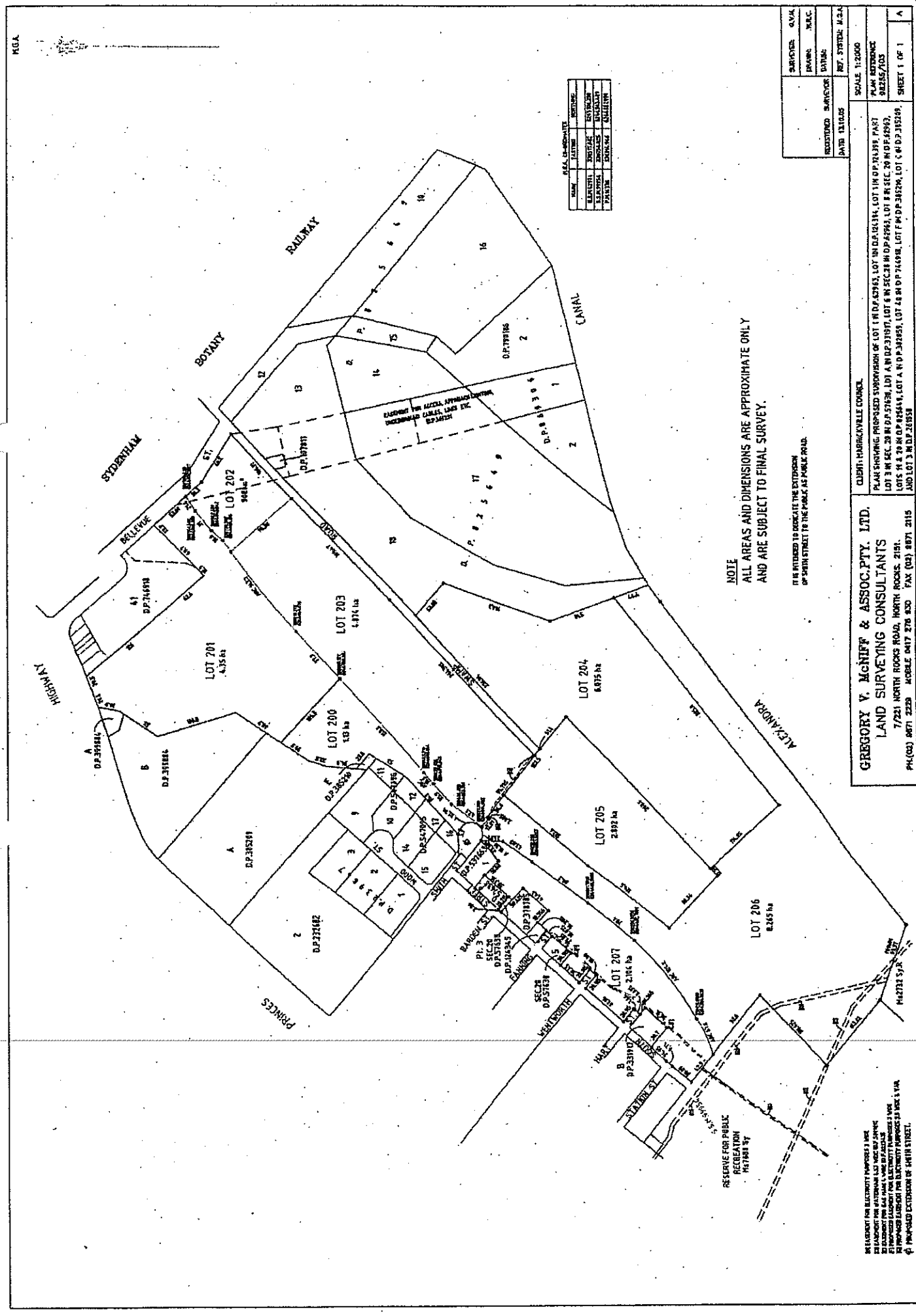
Other information reviewed (including previous site audit reports and statements relating to the site)

- Facsimile Re: 'Tempe Lands Remediation Project', dated 3 April 2006 by Mainland Civil Engineering (MCE).
- Letter Re: 'Tempe Lands Remediation and Development Project, Site Audit Statement for Areas 1A and 1B – VENM Importation', dated 12 April 2006 by Tenix.
- Summary Site Audit Report Remedial Action Plan Tempe Lands, Tempe and Site Audit Statement (audit number GN 35, dated November 2001)
- Summary Site Audit Report – Tempe Lands Remediation Project, Appropriateness of Detailed Design, and Site Audit Statement (audit number GN 35B, dated August 2004)
- Summary Site Audit Report - Validation of Remediation Associated with VRA. and Site Audit Statement (audit number GN 35C, dated September 2005)

Site audit report

Title:	Site Audit Report - Validation of Remediation for Areas 1A and 1B of Tempe Lands
Report no:	Audit GN 35-1, ENVIRON Ref: 31-0024
Date:	May 2006

ATTACHMENT: Survey Plan



PART II: Auditor's findings

Please complete either Section A or Section B, **not** both. *(Strike out the irrelevant section.)*

Use Section A where site investigation and/or remediation has been completed and a conclusion can be drawn on the suitability of land use(s).

Use Section B where the audit is to determine the nature and extent of contamination and/or the appropriateness of an investigation or remedial action or management plan and/or whether the site can be made suitable for a specified land use or uses subject to the successful implementation of a remedial action or management plan.

Section A

☑ **I certify that, in my opinion, the site is SUITABLE for the following use(s)** *(tick all appropriate uses and strike out those not applicable)*:

- ~~☐ Residential, including substantial vegetable garden and poultry~~
- ~~☐ Residential, including substantial vegetable garden, excluding poultry~~
- ~~☐ Residential with accessible soil, including garden (minimal home-grown produce contributing less than 10% fruit and vegetable intake), excluding poultry~~
- ~~☐ Day care centre, preschool, primary school~~
- ~~☐ Residential with minimal opportunity for soil access, including units~~
- ~~☐ Secondary school~~
- ~~☐ Park, recreational open space, playing field~~
- ☑ Commercial/industrial
- ~~☐ Other *(please specify)* .....~~

subject to compliance with the following environmental management plan *(insert title, date and author of plan)* **in light of contamination remaining on the site:**

'Tempe Lands, Site Environmental Management Plan For Areas 1A and 1B', dated 19 April 2006 by Tenix Projects.

Document Number 509TR004 Revision 04, included as Appendix E to the Site Audit Report.

~~**OR**~~

~~☐ **I certify that, in my opinion, the site is NOT SUITABLE for any use due to the risk of harm from contamination.**~~

Overall comments

- The site is part of a former landfill. Landfill gas produced within the landfill and the leachate/groundwater beneath the site contains contaminants.
- Groundwater should not be abstracted for use.
- The existence of the Site Audit Statement, Site Audit Report and Environmental Management Plan should be noted on the S.149 certificate for the site.

Section B

Purpose of the plan[1] which is the subject of the audit .....

.....

I certify that, in my opinion:

- ☐ **the nature and extent of the contamination HAS/HAS NOT* been appropriately determined**

AND/OR

- ☐ **the investigation/remedial action plan/management plan* IS/IS NOT* appropriate for the purpose stated above**

AND/OR

- ☐ **the site CAN BE MADE SUITABLE for the following uses** *(tick all appropriate uses and strike out those not applicable)*:
  - ☐ Residential, including substantial vegetable garden and poultry
  - ☐ Residential, including substantial vegetable garden, excluding poultry
  - ☐ Residential with accessible soil, including garden (minimal home-grown produce contributing less than 10% fruit and vegetable intake), excluding poultry
  - ☐ Day care centre, preschool, primary school
  - ☐ Residential with minimal opportunity for soil access, including units
  - ☐ Secondary school
  - ☐ Park, recreational open space, playing field
  - ☐ Commercial/industrial
  - ☐ Other *(please specify)* .....

if the site is remediated/managed* in accordance with the following remedial action plan/management plan* *(insert title, date and author of plan)*

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.....

.....

subject to compliance with the following condition(s):

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[1] For simplicity, this statement uses the term 'plan' to refer to both plans and reports.

** Strike out as appropriate*

~~Overall comments~~

.....

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PART III: Auditor's declaration

I am accredited as a site auditor by the NSW Environment Protection Authority under the *Contaminated Land Management Act 1997* (Accreditation No. 9808).

I certify that:

- I have completed the site audit free of any conflicts of interest as defined in the *Contaminated Land Management Act 1997*, and
- with due regard to relevant laws and guidelines, I have examined and am familiar with the reports and information referred to in Part I of this site audit, and
- on the basis of inquiries I have made of those individuals immediately responsible for making those reports and obtaining the information referred to in this statement, those reports and that information are, to the best of my knowledge, true, accurate and complete, and
- this statement is, to the best of my knowledge, true, accurate and complete.

I am aware that there are penalties under the *Contaminated Land Management Act 1997* for wilfully making false or misleading statements.

Signed ..... Date ...11/5/2006

PART IV: Explanatory notes

To be complete, a site audit statement form must be issued with all four parts.

How to complete this form

Part I identifies the auditor, the site, the purpose of the audit and the information used by the auditor in making the site audit findings.

Part II contains the auditor's opinion of the suitability of the site for specified uses or of the appropriateness of an investigation, or remedial action or management plan which may enable a particular use. It sets out succinct and definitive information to assist decision-making about the use(s) of the site or a plan or proposal to manage or remediate the site.

The auditor is to complete either Section A or Section B of Part II, **not** both.

In **Section A** the auditor may conclude that the land is *suitable* for a specified use(s) OR *not suitable* for any beneficial use due to the risk of harm from contamination.

By certifying that the site is *suitable*, an auditor declares that, at the time of completion of the site audit, no further remediation or investigation of the site was needed to render the site fit for the specified use(s). Any **condition** imposed should be limited to implementation of an environmental management plan to help ensure the site remains safe for the specified use(s). The plan should be legally enforceable: for example a requirement of a notice under the *Contaminated Land Management Act 1997* (CLM Act) or a development consent condition issued by a planning authority. There should also be appropriate public notification of the plan, e.g. on a certificate issued under s.149 of the *Environmental Planning and Assessment Act 1979*.

Auditors may also include **comments** which are key observations in light of the audit which are not directly related to the suitability of the site for the use(s). These observations may cover aspects relating to the broader environmental context to aid decision-making in relation to the site.

In **Section B** the auditor draws conclusions on the nature and extent of contamination, and/or suitability of plans relating to the investigation, remediation or management of the land, and/or whether land can be made suitable for a particular land use or uses upon implementation of a remedial action or management plan.

By certifying that a site *can be made suitable* for a use or uses if remediated or managed in accordance with a specified plan, the auditor declares that, at the time the audit was completed, there was sufficient information satisfying guidelines made or approved under the CLM Act to determine that implementation of the plan was feasible and would enable the specified use(s) of the site in the future.

For a site that *can be made suitable*, any **conditions** specified by the auditor in Section B should be limited to minor modifications or additions to the specified plan. However, if the auditor considers that further audits of the site (e.g. to validate remediation) are required, the auditor must note this as a condition in the site audit statement.

Auditors may also include **comments** which are observations in light of the audit which provide a more complete understanding of the environmental context to aid decision-making in relation to the site.

In **Part III** the auditor certifies his/her standing as an accredited auditor under the CLM Act and makes other relevant declarations.

Where to send completed forms

In addition to furnishing a copy of the audit statement to the person(s) who commissioned the site audit, statutory site audit statements must be sent to:

Department of Environment and Conservation (NSW)
Contaminated Sites Section
PO Box A290, SYDNEY SOUTH NSW 1232
Fax: (02) 9995 5930

AND

the **local council** for the land which is the subject of the audit.

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

LIST OF APPENDICES

LIST OF ABBREVIATIONS

AHD	Australian Height Datum
ALS	Australian Laboratory Services
ANZECC	Australian and New Zealand Environment and Conservation Council
BaP	Benzo(a)pyrene
BTEX	Benzene, Toluene, Ethylbenzene & Xylenes (Monocyclic aromatic Hydrocarbons)
CT	Certificate of Title
DP	Deposited Plan
DQO	Data Quality Objectives
EMP	Environmental Management Plan
EPA	Environment Protection Authority (NSW)
ESA	Environmental Site Assessment report
ha	Hectare
km	Kilometres
LEL	Lower explosive limit
LEP	Local Environmental Plan
LOR	Limit of Reporting
m	Metres
MAH	Monocyclic Aromatic Hydrocarbons
MCE	Mainland Civil Engineering
Mercury	Inorganic mercury unless noted otherwise
Metals	As: Arsenic, Cd: Cadmium, Cr: Chromium, Cu: Copper, Fe: Iron, Ni: Nickel, Pb: Lead, Zn: Zinc, Hg: Mercury, Se: Selenium
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Litre
m BGL	Metres below ground level
µg/L	Micrograms per Litre
NATA	National Association of Testing Authorities
NC	Not Calculated
ND	Not Detected
n	Number of Samples
OCPs	Organochlorine Pesticides
OH&S	Occupational Health & Safety
OPPs	Organophosphorus Pesticides
PAHs	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PID	Photoionisation Detector
ppm	parts per million
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
RAP	Remediation Action Plan
RPD	Relative Percent Difference
SAR	Site Audit Report
SAS	Site Audit Statement
SEMP	Site Environmental Management Plan
SILs	Soil Investigation Levels
SPT	Standard Penetration Test
SVOCs	Semi Volatile Organic Compounds
TPHs	Total Petroleum Hydrocarbons
VENM	virgin excavated natural material
VOCs	Volatile Organic Compounds
v/v	volume by volume
-	On tables is "not calculated", "no criteria" or " not applicable"

1 INTRODUCTION

A site contamination audit has been conducted relating to Areas 1A and 1B within the land known as the Tempe Lands (the former Tempe Tip landfill), at Tempe NSW (Attachment 1, Appendix A). The Tempe Lands are currently under the control of Marrickville Council, with remedial works being managed for Council by Tenix Projects Pty Ltd (Tenix).

The site audit was undertaken to fulfil a requirement of a contract of sale and is not a requirement of a condition of consent.

The audit was conducted to provide an independent review of whether Areas 1A and 1B (the site) are suitable for any specified use or range of uses by an EPA Accredited Auditor i.e. an Audit under Section 47 (1) (b) (iia) of the NSW *Contaminated Land Management Act* 1997 (the CLM Act).

Details of the audit are:

Requested by:	Anthony Fazio, Marrickville Council
Request/Commencement Date:	21 August 2001
Auditor:	Graeme Nyland
Accreditation No.:	9808

To date, the Auditor has prepared three audit reports and one Interim Advice Letter in relation to the Tempe Lands as follows:

- Summary Site Audit Report Remedial Action Plan Tempe Lands, Tempe and Site Audit Statement (audit number **GN 35**, dated November 2001)
- **Letter** Re: Remedial Action Plan, Remediation and Development of Tempe Lands, dated 7 October 2003 (Interim Advice Letter).
- Summary Site Audit Report – Tempe Lands Remediation Project, Appropriateness of Detailed Design, and Site Audit Statement (audit number **GN 35B**, dated August 2004)
- Summary Site Audit Report - Validation of Remediation Associated with VRA. and Site Audit Statement (audit number **GN 35C**, dated September 2005)

These previous reports and letters were undertaken to address conditions of a Voluntary Remediation Agreement (VRA) and relate to offsite migration of contaminants in landfill leachate. The many documents reviewed during the preparation of the reports are referenced in the individual Site Audit Reports (SAR). It is anticipated that the off-site migration of leachate will be subject to separate regulation for maintenance of remediation under the CLM Act.

This SAR (**GN 35-1**) has been prepared to assess the suitability of the site for future commercial/industrial uses. The Audit is limited to a review of the capping and containment of fill material over Areas 1A and 1B and the management of landfill gases. These works were undertaken to prepare the site for future uses. This SAR has not been prepared to address the VRA.

Reports reviewed that are relevant to the suitability of Areas 1A and 1B include:

- 'Remediation and Development of Tempe Lands, Reference 164CSA001 Remedial Action Plan **(RAP)**', 4 September 2003 by Coffey Geosciences Pty Ltd (Coffey).
- 'Remediation and Development of Tempe Lands, Reference 164CSA001 Report on Fill Quality/Soil Gas Investigation, Areas 1A and 1B', Final Draft dated 21 November 2003 by Coffey.
- 'Remediation and Development of Tempe Lands, Reference 164CSA001 Report on **Fill Quality/Soil Gas Investigation**, Areas 1A and 1B', Final 29 June 2004 by Coffey.
- 'Remediation and Development of Tempe Lands, Reference 164CSA001 **Landfill Gas Monitoring Plan**, Tempe, NSW', 13 January 2005 by Coffey.
- 'Remediation and Development of Tempe Lands, **Landfill Gas Investigation**', 10 October 2005 by Coffey.
- 'Tempe Lands Remediation – Cap Validation Report, Areas 1A and 1B', draft dated13 January 2006 by Coffey.
- 'Tempe Lands, Site Environmental Management Plan', 16 February 2006 by Tenix.
- 'Tempe Lands, Site Environmental Management Plan for Areas 1A and 1B', 19 April 2006 by Tenix (the **EMP**).
- 'Tempe Lands Remediation – **Cap Validation Report**, Areas 1A and 1B', final dated 10 May 2006 by Coffey.

The Audit has also included the following:

- A review of correspondence prepared for the Auditor:
  - Facsimile Re: 'Tempe Lands Remediation Project', dated 3 April 2006 by Mainland Civil Engineering (MCE).
  - Letter Re: 'Tempe Lands Remediation and Development Project, Site Audit Statement for Areas 1A and 1B – VENM Importation', dated 12 April 2006 by Tenix.
- A site visit by the Auditor, 4 May 2006.
- Discussions with Marrickville Council, Coffey and Tenix.

The **RAP** was prepared for the whole of the former Tempe Tip and provided a number of remedial options however no preferred options were provided. The RAP did not address landfill gas and an addendum was to be prepared. The RAP was not reviewed by the Auditor with regard to the proposed commercial/industrial uses of the site prior to implementation.

The **Fill Quality/Soil Gas Investigation** was undertaken specifically for Areas 1A and 1B and included 75 boreholes for soil sample collection and for soil gas screening. An additional eight soil gas monitoring wells were installed that were sampled twice.

Coffey recommended that measures be implemented to minimise the potential impact of gases and that hotspots in the soil be managed by capping or remediation.

The **Landfill Gas Monitoring Plan** was not reviewed by the Auditor prior to implementation. It was prepared to satisfy the requirements of the EPA Section 80 (1) – Approval of the Surrender of License No. 6665 dated 9 December 2004. The licensed area is located to the south of Areas 1A and 1B. It is understood that the remainder of Tempe Tip including Area 1 have previously surrendered their licenses. While the license only applies to a small section of the Tempe Lands, the Plan outlines an approach for the whole Tempe Lands site.

The **Landfill Gas Investigation** was undertaken over the former Tempe Lands including Areas 1A and 1B. Seven gas monitoring wells were installed over Areas 1A and 1B. Conclusions regarding Areas 1A and 1B were not provided.

The **Cap Validation Report** includes validation of the materials used to cap the site and provides recommendations for content of the EMP.

The **EMP** provides a site specific plan of management for the maintenance of the cap and management of landfill gas. The EMP is attached to this SAR as Appendix E.

2 SITE DETAILS

2.1 Location

The former Tempe Lands are located at Bellevue Street, Tempe NSW 2044 (Attachment 1, Appendix A). The site, known as Areas 1A and 1B, is located in the northern corner of the former Tempe Lands (Attachment 2, Appendix A). The site location is shown in Attachment 3, Appendix A. Area 1A is shown as proposed Lot 201 and Area 1B as proposed Lot 200.

The site details are as follows:

Street address:	Entry to the site is via Bellevue Street, Tempe.
Identifier:	Currently Areas 1A and 1B include Lot A and Lot C DP 385209, Lot F DP 385210 and Lot 40 DP 746918.
Local Government:	Marrickville Council
Owner:	Marrickville Council
Site Area:	5.48 ha (Area 1A is 4.35 ha and Area 1B 1.13 ha)

2.2 Adjacent Uses

The site is bounded by:

- Commercial premises to the north (Salvation Army warehouse), north-west (KAS and Millers Self Storage) and west (Ateco Automatic)
- Low density residential properties to the west
- A container storage area to the south and east on the Tempe Lands
- Bellevue Street to the north.

The boundaries of the site to the south, within the Tempe Lands, are not well defined.

Tempe Lands extend to Alexandra Canal to the south-east and to the Tempe Recreational Reserve to the south-west. The remainder of the Tempe Lands is bounded by streets and adjacent properties. The Tempe Lands are located amongst single density residential, recreational open space, airport, and light industrial and commercial uses.

2.3 Zoning

It is understood that the site is currently zoned as 'arterial roads and arterial road widening'. Rezoning of the site is envisaged in future, which is proposed to include 4(b) - light industrial with Bulky Goods for Area 1A, and 4(b) - light industrial for Area 1B, specified in amendment number 24 from Marrickville Council's Draft Local Environmental Plan (LEP) 2001. It is understood that development approval would be required to facilitate a change in the rezoning.

2.4 Site Condition

Coffey (2004) indicated that the site was being used as a container storage area with no surface staining observed. The site is currently vacant with no facilities.

At the time of the Auditor's site inspection on 4 May 2006, the site was noted to be surfaced with sandstone capping that extended to near the pegged site boundary. The toe of the batter was near the boundary. There was almost no vegetation on the top of the capping, and some weed and shrub revegetation on some batters. The surface was graded towards drainage lines. Some surface cracking was noted near the northern side.

There was a small pile of soil, rubble and green waste that had been stripped from the site prior to capping. Council advised that this material was to be removed from the site.

2.5 Proposed Development

It is understood that the site is to be divested by Council prior to the submission of any development applications. While the proposed development of the new owners is therefore not known, any excavation works for development would require development approval.

It is understood that future development works may remove part of the cap to achieve appropriate levels.

Coffey note that the Site Audit Statement and the Environmental Management Plan would be noted on the Section 149 Certificate which would be the trigger for Council Planners reviewing development applications.

3 SITE HISTORY

The site history of Areas 1A and 1B as provided by Coffey is summarised in Table 3.1.

Table 3.1 – Site History

Year	History of Areas 1A and 1B
1920 - 1930	The site was used as a shale quarry by Spear's Brick, Pipe and Tile Works. This pit was used as a brick and rubble disposal pit.
1930 -1940	The pit was substantially filled by 1942. The remainder of the Tempe Tip site was operated from 1942 by the NSW State Government and Council receiving putrescible and public waste.
1940 – 1960	The site was used as a car sales yard with an office and shed were located on-site in the 1950s.
1960 -1990	Used intensely as a landfill with operation phased out by early 1980s. The site was temporarily leased to Wanless Scrap Metal in 1986 and 1987. The dumping of waste on the remainder of the Tempe Tip site was ceased in stages between 1969 and 1974. By 1975 only solid waste disposal of road works material.
1990 – 2004	Council disposed of the 'nightly lane clearing collections' until the mid 1990s. From 1999-2004 the land was leased to Tyne Container Terminal for the storage of empty containers. Prior to occupation the land was filled with sandstone to approximate depths of 0.3-0.5 m.
2004 -	The site has been left vacant since 2004. Prior to remedial works Coffey indicate that the site was largely un-vegetated and covered in parts with concrete, broken asphalt, brick and sandstone, mixed with sand and clay soils. Site remediation commenced in 2004.

Coffey (13 January 2005) indicated that for the Tempe Tip 'given that most material was deposited over 30 years ago, the gas generation is expected to be in Phase 4 (stable % of methane, carbon dioxide and nitrogen and the gradual reduction in methane) and likely to reduce from current levels'.

In the Auditor's opinion, the general uses of the site are well known. Due to the nature of the use, there will be uncertainties regarding the actual materials disposed.

4 CONTAMINANTS OF CONCERN

Coffey did not provide an indication of the contaminants of concern in the investigation reports reviewed for Areas 1A and 1B. Following a review of previous results and the site history, the contaminants of concern are summarised in Table 4.1.

Table 4.1 – Contaminants of Concern

Area	Potential Contaminant
Landfilling over the entire site	Heavy metals, PAHs, hydrocarbons, asbestos (soil), nutrients such as ammonia (leachate), dissolved solids (leachate), cations and anions (leachate) unknown VOCs (BTEX) and SVOCs. Generation of landfill gas potentially containing methane and trace toxic components.
Various activities including car sales, scrap metal storage and container terminal storage.	Petroleum hydrocarbons and metals.
Capping of the site with imported fill	Unknown, could include metals, PAHs and hydrocarbons.

Investigations specific to Areas 1A and 1B (Coffey, 2004) included submission of soil samples for metals, petroleum hydrocarbons including BTEX, and PAHs only. Coffey (2003 and 2005) screened the landfill gas for methane to address the risk of explosion. Other gases screened were limited to carbon monoxide, hydrogen sulphide and oxygen. Coffey consider that the characterisation of trace gasses is not crucial for assessing the suitability of the site, as no significant PID readings or landfill gases were detected in Stage 2 (upper, see Section 5) landfill material.

The Auditor notes that as trace contaminants have not been assessed that these would need to be considered during the design of any gas management measures for the protection of human health. The risks to human health from the potential exposure to landfill gas are discussed in the EMP (Section 12).

Coffey (2005) indicate that there is 'currently no information regarding the contamination status of groundwater beneath Areas 1A and 1B'. However previous assessments of groundwater at the former Tempe Lands site under the VRA determined that the leachate was impacted particularly by metals and ammonia. The risks to human health from the potential exposure to groundwater are discussed in the EMP (see Section 12 of this SAR).

Material imported to the site was specified as being virgin excavated natural material (VENM). Reports provided regarding the imported material were reviewed to determine more source specific contaminants of concern.

The individual substances included in each suite of analytes are listed in Appendix D.

5 STRATIGRAPHY AND HYDROGEOLOGY

5.1 Sub-Surface Conditions

Investigations defined two stages of landfilling at the Tempe Tip overlying natural materials.

Table 5.1 – Sub-surface Conditions

Depth	Types	Areas 1A and 1B
0 – 0.1	**Compacted** surface (hardstand) constructed in trafficable areas.	Gravel/gravely sand fill
0.1 – 1.0	**Stage 2** landfill: council generated waste and fill placed as part of earthworks to form and maintain a working platform (council tipping).	Clayey sand, gravely clay, bricks, concrete, metal and wood fragments.
1.0 - 5.0	**Stage 1** landfill: placed when landfill fully operational (pre 1974) (general tipping).	Glass, metal, plastic and organic matter, domestic waste, paper, fabric, concrete etc.
5.0 - > 6 m	**Natural**	Alluvial clays and sands in unquarried areas Silty clay and sandy clay Weathered shale Weathered sandstone

5.2 Hydrogeology

Groundwater at the site consists of leachate previously generated by rainfall infiltration and waste decomposition. Coffey note that it is likely to be complex with localised perching of groundwater on less permeable zones within the fill materials.

Groundwater was not encountered by Coffey (2004) within 6 metres of the tip surface. Previous investigations in this area suggest that groundwater is located more than 9 metres below the surface.

Leachate is expected to migrate towards Alexandra Canal where it is currently collected and treated in accordance with the VRA.

6 EVALUATION OF QUALITY ASSURANCE AND QUALITY CONTROL

The Auditor has assessed the quality of the landfill gas and soil sampling procedures by review of the information presented in the referenced reports as summarised in Table 6.1.

Table 6.1 - Evaluation of Soil and Soil Gas Sampling Quality Assurance

Investigation	Sampling Pattern, Locations, Density and Depth	Well construction, Collection Method, Calibration and PQLs
Coffey (2003) Fill Quality	13 boreholes were excavated over Areas 1A and 1B. Samples were collected from 0.5-0.95 m and then at approximately 3 m.	Boreholes were drilled with a solid flight auger with samples collected using a Standard Penetration Test (SPT) sampler.
Coffey (2004) Area 1A and 1B Soil and Gas *The Auditor notes that the sampling locations and methods are adequate to provide:* *- an indication of the presence of elevated levels of gas.* *- an indication of the associations of gas with various fill types and depths.* *- an overview of the contaminant status of the upper 0.5m of fill with regard to its suitability for capping.*	75 boreholes were located in a grid at 30 m intervals. These were extended to 0.5 m into Stage 2 material (Council tipping). These boreholes were screened for landfill gas on one occasion. One soil sample collected from each borehole at 0.1m was submitted for analysis. An additional seven samples were collected from 0.4-0.5 m. Eight of these boreholes were extended to 6 m to be converted to gas monitoring wells. These are located at 50-100 m intervals. The wells were screened between 3 and 6 m in Stage 1 material (general tipping) and some also extended into Stage 2 material (council tipping). Two sampling rounds were undertaken a week apart.	Boreholes to 0.5 m were excavated with a solid flight auger. Soils were collected directly from the auger. As these samples were collected from the surface the loss of volatiles that may have occurred is not considered to be significant. A landfill gas meter was used to screen the shallow 0.5 m open excavations (in report says 'during drilling') for methane, carbon monoxide, hydrogen sulphide and oxygen concentrations. The 6 m wells consisted of hand slotted 200 mm PVC screen and then blank PVC casing to the surface. The borehole was backfilled with sand to above the screen and sealed with bentonite and concrete. A ball valve was used to prevent ingress. Well logs were provided. The gas pressure was measured. The meter was zeroed to ambient air. Coffey did not indicate whether other forms of calibration were undertaken. A landfill gas metre was used to pump gas from the well with gas measured. Samples were collected at 10 second, 1 minute, 2 minute and 5 minute intervals. It is not clear whether the wells were purged prior to sampling.

Investigation	Sampling Pattern, Locations, Density and Depth	Well construction, Collection Method, Calibration and PQLs
Coffey (2005) Area 1A and 1B Landfill Gas - installed to meet a condition of the license of surrender regarding off-site migration. *The Auditor notes the results increase the available data set on the presence of landfill gas.* *The results indicate that gas generation is associated with Stage 1 landfill.*	Seven soil gas monitoring wells were installed at 30 m intervals within the western and northern boundaries on-site in April 2005. Sampling was undertaken once for most wells and biweekly between May and August 2005 for one well. Three wells were installed in 'fill associated with recent earthworks and natural material' Four wells were screened in both Stage 2 (council filling) and Stage 1 landfill (general filling) material.	The wells were excavated with a solid flight auger. The wells were constructed of machine slotted 50 mm PVC screen and then blank PVC casing to the surface. The borehole was backfilled with sand to above the screen and sealed with bentonite and concrete. An expanding rubber seal cap with an inbuilt quick connect valve fitting was attached. Top of screen was between 0.5 to 2 m and the base between 2.5 and 4.5 m. The wells were installed 1m below the water table or to a minimum of 4 m. Well logs were provided. The wells were installed to 1m below the watertable 'such that during seasonal water level fluctuations, the vadose zone that will contain any gas is directly above the water table and is adequately screened'. A GA2000 Landfill Gas Analyser was fitted to the valve and was used to screen the soil gas. The Analyser measured methane, carbon monoxide, hydrogen sulphide and carbon dioxide and an estimation of %LEL. No trace gases were analysed. The wells were purged to remove a minimum of one volume of air and measured until readings stabilised and then sampled at 10, 20 and 30 seconds and then every minute for five minutes. Calibrated prior to delivery to Coffey and also with fresh air daily. Calibration certificates provided. The analysers were purged between rounds. Details on leak detection or flow rate were not provided. Gas pressure was not measured.

Investigation	Sampling Pattern, Locations, Density and Depth	Well construction, Collection Method, Calibration and PQLs
Coffey (2005) – Area 1A and 1B: Services and drains	Accessible stormwater drains and utility pits 'in the vicinity of South Street, Bellevue Street'. The sampling locations of these drains and services are described in the text but are not provided on a plan.	The openings (< 4 cm) to the drains were not sealed. A 1m to 2m tube was attached to a VRAE multi-gas monitor. Readings were taken at 10, 20 and 30 seconds and then every minute for five minutes. Methane, carbon monoxide, hydrogen sulphide and carbon dioxide and % LEL were reported. No trace gases were analysed. Calibrated prior to delivery to Coffey and also with fresh air daily. Calibration certificates provided. The analysers were purged between rounds.
Coffey (2005) – Area 1A and 1B: Services and drains	Accessible stormwater drains and utility pits 'in the vicinity of South Street, Bellevue Street'.	The openings (< 4cm) to the drains were not sealed. A 1m to 2m tube was attached to a VRAE multi-gas monitor. Readings were taken at 10, 20 and 30 seconds and then every minute for five minutes. Methane, carbon monoxide, hydrogen sulphide and carbon dioxide and % LEL were reported. No trace gases were analysed. Calibrated prior to delivery to Coffey and also with fresh air daily. Calibration certificates provided. The analysers were purged between rounds.

Investigation	Sampling Pattern, Locations, Density and Depth	Well construction, Collection Method, Calibration and PQLs
Coffey (2006) – Area 1A and 1B Douglas (letter report 8 April 2005, included in Coffey 2006) Coffey (9 August 2005) Coffey (31 October 2005) Imported fill material for capping	Coffey collected only two independent validation samples on 9 August 2005. One sample was collected by Douglas (16 March 2005) and another 3 samples were collected by Coffey (31 October 2005) from the 40660 m^3 of material in close proximity following completion of the cap. The density of testing is considered to be adequate where adequate documentation confirming VENM is provided. Coffey note that excavations undertaken in the southern and north-western sections of the site indicated that contaminated shale had been placed in these locations. 40 excavations were undertaken in these areas and screened with a PID. 24 validation samples were collected from the excavation following removal of the impacted material. This is approximately one sample every 20 m^2. Douglas: A number of pages of the laboratory certificates appear to be missing 1-5, 11 and the cover sheet indicates there are 8 pages however the remainder indicate that there are 13. The samples do not appear to have been submitted for TPH, BTEX, Phenols, OCP and PCBs as stated in the Douglas report.	Coffey only indicate that the methods were based on procedures outlined in the Coffey Environmental Field Manual. Douglas do not provide details on how the sample was collected.

The Auditor has assessed the overall quality of the soil data by review of the information presented in the referenced reports, supplemented by field observations. The Auditor's assessment of soil follows in Table 6.2.

Table 6.2 - Evaluation of QA/QC undertaken for Soil Sampling

Decontamination Procedures	Coffey indicate that 'sampling equipment was decontaminated between samples and that clean disposable gloves were used'. Procedures were not discussed by **Douglas (2005) or Coffey (2006).**
Sample handling and containers	All samples were placed into prepared and preserved sampling bottles provided by the laboratory and chilled during storage and subsequent transport to the labs. **Coffey (2006)** Coffey only indicate that the methods were based on procedures outlined in Coffey Environmental Field Manual. **Douglas (2005)** did not report the field QA/QC procedures employed.
Chain of Custody	Completed chain of custody forms were provided in the reports with the exception of the **Douglas (2005)** report.
Detailed description of field screening protocols including calibration	**Coffey (2003 and 2004)** Field screening for volatiles in soil was not undertaken using a PID. **Coffey (2006)** Excavated materials and samples were screened with a PID.
Sampling Logs	**Coffey (2003)** Borehole logs and test pit logs were provided for most excavations however those numbered greater than 21 were not included. A description of 'fill' or 'landfill' and depth were provided in the results table. **Coffey (2004)** Soil logs are only provided for the six wells installed to 6m. These provide an indication of fill types which are likely to be fairly consistent. A separate sample register for other samples was not provided. **Coffey (2006) and Douglas (2005)** sample logs were not provided.
Field quality control samples	**Coffey (2003)** One intra-laboratory field duplicate was analysed. No other field QA/QC was undertaken. Coffey note that based on previous results that volatiles were not contaminants of concern and that the lack of a trip spike is not likely to affect the data usability in a significant way. **Coffey (2004)** Field quality control samples including intra-laboratory duplicates, inter-laboratory duplicates, trip spike (only one for three days of sampling) and trip blank (only one for three days of sampling) were undertaken. It is likely, given the sample handling, that the results for the trip blank and trip spike were representative of all trips. No rinsate blanks were collected however decontamination was undertaken. **Douglas (2005)** Not discussed by Douglas and no evidence in the lab certificates. **Coffey (2006)** Two intra-laboratory samples and one inter-laboratory duplicate were collected.

Field quality control results	**Coffey (2003):** The RPDs were elevated for metals at greater than 50%. Coffey note that the heterogeneity of the material sampled should be taken into account when interpreting the data. **Coffey (2004):** RPDs for the inter-laboratory soil duplicate samples for the two batches were greater than 50% for PAHs (maximum of 116% fluoranthene). Three duplicate pairs reported RPDs of between 51% (zinc) and 164% (lead) with one reporting an RPD of 122% for TPH C15-C28. The results for the duplicate samples were not provided so the RPDs cannot be verified. Coffey conclude that the elevated RPDs are a 'reflection of the heterogeneity of the material sampled' and should be taken into account during review of the data. The Auditor notes that these discrepancies do not affect the conclusions with regard to capping suitability. Coffey discuss copper as being detected in a wash blank for an SPT sample. The Auditor notes that no wash blanks were collected and that this is probably not relevant to the current site. **Coffey (2006):** All within appropriate limits. All other results from field quality control samples were within appropriate limits.
NATA registered laboratory and NATA endorsed methods	Laboratories used included: ALS, Labmark (secondary laboratory for Coffey 2004 only), SGS (Douglas only) and Amdel (secondary laboratory for Coffey 2006 only). All laboratory certificates were NATA stamped.
Analytical methods and holding times	In-house analytical methods were included in the laboratory test certificates. While, references to the USEPA methods for extraction and analysis were given for the ALS laboratory certificates for TPH, VOCs and SVOCs the exact methods used have not been detailed. Coffey: Review of the COCs and laboratory certificates indicate that the holding times had been met.
Practical Quantitation Limits (PQLs)	PQLs were all less than the threshold criteria for the contaminants of concern.
Laboratory quality control samples	Laboratory quality control samples including method blanks, laboratory duplicate, control samples, surrogates, matrix spikes and matrix spike duplicates were undertaken by the laboratory at appropriate frequencies.
Laboratory quality control results	The results from all laboratory quality control samples were within appropriate limits.
Data Quality Objectives and Data Evaluation (completeness, comparability, representativeness, precision, accuracy)	Coffey did not define DQOs and did not undertake a formal QA/QC data evaluation against the five category areas. A QA/QC checklist referred to as 'data point validation' describing information relevant to the site assessment was included and concluded that the data was satisfactory. Coffey (2006): Data Point validation was not undertaken.

In the Auditor's opinion the results obtained by these methods are adequate to provide:

- an indication of the presence of elevated levels of gas and likely fill source
- an indication of the contaminant status of surface soil (now capped)
- an indication of whether the contaminant status of the VENM is consistent with other information provided.

The results of the validation testing are considered to be valid given the density of testing undertaken.

The Auditor considers that management would be required of the following uncertainties:

- Trace gasses have not been characterised.
- It is not clear whether gasses are emitting from the surface. As the site was capped recently it would be difficult to establish past or current flow paths.
- There is no systematic and historic monitoring of gases being generated at the site to establish trends.

7 ENVIRONMENTAL QUALITY CRITERIA

The Auditor has referred to the NSW EPA (1997) Solid Waste Landfill Guidelines for methane which indicate that concentrations should not exceed 1.25% methane by volume (i.e. 25% Lower Explosive Limit (LEL)). The LEL for methane is the lowest limit at which gas becomes explosive, which is 5%. Methane concentrations have been used as an indicator of whether landfill gases are present and whether other trace contaminants need to be considered.

The Auditor has assessed the soil data provided by Coffey in reference to Soil Investigation Levels for Urban Redevelopment Sites in NSW (SIL Column 4 – 'commercial/industrial' in EPA (1998) *Guidelines for the NSW Site Auditor Scheme*.

EPA (1994) *Guidelines for Assessing Service Station Sites* have also been referred to for assessing TPH and BTEX results.

Imported clean fill is required to be VENM. The NSW EPA (1999) *Environmental Guidelines: Assessment, Classification & Management of Liquid & Non-liquid Wastes* classifies VENM as 'clay, gravel, sand, soil and rock that is not mixed with any other waste and that:

(a) has been excavated from areas that are not contaminated, as a result of industrial, commercial, mining or agricultural activities, with manufactured chemicals and that does not contain sulphidic ores or soils, or

(b) consists of excavated natural materials that meet such criteria as may be approved by the EPA'.

On this basis, the Auditor considers that for soil to be classified as VENM, the following criteria generally apply:

- Organic compounds (including petroleum hydrocarbons, PAHs, OCPs, PCBs, Phenols) should be less than the LORs, and
- Inorganic compounds should be consistent with background concentrations.

8 EVALUATION OF SOIL AND SOIL GAS ANALYTICAL RESULTS

8.1 Soil

In March 2003 samples were collected from 0.5 – 0.95 m below ground level (BGL) at 13 locations and at depth (generally at 3 – 3.45 m BGL) at six of these locations. One sample was collected from 'landfill'. Those collected from the upper 0.5 m are summarised in Table 8.1.

In June 2004 the upper 0.1 m of 'fill', described in boreholes logs (only six provided) as fill containing gravely sand or crushed sandstone, was sampled from the 76 boreholes. An additional 7 samples were collected from 0.4 – 0.5 m in 'fill', described in the boreholes as crushed shale or crushed sandstone. All results obtained during this sampling round are summarised in Table 8.1.

Samples locations are shown as Attachment 4, Appendix A. The samples were submitted for metals, TPH, BTEX and PAH analysis.

Table 8.1 - Evaluation of Soil Analytical Results – Summary Table (mg/kg).

Analyte	n	Detections	Maximum	n > EPA (1994)	n > SIL Column 4 (EPA 1998)
Arsenic	91	86	33	NA	0
Cadmium	91	13	4	NA	0
Total Chromium	91	91	87	NA	0
Copper	91	91	2590	NA	0
Lead	91	91	1320	1	0
Nickel	91	84	93	NA	0
Zinc	91	91	8030	NA	0
Mercury (inorganic)	91	28	0.8	NA	0
TPH (C_6-C_9)	91	1	3	0	NA
TPH (C_{10}-C_{36})	91	57	3550	**26**	NA
BTEX	89	0	-	0	NA
Total PAHs	91	53	399	NA	**3**
Benzo(a)Pyrene	91	43	28	NA	**9**

n number of samples
- No criteria available/used

Slightly elevated concentrations of copper, lead and zinc were detected in surface soil at the site boundary. Copper was reported at 2590 mg/kg and 852 mg/kg, lead at 248 mg/kg and 1320 mg/kg and zinc at 8030 mg/kg. These concentrations were less than the SILs.

TPH C_{10}-C_{36} were detected in over half of the samples in excess of the criteria of 1000 mg/kg. These samples were distributed across the site in the upper 0.1 m.

Benzo(a)pyrene was detected above the SIL at nine locations and PAHs at three across the site in the upper 0.1 m.

The results indicate that the upper 0.1 m (prior to capping) is impacted by slightly elevated concentrations of TPH C_{15}-C_{36}. TPH C_6-C_9 was only detected in one sample well below the criteria. Naphthalene was detected at low concentrations and in only two samples. Remedial works to cap these materials are discussed in Section 9.

8.2 Soil Gas

The results are summarised as Table 8.2. Coffey reported the %LEL and methane percentage for each screening point. Coffey note that elevated CO_2 levels to the south may indicate that the material may be at a 'stage of decay' however the results were not provided. The Auditor notes that the wells to the south were screened in Stage 2 (upper-council tipping) rather than Stage 1 material (lower-general filling).

Soil gas sampling locations are shown as Attachment 4, Appendix A.

Table 8.2 - Evaluation of Soil Gas Sampling Results

Investigation	Results	Coffey Comments	Auditor Comments
Coffey (2004) Screening to 0.5m	The maximum reported methane percentage was 7% (140%LEL). All other readings were less than 0.7% where the borehole was less than 0.5 m depth BGL.	'the methane monitoring results suggests that significant methane is being generated in the Stage 1 fill material, although it is not significant by the time it reaches the Stage 2 fill layer'.	Surface gas has not been assessed. As the site has now been capped locating areas of potential breakthrough would be difficult.
Coffey (2004) Landfill gas wells to 6m.	Initial screening indicated that the maximum methane ranged from 12 to 43% in the three wells screened prior to well construction. Following completion of the wells the maximum concentrations were reported between 28 and 67% of methane. Coffey indicate that 'explosive gasses' were reported in all eight of the monitoring wells from 556% to 1348% LEL.	Coffey conclude that measures to manage gas are required for services that extend below 0.5 m depth or basements due to high explosive gas levels detected in the Stage 1 fill material (deep fill).	The Auditor agrees that significant levels of methane are being generated from Stage 1 fill.
Coffey (2005) Landfill gas wells at the boundary.	Methane was reported at 40 to 55% in most wells along the boundary in two rounds. Reduced levels were reported in one well at the northern boundary (installed into Stage 2	Gas generation 'appears to be producing significant quantities'. 'The VENM cap in Area 1A/1B may be acting to reduce opportunities for landfill gases to be released from the ground surface	The results are consistent between sampling rounds and consistent with the landfill materials encountered.

Investigation	Results	Coffey Comments	Auditor Comments
	material overlying shale) of 0.21% methane in April and May 2005 and then > 28% methane in August 2005. Wells reporting elevated readings of methane were installed in the Stage 1 landfill material (overlain by Stage 2 material).	into the atmosphere, which could then lead to landfill gas attempting to migrate laterally. Whether this is a temporary scenario or not would need to be assessed during future monitoring rounds'.	Given that future migration of gas through the cap cannot be predicted, management is likely to be required. It is understood that these wells will be monitored in the future as part of the landfill surrender conditions imposed by EPA.
Coffey (2005) Services and drains	Stormwater, hydrant, Telstra and unidentified service pits: 0%methane	'Landfill gases are not likely to be migrating into and through service pits and stormwater drains' in these areas.	

Coffey state that 'it is highly unlikely that significant gasses will migrate through the Stage 2 layer and VENM cap' as:

- Gas generation has been shown to be limited to the Stage 1 Landfill material
- There is no vertical migration through the Stage 2 Landfill material at levels detectable with a hand held PID and a explosive gas indicator. (The Auditor notes that these excavations were located on a grid rather than targeting known migration pathways i.e. visible cracks.)
- VENM capping has been constructed of 0.5 m thickness and compacted to 100% standard compaction.

No surface gas emission monitoring was undertaken to demonstrate that the cover material is controlling the emission of landfill gas. This is usually undertaken by testing the atmosphere 5 cm above the ground surface in areas that are likely to be the final cover.

Given that 'significant quantities' of landfill gas appear to be generated in Area 1 and the lack of data on the build up of gasses, trace contaminants, emissions from the surface and the likely concentration trends, the Auditor concludes that the management of gases would need to be considered during development of the site.

9 EVALUATION OF REMEDIATION

9.1 Remediation Strategy

The RAP (2003) was previously reviewed with regard to its relevancy to the VRA, in Audit GN35B. The RAP was prepared for the whole of the Tempe Lands and provided a number of remedial options with the preferred options including:

- 'Capping the site with imported fill material
- Installation of a vertical groundwater cut-off barrier
- Further investigation of landfill gas conditions across the landfill and providing landfill gas mitigation management measures, if required'.

The RAP was not formally reviewed with regard to capping works by the Auditor prior to implementation. The RAP was prepared for the former Tempe Lands and was not specific to Areas 1A and 1B.

Following a review of the previous results the Auditor considers that capping to address the risk to human health from impacted soil is considered appropriate.

No options for landfill gas management were provided in the RAP as insufficient data had been collected. Following further soil gas sampling Coffey recommended that measures be taken to manage landfill gas such as the passive or semi-active landfill gas collection, ventilation system beneath buildings, positive pressure in buildings and the measures for services that extend below the capping.

A Landfill Gas Monitoring Plan was prepared to satisfy the requirements of the EPA 'Approval of the Surrender of License' regarding further monitoring of landfill gas to address the potential for subsurface migration of landfill gas from Tempe Lands. The plan did not specifically discuss the requirement to monitor for land use development purposes.

9.2 Remedial Works

The remedial approach and validation strategy presented in the RAP (2003) by Coffey was generally adopted during the subsequent remedial works. Table 9.1 provides a discussion on the remedial approach.

Table 9.1 – Main Elements of Remediation

RAP	Remediation Works	Auditor's Comments
Preferred option is to cap	Preferred method was to cap. Capping was required to provide a physical barrier to impacted soil.	Capping to address the risk to human health from impacted soil is considered appropriate. Landfill gas was not discussed by either the RAP or the validation report.
Validation of VENM -provide documentation on the source site history - facilitate council review of documentation and a site visit of source site - undertake an inspection and testing of VENM on delivery (1 per 10,000m^3) - review results in reference to NSW EPA (1998)	- an application form by the generators of the VENM including address, material type and quantity. A report confirming that the material was VENM was also to be attached. - MCE and Tenix were to review the VENM report and whether the report was adequate to classify the material as VENM. - MCE was to visit the site to confirm there were no visual or olfactory signs of impact. The material was not to be imported until remediation and validation works had been undertaken to the satisfaction of MCE and Tenix. - Material was to be observed at point of delivery by MCE and periodically by Tenix. The material was to be rejected if there were any visual or olfactory signs of impact. - Check samples were to be collected at a rate of 1 per 10 000m3 - Coffey reported that there was no evidence of any olfactory or visual impacts in VENM during a site inspection on 5 May 2005 and 9 August 2005. Coffey concluded that the material brought onto site (other than the remediated material) was VENM.	- A review of daily record sheets by Coffey indicated that the estimated volumes correlated with imported volumes. - reports prepared by the external consultants were provided. These are discussed in Section 9.2.1. - the application form was limited to a description of 'sandstone'. - MCE provided a letter that indicated that an application form and a pre-import site inspection record (completed by MCE) were completed prior to importation. Examples of these were provided. - the daily record sheets at the point of delivery only reported volumes except where gross contamination was observed from above eg bricks (11 loads rejected from five of nine sites). The Auditor notes that the rejected loads indicate that non-VENM material was making it to the point of delivery. - A letter from Tenix indicates that a site supervisor and two project engineers were on-site between February 2004 and July 2005. The team were to ensure that MCE complied with the validation procedure of logging incoming loads at the entry point and the off-loading

RAP	Remediation Works	Auditor's Comments
		point. All non-compliances were raised with MCE including segregation of suspect loads. Tenix indicate that during grading out and compaction any concerns about suspect material were raised. Limited sampling was undertaken of the imported materials by Coffey and Douglas.
Validation of Cap Construction - ensure Geotechnical supervision - ensure 'site superintendent' validates minimum 0.5 m of compacted fill through level surveys. Layers to be < 200mm in industrial areas.	- approximately 40660 m^3 of VENM was imported to the site between January and November 2005 with an additional 4500 m^3 included in the MCE daily record sheets sent to other areas over the larger Tempe landfill site. - Tenix supervised compaction of the cap. Douglas undertook compaction and density testing. - standard compaction of 100% to minimise infiltration of water into the landfill material. - 0.5 m with layers < 200 mm	The survey plan indicates that the site is capped by more than 0.5 m of material over the landfill area.
Long-term integrity of the implemented measures - Site environmental management plan	An EMP was prepared and provided to the Auditor.	A review of the EMP is provided in Section 12.
Landfill Gas Management - Insufficient information had been collected and RAP recommended further investigation. If 'significant methane' was found an addendum to the RAP was proposed that would include engineering measures (e.g. gas venting pipe) to be incorporated in the capping design to manage methane	Summarises the Coffey (2005) Landfill Gas Investigations and indicates that additional targeted landfill gas investigations were being undertaken. Gas management for site suitability were not incorporated into the capping strategy. An EMP was prepared and provided to the Auditor.	Landfill gas with regard to suitability was not addressed during the capping works. A review of the EMP is provided in Section 12.

RAP	Remediation Works	Auditor's Comments
accumulation. A Landfill Gas Monitoring Plan (2005) was prepared prior to capping of the site to address the requirements of the 'Approval of the Surrender of Licence'. The Plan addresses off-site migration of gas rather than the suitability of the site for specific land uses. Only sub-surface monitoring was proposed		

9.3 Validation Results

Coffey and Douglas undertook limited testing of the VENM.

Douglas indicated that one sample was collected from material sourced from the cross city tunnel and submitted for TPH, BTEX, PAH, Phenols, OCP and PCB analysis. Tabulated results indicate that PAHs were reported at 2.5 mg/kg with 0.2 mg/kg of benzo(a)pyrene, metals were reported at low concentrations. Douglas concluded that 'Based on the analytical results and site observations, the imported material is classified as Virgin Excavated Natural Material (VENM).'

Coffey collected two independent validation samples on 9 August 2005 from two stockpiles (< 30 m^3 each) of VENM that had recently been imported to the site. Coffey collected the two samples randomly and submitted them for metals, PCB, OCP, TPH, BTEX analysis. Low concentrations of metals were reported with PCB, OCPs, PAHs, TPH and BTEX not reported above the PQLs.

Coffey collected three samples to the west of the excavation (for remediation of non-VENM material). The samples were submitted for TPH and BTEX analysis only with no detections above the PQLs.

Results of PID screening for the 40 locations and validation of the excavation to address imported non-VENM material are discussed in Section 9.4.1.

9.4 VENM Source Documentation

VENM was sourced from nine separate sites for which external consultants provided VENM certificates which were collated and reviewed by Coffey. These are discussed in Table 9.1. The Auditor's comments are limited to the suitability of the material for use on a commercial/industrial site. Coffey, Tenix, MCE and the external consultants provided documentation that certified that the material imported to site (other than from Pitt Street) was VENM.

Coffey noted that some reports had deficiencies such as the omission of laboratory reports and confirmation of removal of overlying fill material. Coffey considered that these deficiencies did not 'significantly affect the level of confidence regarding the

suitability of the material imported'.

Individual assessments of the various sites based on information provided by Coffey are as follows in Table 9.2.

Table 9.2 – VENM Validation Reports

Source	Site History	Sampling	Coffey	Auditor's Opinion
Chippendale, corner of Cleveland Road and Shepard Street consisted of 1423 m^3 of shale. Delivered between 25 February and April 2005.	Environmental Investigation Services (EIS) 2 December 2004. Site history not provided. The excavated area was previously identified to be contaminated by Douglas Partners. The Douglas report was not provided and the nature of impact is not clear.	EIS collected four samples (not sure if targeted to the correct locations). PAHs were not reported above the PQLs and only low levels of metals were reported. (Lab certificates or a table of results were not provided.) EIS concluded that 'the red and pale grey clay can be considered as VENM'.	'it is likely that the material was most likely suitable to be classified as VENM based on the content of the report'	Given that PAHs and metals were reported below the PQLs and that only a small amount of material was imported to the site the Auditor considers that the risk of significant impacts presenting a risk to human health is low.
Darling Point, 11-21 Greenoaks Avenue consisted of 2141 m^3 of sandstone. Delivered between 25 February and April 2005.	Environmental Consulting Services (ECS) 3 January 2005. The site was used for residential purposes and is within a residential area. The overlying topsoil contained building wastes 0.1-0.3 m which was underlain by sandstone bedrock.	No testing was undertaken and an indication of the visual/olfactory signs was not provided. ECS concluded that 'The sand, excavated during the construction of the retaining wall, and the sandstone bedrock is considered suitable to be VENM.'	Coffey consider that if the fill was impacted that it is unlikely to have 'significantly leached' to the sandstone and that fill would have been rejected at the point of delivery by MCE.'	Given that the site was used for residential purposes and the sandstone and sand were ripped from the underlying layers the risk of impacted fill being imported to site is low.

Sydney, 185 Macquarie Street, consisted of 10,438 m3 of sandstone. Delivered between February and September 2005.	Douglas Partners 4 April 2005 The site history, including any remedial works, was not documented. The site had been cleared prior to a site visit. The material had not been excavated and residual clays had been retained over parts of the sandstone bedrock. Douglas indicated that there were no indications of odours or discolouration of the sandstone.	One sample was collected and submitted for asbestos, metals, TPH, BTEX, PAH, OCP and PCB analysis. Organics were not reported above the detection limits, metals less than 10 mg/kg and asbestos not detected. The sample description was 'sand & rocks'. Douglas concluded that 'on the basis of visual inspection and analytical results, the sandstone material satisfies the classification of VENM'.	Coffey indicated that 'there is a high level of confidence regarding suitability of material for use in cap'.	From the information provided there is no reason to believe that the material imported to site is impacted.
Darling Island, Union Street, Site 4 and 5, consisted of 3722 m3 of sandstone. Delivered between July and September 2005.	Douglas Partners 21 June 2004 A site inspection indicated that the site had been used for maritime purposes. Douglas noted 'all contaminated materials have been removed separately and the resulting excavations appropriately validated'. Douglas concluded that 'the observed natural sandstone material is classifiable as VENM.	No sampling was undertaken. Douglas did note that overlying fill had been removed, that the sandstone was white, grey and brown in colour and excavation of the sandstone was occurring at the time of the inspection.	Coffey indicated a high level of confidence regarding the suitability of the material.	Given that Douglas indicated all impacted material had been removed and that the material was ripped from sandstone the risk to human health on the proposed commercial site is considered to be low.

Material sourced from Sydney, **Cross City Tunnel**, consisted of 16694 m^3 of sandstone/clay. Delivered between February and May 2005.	In an extract from Connell Wagner (31 January 2003) Geotechnical Investigation Report it was noted that 'the deeper residual' material was likely be classified as VENM however, confirmation would be required'. Excerpts from a URS report dated February 2003 indicated that the site was overlain with fill containing roadbase, concrete, brick, metal and ceramics classed from inert to hazardous waste. No site history was provided. Petroleum hydrocarbon odours were noted in some boreholes. A letter from Cross City Tunnel JV (9 May 2006) states that all material sent to Mainland Civil was VENM from deep rock excavations.	URS undertook testing of the fill and the bedrock. Notes on the report by Coffey indicate what was actually tested i.e. fill and bedrock or just bedrock. Only the 95% UCL exceedances of the inert waste criteria were reported with all others 'below the Inert Waste Criteria'. Areas A, C and F contained fill and bedrock however similar results were reported as summarised below. Bedrock reported some slightly elevated concentrations of mercury (1mg/kg) and lead (155 mg/kg) and benzo(a)pyrene at 9 mg/kg in Area B Bedrock reported slightly elevated concentrations of nickel (33 mg/kg), mercury (1.5 mg/kg) and lead (330 mg/kg), benzo(a)pyrene (3 mg/kg)in Area D. Bedrock reported slightly elevated concentrations of arsenic (7 mg/kg), mercury (0.74 mg/kg) and lead (355 mg/kg), benzo(a)pyrene	Coffey indicated a moderate to high level of confidence regarding the suitability of the material given that it is 'likely' that validation was undertaken and significant leaching to the sandstone is unlikely as the upper layers would not have been used in Areas 1A and 1B.	The bedrock may consist of sandstone but is impacted by elevated concentrations of metals and benzo(a)pyrene. Based mainly on advice from Cross City Tunnel JV that indicates that the material supplied to Tempe was from deep rock excavations, the Auditor considers that the risk of significant impacts presenting a risk to human health is low.

		(3 mg/kg) in Area E. Bedrock reported elevated concentrations of arsenic, lead, nickel and benzo(a)pyrene. Laboratory results for the overlying materials were not provided. URS does not state whether the material can be classified as VENM.		
Material sourced from **Ultimo**, William Henry Street, consisted of 5112 m^3 of Sandstone.	MPL September 2005 The site history was not provided. Only the sandstone bedrock was classified as VENM and imported to the site. A small section of discoloured sandstone.	Discoloured sand reported PAHs at 15mg/kg which was not classified as VENM. The crushed sandstone reported PAHs at 4.5 to 5.4 mg/kg. Discussions between Coffey and MPL indicated that the overlying crushed sandstone had ash and that this may have been mixed with the VENM. Coffey advised Tenix that only the underlying sandstone should be imported. Based on 'information provided by MCE" only the sandstone bedrock was imported with no evidence of ash.	'there is a high level of confidence regarding suitability of material for use in cap'.	The material may have contained some residual PAH impacts however the risk to human health in a commercial setting is considered to be low.

Material sourced from **Vaucluse**, 7 Wentworth Road, consisted of 89 m^3 of Sandstone.	Douglas (14 December 2004) indicated that the site was used for residential purposes with topsoil and fill, including building materials present over sandstone at the time of the site visit.	Apparently Douglas submitted one sample of sandstone for analysis for asbestos, petroleum hydrocarbons, OCPs and PCBs. Douglas indicate that these were either below detection limits or at very low (background) levels. Douglas classified the material as VENM.	Coffey conclude that 'there is a high level of confidence regarding suitability of material for use in cap'.	The risk to human health in a commercial setting is considered to be low.
Material sourced from **Woolloomooloo**, 76-88 Crown Street, consisted of 2701 m^3 of Sandstone.	In discussions between Coffey and Brink and Associates, it became apparent that the site was used as an industrial property where PAH impacted materials and USTs had been removed but not validated. Coffey obtained a list of contamination assessment reports undertaken for the site which were not provided.	Brink and Associates classified the sandstone material as VENM following a site visit, given that there was no visual evidence of staining on the exposed surfaces. No testing was undertaken.	Coffey conclude that it is 'likely that the classification of the material as VENM was appropriate'.	The risk to human health in a commercial setting is considered to be low.

9.4.1 Non – VENM

Impacted non-VENM was imported to the site and used as capping material. This system failure is discussed below.

Material sourced from **Sydney, Pitt Street,** consisted of 2879 m^3 of clay and shale.

Urban Environmental (2005) indicated that USTs and hydrocarbon impacted soils associated with a mechanics workshop and garage had been removed. The remedial works were the subject of an Audit by a NSW EPA Accredited Site Auditor. Six samples collected did not report petroleum hydrocarbons or PAHs above the detection limits and metals were less than 15 mg/kg.

Coffey conclude that 'there is a high level of confidence regarding suitability of material for use in cap'.

Coffey visited this source site which was not part of the validation system undertaken by MCE to validate VENM. It was observed that 'VENM' was being excavated from the former location of USTs. Coffey noted a strong petroleum hydrocarbon odour and PID readings of up to 500 ppm. Importation of material from Pitt Street ceased on 14 October 2005.

The material had already been imported to site and bypassed the system of VENM validation. Coffey indicate that this was a result of the following:

- It was the last source site used and was imported at the end of the cap construction works when the inspection regime had been diminished with Tenix no longer onsite undertaking regular inspections.
- Tenix were on-site full time until June 2005 (half material imported) and then part-time during the importation of the remaining material due to the low import rate.
- The designated MCE personnel did not visit the site as MCE were excavating the VENM. MCE disregarded the presence of odorous material.

A letter from MCE indicated that the importation of non-VENM was an isolated failure. Although hydrocarbon odours had been noted at the tipping face by the truck controller on-site 'the odour was disregarded due to the validation report and the assurance from the source site Project Manager that the material was indeed classified as VENM'. The Auditor notes that this indicates that visual observations were not considered where a validation report certified the material as VENM.

A letter from Tenix indicated that 'the slow rate of VENM importation being achieved, the limited scope of works, and the confidence in a well established system for VENM importation meant that a full time site presence from Tenix Projects was not justified'. A Project Engineer visited 1-2 days per week.

Tenix concluded that 'the earlier independent sampling and significant trial pitting coordinated and systematic approach taken by Tenix Projects, MCE and Coffey Geosciences undertake following the discovery of contaminated material, provided a clear indication that this was an isolated event'.

Remediation and Validation

It was known by Tenix/MCE that the material had been placed within the cap in three different locations. The grey clayey sands were visually discernable from the surrounding sandstone. Test pits were spaced between 5 and 20 m with 40 test pits in total excavated to determine whether the material was impacted. The pits were screened with a PID and observations and odours were noted.

PID readings and strong hydrocarbon odours were detected in one of areas in the northern corner. Three samples were collected from the odorous material which reported detections of TPH C6-C14, ethylbenzene, xylene and lead.

The upper 0.3 m over 442 m^2 was excavated and removed to the stockpile area. Twenty one validation samples were collected from the base and walls and screened with a PID (< 4.4ppm). Nine soil validation samples were submitted for analysis. TPH and BTEX were not detected above the PQLs.

An additional three samples were collected from non-odorous material approximately 10 m south of the validation wall. TPH and BTEX were not detected above the PQLs.

Stockpile

Seven stockpiles (85 m^3) of the 'final loads' were located in the west of the site. Two samples were collected where elevated PID readings and odours were reported (maximum of 150ppm). The results indicated detections of TPH C_6-C_9, toluene, ethylbenzene, xylene and lead. Coffey considered that 'the stockpile material where samples were collected from is not suitable for use as VENM'.

An additional two samples were collected from non-odorous material. TPH and BTEX were not detected above the PQLs.

Disposal

Coffey indicate that the stockpiles (85 m^3) and the excavated capping material (132 m^3) were disposed of to the Alexandria Landfill P/L and a weighbridge transaction report was provided. No material assessed to be unsuitable for use in the construction of the cap was replaced beneath the cap.

9.4.2 Auditor's Conclusion

The management of gas with regard to the suitability of the site for development was not addressed through remedial works. The Auditor concludes that gas will need to be managed in accordance with an EMP as discussed in Section 12.

Following a review of the VENM validation system and the associated documentation (VENM certificates, MCE letter, Tenix letter, Coffey report, analytical results and visual observations) the Auditor concludes that the risk of gross pollution being imported to the site is low. Coffey conclude that based on the information provided that the material imported to the site is VENM.

Given that the material imported was sandstone, with minor amounts of shale, that there was a validation system in place and that there is no evidence of gross impact

at the surface of the imported material that the capping is suitable for the purposes of commercial/industrial land uses.

10 CONTAMINATION MIGRATION POTENTIAL

The migration potential of leachate and groundwater was addressed in SAS GN 35C. The Auditor notes that off-site migration of leachate from the site is being managed under a VRA. It is anticipated that following completion of the VRA, ongoing management of the leachate collection and treatment system will be regulated under a separate agreement for maintenance of remediation under the CLM Act. This will not require any actions to be conducted on Areas 1A and 1B.

The potential for off-site migration of contaminants, including asbestos, in surface water or dust has been eliminated through the capping works.

Coffey indicate that there is lateral migration of landfill gas within the landfill. It is understood that further subsurface gas migration investigations are currently being undertaken off-site to determine whether gas migration measures are required to abate gas migration off-site. The Auditor notes the risk of off-site migration will be addressed through the landfill license surrender process administered by the EPA.

11 ASSESSMENT OF RISK

Potential risks that have been addressed in the EMP, discussed in Section 12, include:

- risks to human health from cap penetration
- risks to human health or risk of explosion from gas migration to the surface
- risks to human health from exposure to groundwater

There is a risk that material imported for capping may have included material that is not VENM. The risk that this material was significantly impacted, over a large area, at the surface of the cap is considered to be low.

12 ASSESSMENT OF ENVIRONMENTAL MANAGEMENT PLAN

The EMP to be implemented to ensure the long term integrity of the cap and protection of human health and the environment has been assessed by the Auditor as summarised in Table 12.1.

Table 12.1 – Assessment of the EMP

Plan Objective	'Implement a monitoring program for the ongoing maintenance of site controls designed to minimise access to contaminated material by site users and environmental impacts' 'Implement controls on future development and maintenance work'. 'Implement a monitoring program for the ongoing maintenance of site controls constructed to minimise off-site migration of landfill gas through the cap and across the site boundary (if required)'. The Auditor considers that these objectives are appropriate as they aim to minimise the risk to human health and the environment.
Contamination Issues to be Managed	The plan discusses exposure pathways if the cap is breached or landfill gas ingresses buildings: ▪ inhalation of impacted dust and dermal contact with or ingestion of impacted soil for maintenance and construction work. ▪ dermal contact with or ingestion of impacted groundwater for maintenance and construction work. ▪ explosion or asphyxiation due to landfill gas in confined spaces eg buildings or service pits for maintenance or construction work. The Auditor agrees that the contamination issues identified are those that require management.
Extent of Management Required	The EMP applies to the entire site.
Site Specific stand-a-lone document i.e. address site specific issues, site details and site condition	The EMP is site specific to Areas 1A and 1B with the remainder of the Tempe Lands managed under a separate EMP. The current conditions specific to the site (referred to in the EMP) include: - Area 1 is capped with a minimum of 500 mm of VENM. - gas management measures for the potential ingress of gas into buildings or service pits to be constructed at the site are not currently in place. The Auditor notes that as trace contaminants have not been assessed that these would need to be considered during the design of any gas management measures for the protection of human health.

Responsibilities	Responsibilities in the EMP are well defined. The EMP notes that the responsibility of implementing mitigation, monitoring and maintenance requirements associated with off-site migration of landfill gas is with Council 'regardless of land ownership'.
Timeframe	The EMP does not set time-frames for the commencement of the EMP or cessation of monitoring. The Auditor understands that the EMP will be implemented following issue of this SAR.
Long-term engineering security of works	The Auditor considers that the monitoring of the cap and the detailed controls are adequate to ensure the long term engineering security of the cap and manage the risks when breach of the cap is required.
Long-term integrity of the cap i.e. risk of the erection of structures on the capped area	The Auditor considers that the monitoring of the cap and the detailed controls are adequate to ensure the long term integrity of the cap with regard to the erection of structures. Importantly the EMP notes that where there is likely to be significant impacts e.g. removal of the cap over a wide area (more than trenching) that a Site Auditor should review the works. The EMP also notes that future Development Applications for buildings and/or service trenches to be constructed at the site should consider the potential ingress and accumulation of explosive gases and if necessary (depending on the scope of the proposed works) ensure appropriate gas mitigation measures are implemented, where required.
Long-term minimisation of the potential for leachate formation and/or volatilisation and/or off-site migration.	The EMP addresses the off-site migration of gasses through the monitoring of wells in accordance with the EPA Waste Group landfill license surrender conditions. Mitigation measures may be required in the future which would be managed by Council. The Auditor understands that the generation of leachate is managed through those responsible for the larger Tempe Site.
Occupational Health and Safety (OH&S)	An outline of OH&S was provided within the EMP.
Public notification mechanisms to ensure potential purchasers or other interested parties are aware of the restrictions i.e. Section 149, section 88B of Conveyancing Act 1919 or Transfer and compiled plan in accordance with the Real Property Regulation 2003.	The Site Audit Statement will be provided to Council and as a result will be noted on the Section 149 Certificate. A comment on the statement will recommend that the EMP is also noted on the Section 149 (2) certificate and the details of the cap are noted on the Section 149 (5). The EMP outlines how the Council Property Manager would ensure that the appropriate parties would be made aware of the EMP. The Auditor considers the measures to be appropriate.

Will be or can reasonably be made to be legally enforceable?	As indicated above the EMP and extent of capping will be noted on the Section 149 Certificate with a copy lodged with the Development and Environmental Services. An annual summary of gas monitoring is to be provided to EPA Waste group. Marrickville Council will inspect all works at the completion of works for approval. Development works (other than maintenance and minor construction works) that could breach or remove the cap would require a development application.

The license of surrender does not have requirements regarding cap maintenance and does not include ongoing gas monitoring requirements to address risk on site. The license surrender conditions relate to the off-site migration of landfill gas and relevant monitoring measures.

Based on assessment of results against relevant guidelines and consideration of the overall investigation and remediation, it is the Auditor's opinion that the site would present a low risk to human health if used for commercial/industrial purposes subject to maintenance of the capping and consideration of landfill gases in accordance with the EMP.

13 COMPLIANCE WITH REGULATORY GUIDELINES AND DIRECTIONS

Guidelines approved by the EPA under section 105 of the NSW *Contaminated Land Management Act 1997* are listed in Appendix C. The Auditor has used these guidelines.

The investigations reviewed were generally reported in accordance with the EPA (1997) *Guidelines for Consultants Reporting on Contaminated Sites*. The checklist included in that document has been completed and is kept on file. The EPA's *Checklist for Site Auditors using the EPA Guidelines for the NSW Site Auditor Scheme 1998* (December 1999) has also been completed and is kept on file.

The non-VENM stockpiles (85 m^3) and the excavated capping material (132 m^3) were disposed of to Alexandria Landfill. The material was classified in accordance with the NSW EPA (1999) Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes.

14 CONCLUSIONS AND RECOMMENDATIONS

Coffey (10 May 2006) conclude that 'the site is suitable for commercial/industrial uses subject to the implementation of a Site Environmental Management Plan (SEMP)'.

Based on the information presented in the Coffey reports and observations made on site, and following the Decision Process for Assessing Urban Redevelopment Sites in EPA (1998) *Guidelines for the NSW Site Auditor Scheme*, the Auditor concludes that the site is suitable for the purposes of commercial/industrial landuses subject to compliance with the following environmental management plan:

- 'Tempe Lands, Site Environmental Management Plan For Areas 1A and 1B', dated 19 April 2006 by Tenix Projects.

Groundwater should not be abstracted for use.

The existence of the Site Audit Statement and Site Audit Report should be noted on a certificate issued under S.149 of the Environmental Planning and Assessment Act 1979 for the site.

15 OTHER RELEVANT INFORMATION

This Audit was requested by Marrickville Council for the purpose of assessing whether the land is suitable for commercial purposes, as contemplated in Section 47(1)(b)(iia) of the CLM Act. This audit report may not be suitable for other uses. Coffey included limitations in their reports. The audit must also be subject to those limitations. The Auditor has prepared this document in good faith, but is unable to provide certification outside of areas over which he had some control or is reasonably able to check.

It is not possible in a Site Audit Report to present all data which could be of interest to all readers of this report. Readers are referred to the referenced reports for further data. Users of this document should satisfy themselves concerning its application to, and where necessary seek expert advice in respect to, their situation.

APPENDIX A

ATTACHMENTS

ATTACHMENT 1: Tempe Lands Site Location

ATTACHMENT 2: Areas 1A and 1B Site Location

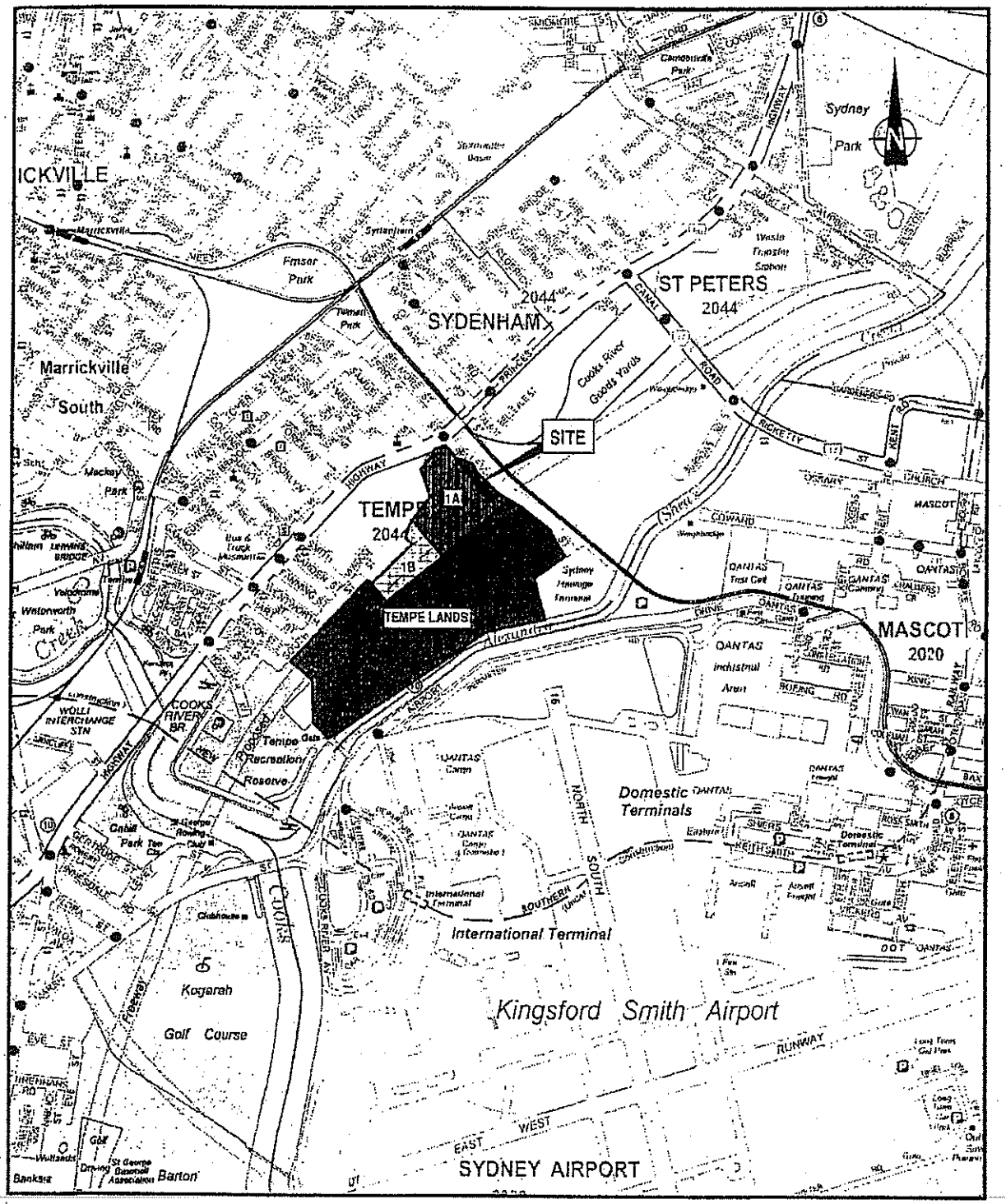
ATTACHMENT 3: Survey Plan

ATTACHMENT 4: Investigation Sample Locations

ATTACHMENT 5: Validation Sample Locations

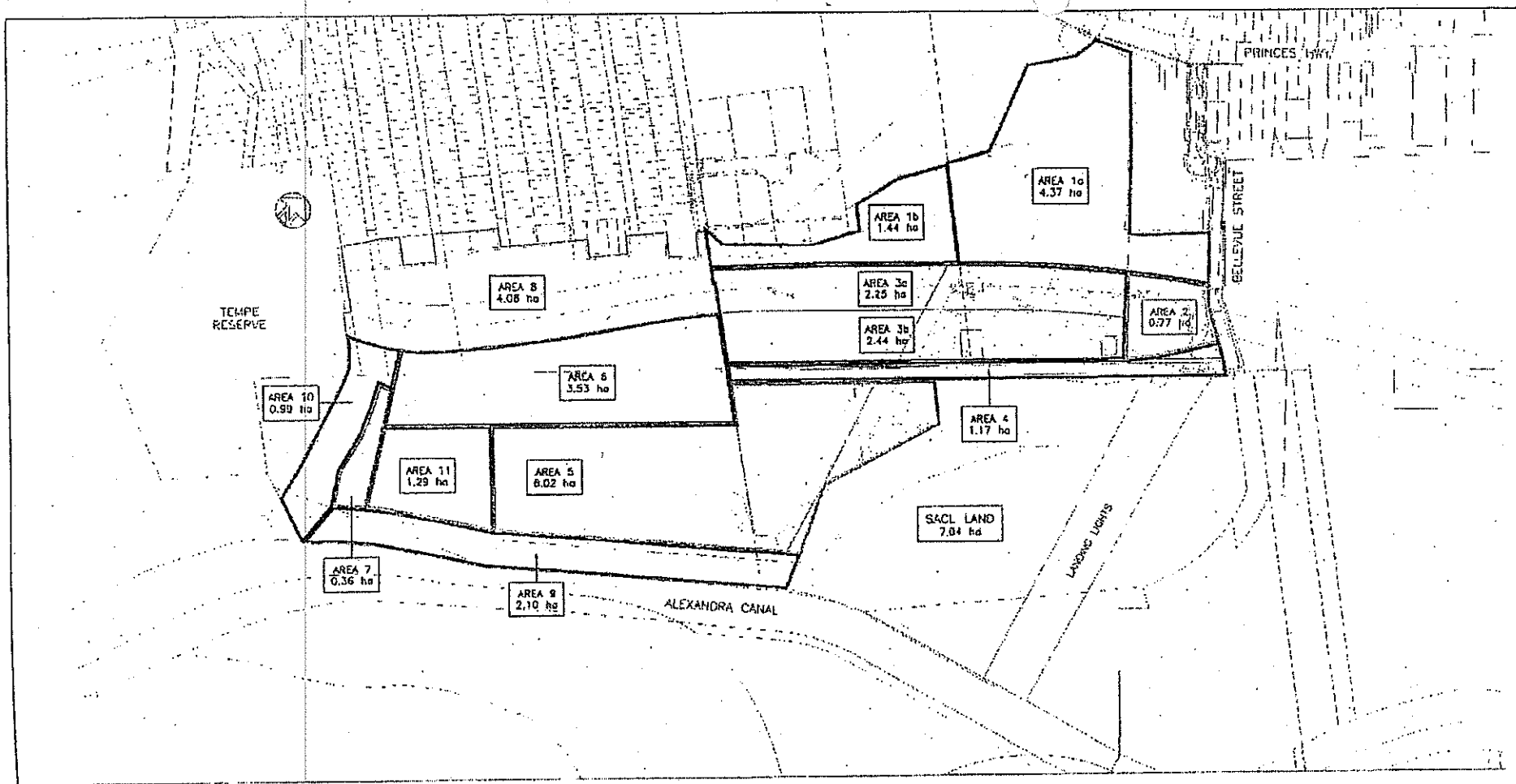
ATTACHMENT 6: Cap Extent

ATTACHMENT 1: Tempe Lands Site Location



Coffey

Coffey Geosciences Pty Ltd ACN056335516		Geotechnical I **Resources** I Environmental I **Technical** I Project Management	
Drawn	NK/SW	TEMPE LANDS REMEDIATION AND REDEVELOPMENT CAP VALIDATION REPORT AREAS 1A/1B SITE LOCATION PLAN – TEMPE LANDS	FIGURE 1
Approved	KM		
Date	12/10/2005		
Scale	1:20,000		Job no. S21090/7-EH



LEGEND

AREA 1a - BULKY GOODS RETAIL OR SIMILAR
AREA 1b - COMMERCIAL/RETAIL USE
AREA 2 - "
AREA 3a & 3b - INTERIM CONTAINER STORAGE USE (TEMPORARY)
AREA 4 - SWAMP ROAD (20m ROAD RESERVE)

AREA 5 - NEW CONTAINER YARD (TEMPORARY)
AREA 6 - OPEN SPACE (TEMPORARY GOLF DRIVING RANGE)
AREA 7 -
AREA 8 - STORMWATER WETLANDS
AREA 9 - CANAL SLOPE
AREA 10 - TEMPE RESERVE SLOPE
AREA 11 - OPEN SPACE

AREA SUMMARY
AREAS 1 - 11 = 30.77 ha
SACL LAND = 7.84 ha
TOTAL = 37.61 ha

NOTE
1. THESE AREAS ARE FOR DESIGN COORDINATION ONLY.
2. 20m ROAD RESERVE HAS BEEN USED FOR SWAMP ROAD, 10 EITHER SIDE OF EXISTING ROAD RESERVE

Coffey Geosciences Pty Ltd ACN 056 335 516	Geotechnical I Resources I Environmental I **Technical** I Project Management
Drawn	NK/SW
Approved	KM
Date	12/10/2005
Scale	AS SHOWN

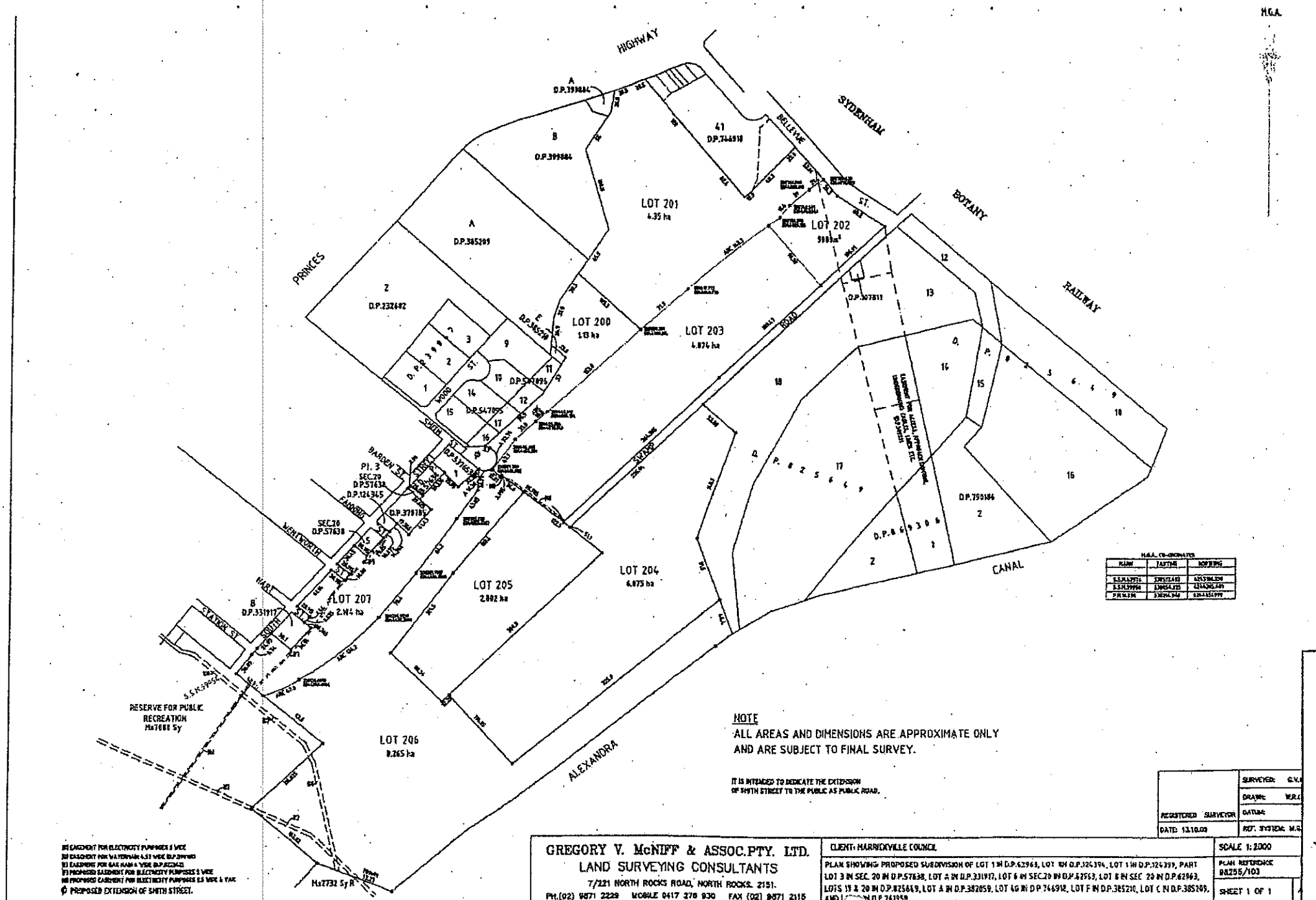
TEMPE LANDS REMEDIATION AND REDEVELOPMENT
CAP VALIDATION REPORT
AREAS 1A/1B
PROPOSED LANDUSE PLAN - TEMPE LANDS

FIGURE 2

Job no: S21090/7-EH

Coffey

ATTACHMENT 2: Areas 1A and 1B Site Location



M.G.A. CO-ORDINATES		
PLAN	EASTING	NORTHING
S.S.M.399776	330915.410	6257386.209
S.S.M.399994	330854.235	6256965.589
P.M.96.336	330956.948	6256854.999

GREGORY V. McNIFF & ASSOC.PTY. LTD.
LAND SURVEYING CONSULTANTS
7/221 NORTH ROCKS ROAD, NORTH ROCKS. 2151.
PH.(02) 9871 2229 MOBILE 0417 278 930 FAX (02) 9871 2115

CLIENT: MARRICKVILLE COUNCIL

PLAN SHOWING PROPOSED SUBDIVISION OF LOT 1 IN D.P.62963, LOT 101 IN D.P.1243194, LOT 1 IN D.P.1243197, PART LOT 3 IN SEC. 20 IN D.P.57638, LOT A IN D.P.331917, LOT 6 IN SEC.20 IN D.P.62953, LOT B IN SEC. 20 IN D.P.62963, LOTS 19 & 20 IN D.P.825649, LOT A IN D.P.382059, LOT 46 IN D.P.746918, LOT F IN D.P.385210, LOT C IN D.P.385209, AND [illegible] IN D.P.761958

SCALE 1:2000

PLAN REFERENCE 88255/103

SHEET 1 OF 1

REGISTERED SURVEYOR

DATE: 13.10.09

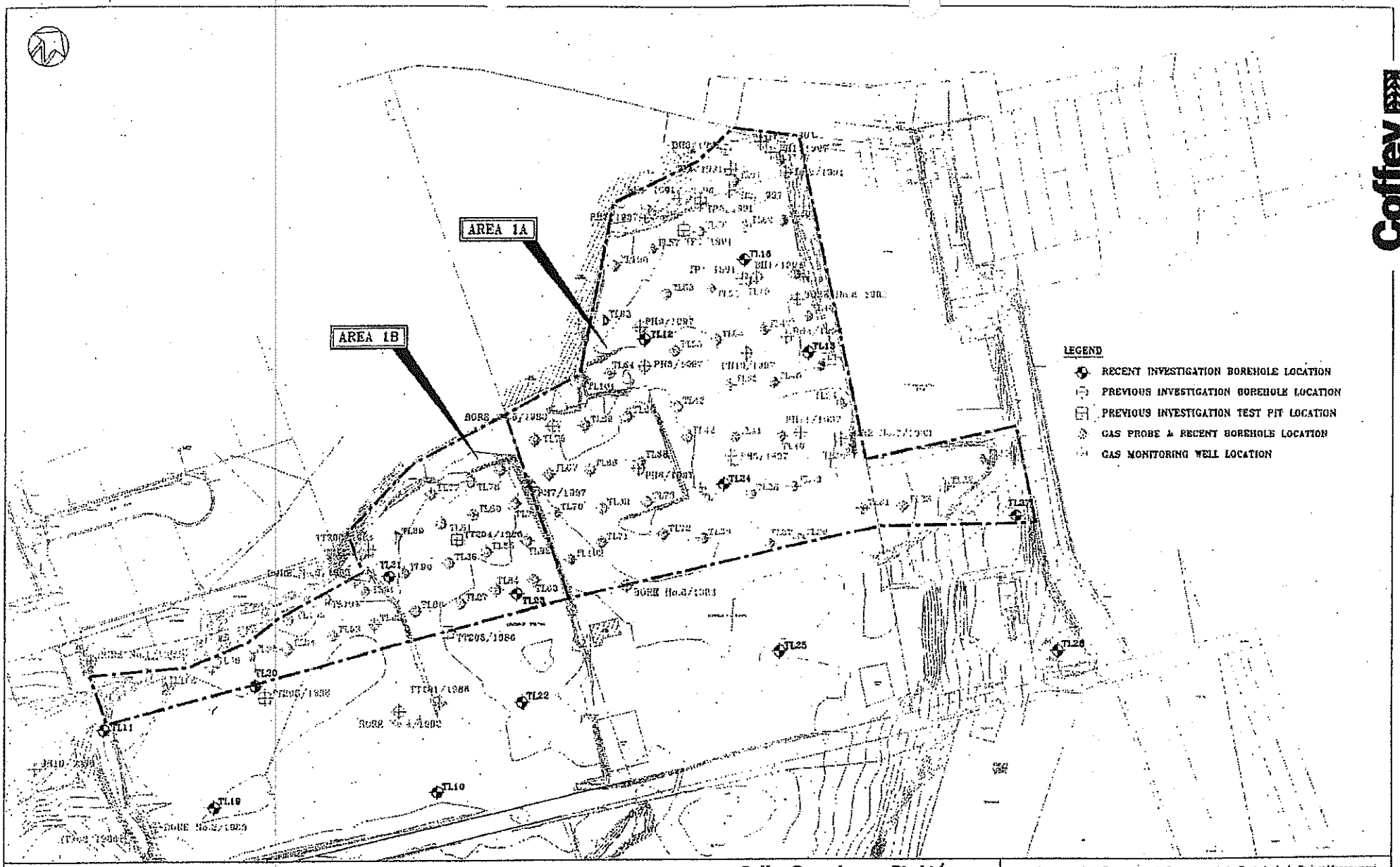
SURVEYED: G.V.

DRAWN: M.R.

DATUM:

ROT. SYSTEM: M.G.

ATTACHMENT 3: Survey Plan



Coffey Geosciences Pty Ltd ABN 93 139 462 521

Geotechnical | Resources | Environmental | Technical | Project Management

20 0 20 60 100
Scale (metres)

Revision	Description	Drawn	Approved	Date

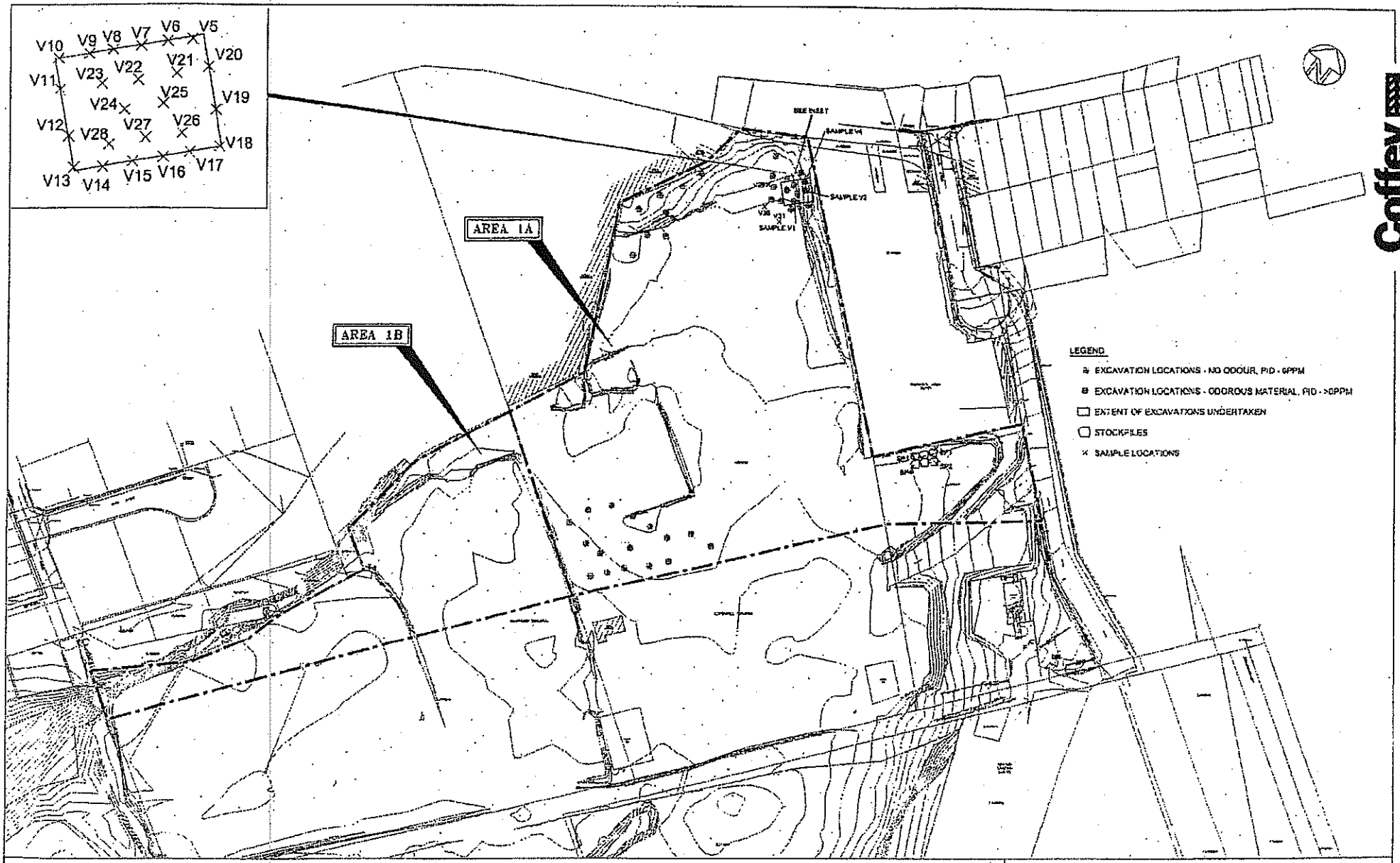
Drawn	NK/AW
Approved	SD/GJ
Date	22/6/04
Scale	1:2000

LSM PROJECTS
MARRICKVILLE COUNCIL
TEMPE LANDS REMEDIATION & DEVELOPMENT
REPORT ON FILL QUALITY/SOIL GAS INVESTIGATION AREAS 1A AND 1B
LOCATIONS OF BOREHOLES, TEST PITS AND GAS PROBES

FIGURE 3

Job No: S21890G-AJ

ATTACHMENT 4: Investigation Sample Locations



Coffey Geosciences Pty Ltd ACN 056 190 419 | Geotechnical | Resources | Environmental | Technical | Project Management

20 0 20 60 160
Scale (metres)

Revision	Description	Drawn	Approved	Date

Drawn	KM/AW
Approved	KM
Date	2/12/05
Scale	1:2000

TEMPE LANDS REMEDIATION & DEVELOPMENT
CAP VALIDATION REPORT
AREA 1A/1B
420 PITT STREET MATERIAL INVESTIGATION LOCATIONS

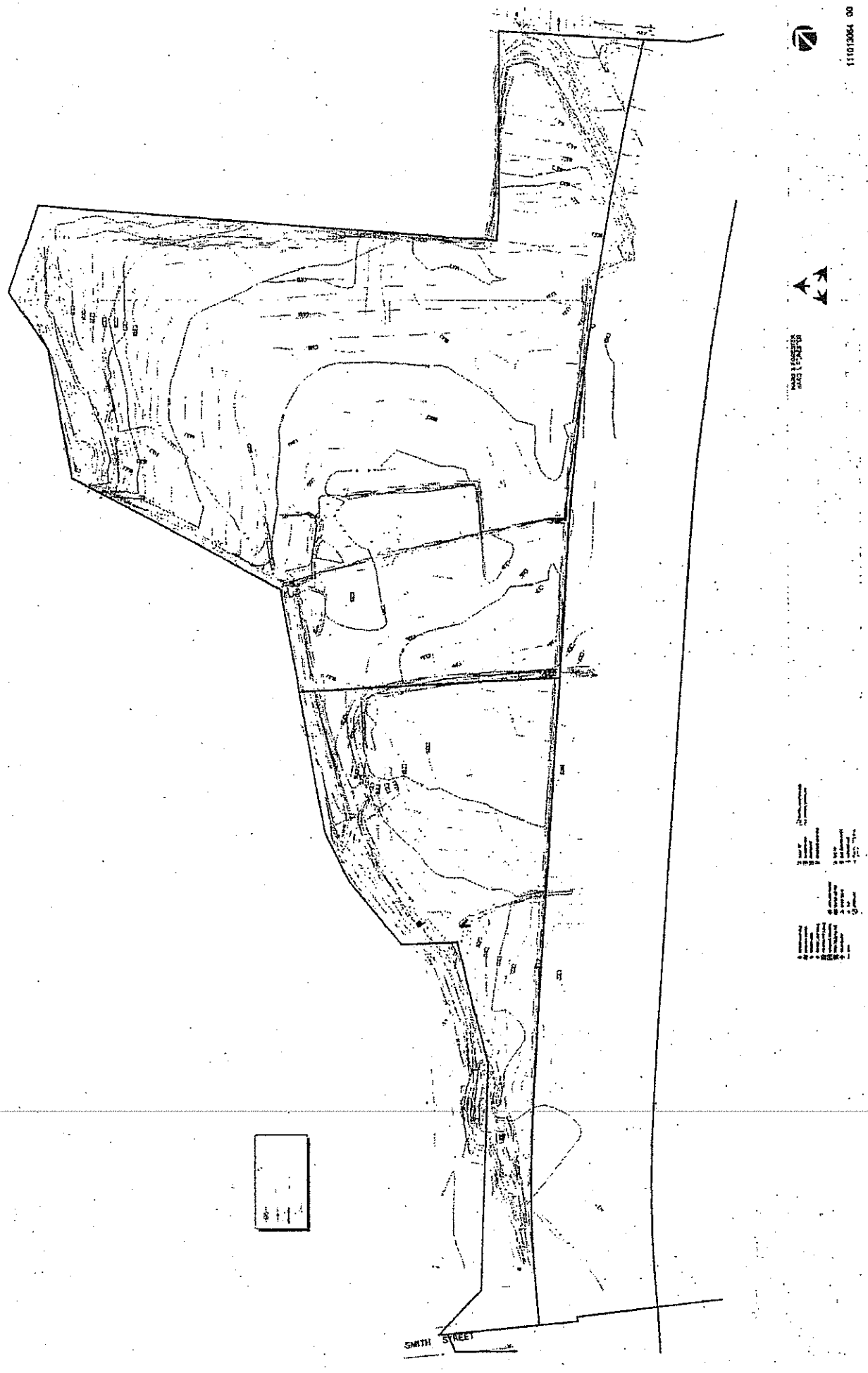
FIGURE 3

Job no: 6210907-EH

Coffey

ATTACHMENT 5: Validation Sample Locations

ATTACHMENT 6: Cap extent



APPENDIX B

EPA APPROVED GUIDELINES

Guidelines made or approved by the EPA under section 105 of the *Contaminated Land Management Act 1997*

(as of 4 July 2005)

Guidelines made by the EPA

- *Contaminated Sites: Guidelines for Assessing Service Station Sites*, December 1994
- *Contaminated Sites: Guidelines for the vertical mixing of soil on former broad-acre agricultural land*, January 1995.
- *Contaminated Sites: Sampling Design Guidelines*, September 1995
- *Contaminated Sites: Guidelines for Assessing Banana Plantation Sites*, October 1997
- *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites*, November 1997
- *Contaminated Sites: Guidelines for the NSW site auditor scheme*, June 1998
- *Contaminated Sites: Guidelines on Significant Risk of Harm from Contaminated Land and the Duty to Report*, April 1999.
- Contaminated Sites: Guidelines for Assessing Former Orchards and Market Gardens, June 2005

Note: All references in the EPA's contaminated sites guidelines to the Australian Water Quality Guidelines for Fresh and Marine Waters (ANZECC, November 1992) are replaced as of 6 September 2001 by references to the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ, October 2000), subject to the same terms.

Guidelines approved by the EPA

ANZECC publications

- *Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites*, published by Australian and New Zealand Environment and Conservation Council (ANZECC) and the National Health and Medical Research Council (NHMRC), January 1992
- *Australian Water Quality Guidelines for Fresh and Marine Waters*, Australian and New Zealand Environment and Conservation Council (ANZECC), November 1992, which are only approved for the purposes of contaminated site assessment, investigation, remediation and site auditing under the Contaminated Land Management Act (or other relevant legislation) commenced before September 2001
- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, Paper No 4, October 2000

EnHealth publications (formerly National Environmental Health Forum monographs)

- *Composite Sampling*, by Lock, W. H., National Environmental Health Forum Monographs, Soil Series No.3, 1996, SA Health Commission, Adelaide
- *Environmental Health Risk Assessment: Guidelines for assessing human health risks from environmental hazards*, Department of Health and Ageing and EnHealth Council, Commonwealth of Australia, June 2002

National Environment Protection Council publications

- *National Environment Protection (Assessment of Site Contamination) Measure 1999*

The Measure consists of a policy framework for the assessment of site contamination, Schedule A (Recommended General Process for the Assessment of Site Contamination) and Schedule B (Guidelines). Schedule B guidelines include:

B(1) *Guideline on Investigation Levels for Soil and Groundwater*
B(2) *Guideline on Data Collection, Sample Design and Reporting*
B(3) *Guideline on Laboratory Analysis of Potentially Contaminated Soils*
B(4) *Guideline on Health Risk Assessment Methodology*
B(5) *Guideline on Ecological Risk Assessment*
B(6) *Guideline on Risk Based Assessment of Groundwater Contamination*
B(7a) *Guideline on Health-Based Investigation Levels*
B(7b) *Guideline on Exposure Scenarios and Exposure Settings*
B(8) *Guideline on Community Consultation and Risk Communication*
B(9) *Guideline on Protection of Health and the Environment During the Assessment of Site Contamination*
B(10) *Guideline on Competencies & Acceptance of Environmental Auditors and Related Professionals*

Other documents

- *Guidelines for the Assessment and Clean Up of Cattle Tick Dip Sites for Residential Purposes*, NSW Agriculture and CMPS&F Environmental, February 1996

- *Australian Drinking Water Guidelines*, NHMRC & Agriculture and Resource Management Council of Australia and New Zealand, 1996

APPENDIX C

SOIL CRITERIA

Soil Investigation Levels for Urban Redevelopment Sites in NSW (EPA 1998)

Substance	Health-based investigation levels[1] (mg/kg)				
	Residential with gardens and accessible soil (home-grown produce contributing less than 10% fruit and vegetable intake; no poultry), including children's day-care centres, preschools and primary schools, or town houses or villas (NEHF A)	Residential with minimal access to soil including high-rise apartments and flats (NEHF D)	Parks, recreational open space, playing fields including secondary schools (NEHF E)	Commercial or industrial (NEHF F)	Provisional phytotoxicity-based investigation levels[4] for sandy loams pH 6-8 (mg/kg)
	Column 1	Column 2	Column 3	Column 4	Column 5
Aldrin + Dieldrin	10	40	20	50	-
Arsenic (total)	100	400	200	500	20
Benzo(a)pyrene	1	4	2	5	-
Beryllium	20	80	40	100	-
Cadmium	20	80	40	100	3
Chlordane	50	200	100	250	-
Chromium (III)[2]	12%	48%	24%	60%	400
Chromium (VI)	100	400	200	500	1
Copper	1000	4000	2000	5000	100
Cyanides (complex)	500	2000	1000	2500	-
DDT	200	800	400	1000	-
Heptachlor	10	40	20	50	-
Lead	300	1200	600	1500	600
Manganese	1500	6000	3000	7500	-
Methyl mercury	10	40	20	50	-
Mercury (inorganic)	15	60	30	75	1[5]
Nickel	600	2400	600	3000	60
PAHs (total)	20	80	40	100	-
PCBs (total)	10	40	20	50	-
Phenol[3]	8500	34000	17000	42500	70
Zinc	7000	28000	14000	35000	200

1 The limitations of health-based soil investigation levels are discussed in the National Environmental Health Forum's *Health-based Soil Investigations Levels*, National Environmental Health Forum (NEHF) Monographs, Soil Science No.1 (Imray & Langley, 1996).

2 Soil discolouration may occur at these concentrations.

3 Odours may occur at these concentrations.

4 the provisional phototoxicity-based investigation levels proposed in this document are single number criteria. Their use has significant limitations because phototoxicity depends on soil and species parameters in ways that are not fully understood. They are intended for use as a screening guide and may be assumed to apply to sandy loam soils, or soils of a closely similar texture, for pH 6-8.

5 Total mercury.

Threshold Concentration for Sensitive Land Use – Soils Guidelines for Assessing Service Station Site (NSW EPA 1994)

Contaminant	Threshold Concentration (mg/kg)
TPH (C_6-C_9)	65
TPH (C_{10}-C_{36})	1,000
Benzene	1
Toluene	1.4
Ethylbenzene	3.1
Xylenes (total)	14

APPENDIX D

ANALYTICAL LISTS AND METHODS

AMDEL ANALYTICAL METHODS

TARGET COMPOUNDS	AMDEL METHOD ID	METHODOLOGY SUMMARY
BTEX COMPOUNDS		
Benzene	E1010	Soil – Methanol Extraction USEPA 5035. GC/MS Purge & Trap
Toluene		
Ethylbenzene		
meta- & para-Xylene	E0010	Water - purge & trap
ortho-Xylene		
TOTAL PETROLEUM HYDROCARBONS		
C6-C9 Fraction	E1230	E1230 Soil – Methanol extraction USEPA 5035. Purge and trap GC/MS or GS/FID.
	E0230	E0230 Water – Neat or diluted. Purge and Trap GC/MS. USEPA8260B
C10-C14 Fraction	E1221	E1221 Soil – Acetone/dicholoromethane Sonication USEPA 3550B. GC/FID
C15-C28 Fraction		
C29-C36 Fraction	E0221	E0221 Water – dichloromethane extraction. GC/FID. USEPA8260B

LABMARK ANALYTICAL LIST AND METHODS

TARGET COMPOUNDS	LABMARK METHOD ID	METHODOLOGY SUMMARY
HEAVY METALS		
Arsenic	E022.1	E022.2: (Soil) 0.5g digested in nitric/ hydrochloric acid. Analysis by ICP-MS.
Cadmium		
Chromium		
Copper		
Nickel		
Lead		
Zinc		
POLYAROMATIC HYDROCARBONS		
Naphthalene	E007.2	E007.2: (Soil) 8-10g soil extracted with 20mL DCM/acetone (8:2), Analysis by GC/MS.
Acenaphthylene		
Acenaphthene		
Fluorene		
Phenanthrene		
Anthracene		
Fluoranthene		
Pyrene		
Benz(a)anthracene		
Chrysene		
Benzo(b)&(k)fluoranthene		
Benzo(a)pyrene		
Indeno(1.2.3-c,d)pyrene		
Dibenz(a,h)anthracene		
Benzo(g,h,i)perylene		
BTEX COMPOUNDS		
Benzene	E002.2	E002.2 Soil - 8-10g soil extracted with 20mL methanol.
Toulene		
Ethylbenzene		
meta- & para-Xylene		
ortho-Xylene		
TOTAL PETROLEUM HYDROCARBONS		
C6-C9 Fraction	E003.2	E003.2 Soil - 8-10g soil extracted with 20mL methanol. Analysis by P&T/GC/FID.
C10-C14 Fraction	E006.2	E006.2 Soil - 8-10g soil extracted with 20mL DCM/Acetone (8:2). Analysis by GC/FID.
C15-C28 Fraction		
C29-C36 Fraction		

ALS ANALYTICAL LISTS AND METHODS

TARGET COMPOUNDS	ALS METHOD ID	METHODOLOGY SUMMARY
HEAVY METALS		
Arsenic	EG-005T	EG-005T Soil: digest HCL - ICP/AES
Cadmium		
Chromium		
Copper		
Nickel		
Lead		
Zinc		
Mercury	EG-035T	EG-035T Soil: digest HCL - FIM-AAS
POLYNUCLEAR AROMATICS		
Naphthalene	EP-075B	EP-075B-SA Soil: Dichloromethane/ Acetone extraction. Capillary GC/MS
Fluorene		
Phenanthrene		
Anthracene		
Acenaphthylene		
Acenaphthene		
Fluoranthene		
Pyrene		
Benz(a)anthracene		
Chrysene		
Benzo(b) & (k)fluoranthene		
Benzo(a)pyrene		
Indeno(1.2.4-cd)pyrene		
Dibenzo(a.h)anthracene		
Benzo(g.h.I)perylene		
BTEX COMPOUNDS		
Benzene	EP-080	EP-080-SS Soil: Methanolic extraction P&T Followed by GC/MS
Toluene		
Chlorobenzene		
Ethylbenzene		
Meta- & para-Xylene		
Ortho-Xylene		
TOTAL PETROLEUM HYDROCARBONS		
C6-C9 Fraction	EP071	EP071-SS Soil: methanol extraction P&T followed by capillary GC/MS EP071-WS Water: methanol extraction P&T followed by GC/MS
C10-C14 Fraction	EP071	EP071-SS Soil: Dichloromethane/acetone Extraction. Capillary GC/FID detection
C15-C28 Fraction		
C29-C36 Fraction		

APPENDIX E

ENVIRONMENTAL MANAGEMENT PLAN

TEMPE LANDS
SITE ENVIRONMENTAL MANAGEMENT PLAN
FOR AREAS 1A AND 1B

Prepared for:

MARRICKVILLE COUNCIL

Prepared by:
Tenix Projects Pty Ltd
Level 5, 88 Walker Street
North Sydney NSW 2060

Document Number	509TR004	Revision	04	Date:	19/04/06

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	Signed:			Tenix Projects Pty Ltd
	Date:	19/04/06		

CHANGE CONTROL SHEET

This sheet is to be completed by the document author.

Revision No.	Revision Date	Brief Outline of Change/s (Page, section, figure, table)	Approval Reference
00	10/02/06	First Draft, issued for comments	
01	14/02/06	Section 6 converted to flowchart, references updated. Issued for review	
02	16/02/06	Incorporated comments from Coffey Geosciences.	
03	31/03/06	Revised to cover areas 1A and 1B only and include comments from Site Auditor	
04	19/04/06	Incorporate Coffey Geosciences comments	

TABLE OF CONTENTS

1 INTRODUCTION

1.1 Scope of the SEMP

This Site Environmental Management Plan (SEMP) has been prepared to assist Marrickville Council with the maintenance and management of part of the remediated former landfill site at Tempe Lands. It defines the ongoing management and monitoring aspects of the site cap and gas monitoring provided for human health protection.

In Section 2 of this plan definitions are given for the terms used in this plan. Section 3 describes the Tempe Lands site and the remediation works that have been undertaken.

The responsibilities of key persons and parties are defined in section 4. A monitoring programme is defined in section 5 with controls for future works defined in section 6.

Finally the requirements for periodic review and references are presented in sections 7 and 8 respectively.

For management of the remaining areas of the Tempe Lands site please refer to the separate SEMP prepared for those areas (Document 509TR005 prepared by Tenix Projects)

1.2 Objectives

The objectives of this SEMP are to:

1. Implement a monitoring program for the ongoing maintenance of site controls designed to minimise access to contaminated material by site users and environmental impacts;
2. Implement a monitoring program for the ongoing maintenance of site controls constructed to minimise the offsite migration landfill gas through the cap and across the site boundary (if required); and
3. Implement controls on future development and maintenance work

For areas 1A and 1B of the Tempe Lands site.

2 DEFINITIONS

The following definitions are used in this plan.

Term	Definition
Adjacent Land Users	Persons or parties that own, lease or utilise property adjacent to the Tempe Lands site
Contractor	A suitably experienced contractor appointed by Marrickville Council to undertake site maintenance works or construction works requiring excavations within the Tempe Lands site. This may include Marrickville Council's own maintenance staff if appointed to this role.
EPA	Environment Protection Authority – Part of the New South Wales Department of Environment and Conservation. The EPA are the regulatory authority in relation to contaminated land and the close out conditions for the former landfill license.
Director Technical Services	Marrickville Council's appointed Director of Technical Services or their nominated representative. The Director Technical Services has overall responsibility for the SEMP and implementation of it's requirements.
Inert material	Fill material classified as Inert Waste in accordance with the NSW EPA (1999) *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non- Liquid Wastes* or other relevant NSW legislation, regulations and guidelines in effect at the time.
Manager Property	Marrickville Council's appointed Manager Property or their nominated representative. OR The appointed site manager if the ownership of the land transfers from Council to another party.
RAP	Remediation Action Plan – A plan prepared by a suitably qualified contaminated land consultant prior to remediation and reviewed by the NSW EPA Accredited Site Auditor defining the remediation works to be undertaken

Term	Definition
Site Auditor	A person accredited by the NSW DEC as a Site Auditor under the provisions of the Contaminated Land Management Act (1997).
The Plan	The Site Environmental Management Plan as defined in this document
Validation report	A report prepared by a suitable consultant summarising the remediation works that have been undertaken and reviewing their implementation against the RAP or other document which defines the agreed standard and required end result.
VENM	Soil/rock classified as Virgin Excavated Natural Material in accordance with the NSW EPA (1999) *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non- Liquid Wastes* or other relevant NSW legislation, regulations and guidelines in effect at the time.

3 THE SITE

3.1 Site Identification and Surrounding Land use

The Tempe Lands site is irregular in shape, covers an area of approximately 40 hectares and is bounded by the Alexandra Canal to the south-east, Sydney Airport Corporation Limited land to the east, Bellevue Street to the north, an industrial area to the north west, a residential area backing off South Street to the west and Tempe Recreational Reserve to the south-west.

This plan relates specifically to Marrickville Council owned property in the Northern Corner of the site that was formally a container storage yard and is referred to as Areas 1A and 1B. It comprises

The Site is currently owned by Marrickville Council and comprises Lot F of DP385210, Lots A & C of DP385209 and Lot 40 of DP746918. The site boundaries and owners of respective areas are shown on Figure 1.

3.2 Summary of Site History of Tempe Lands

During the last century the major land use of the Tempe Lands site has been as a rubbish tip. Spear Brick, Pipe and Tile Works Ltd initially operated part of the site as a shale quarry (a brick pit). Following completion of quarrying activities, the site was used by firstly, St Peters Council and then Marrickville Council as a landfill forming Tempe Tip from about 1910. During this time it is understood that the site received waste from a wide range of sources including domestic refuse, industrial waste, liquids and hazardous waste and general council waste.

Council dumping at the site ceased in the mid 1970s, with the most recent use prior to remediation being an empty shipping container storage facility. Based on the observations made during previous environmental and geotechnical investigations, the site appears to have been filled since the 1970s with substantial quantities of construction waste including sandstone, concrete, bricks and steel, and some minor areas of garbage refuse.

The surface topography within the site area was significantly modified by the clay/shale extraction, major filling operations with placement of up to 17m depth of filling over the last 90 years.

The following section summarises the remediation works undertaken within areas 1A and 1B during 2004 and 2005.

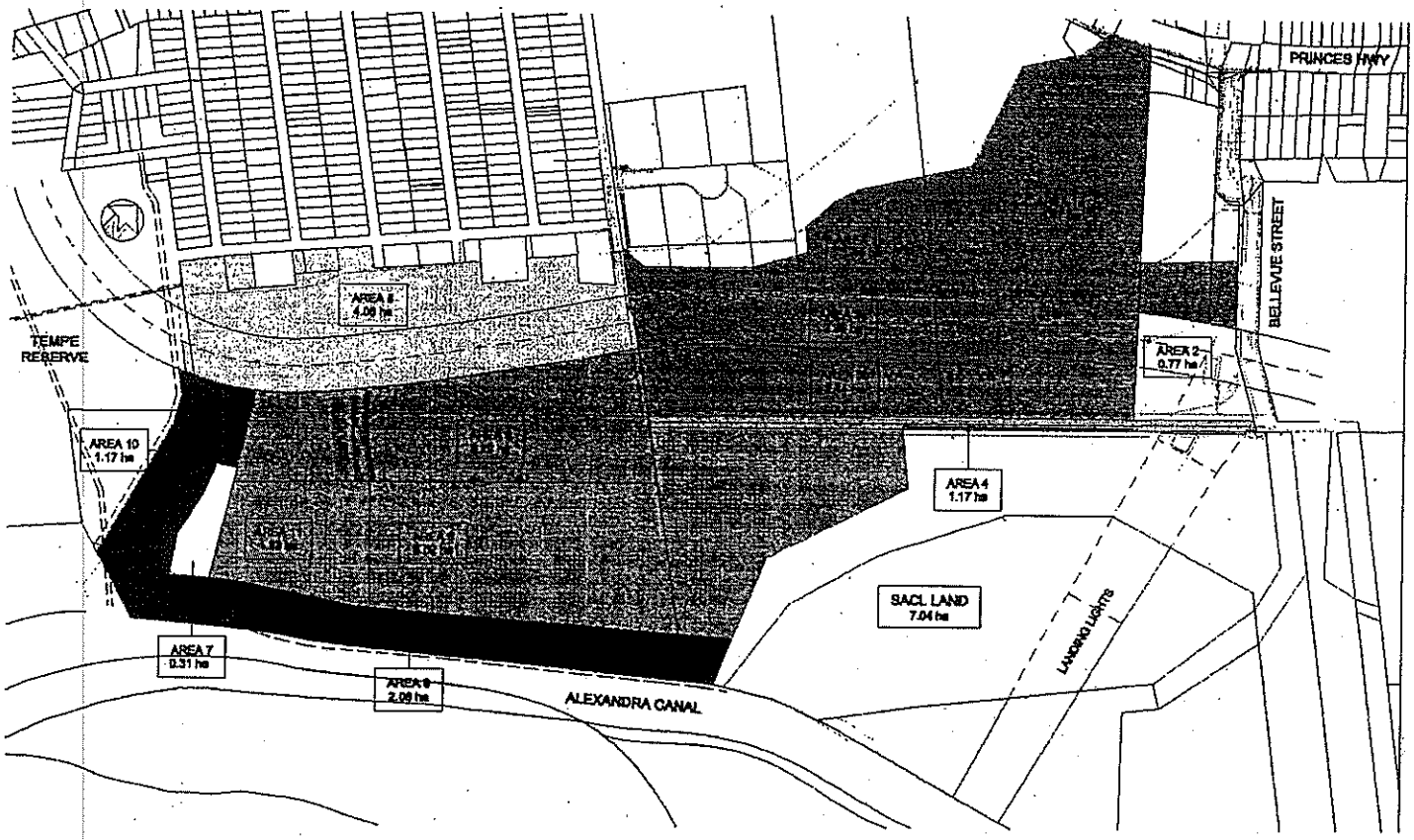


Figure 1 – Site plan showing extent of Tempe Lands site and definition of area numbers
NOTE: This SEMP only covers area 1A/1B shown in red

3.3 Summary of Site Remediation

The site was remediated during 2004 and 2005 in order to make it suitable for uses associated with the proposed zonings of light industrial and bulky goods retail. This involved provision of surface capping to provide a barrier between contaminated material and end users for human health protection.

In areas 1A and 1B, the existing material was graded and covered by a minimum of 500mm of VENM material extending to the property boundaries and including the batters on the Western edge. The finished surface was graded to promote surface water drainage to defined drainage lines and hydroseeding with a grass mix was applied to areas sensitive to erosion.

At the time of preparation of this SEMP, ongoing landfill gas investigations being undertaken at the site have indicated that the offsite migration of landfill gases is occurring at unacceptable levels and that offsite gas migration mitigation measures are likely to be required. While the presence of landfill gases beneath the site and the offsite migration of site originated landfill gas is not considered to affect the usability of the site (subject to appropriate consideration of landfill gases during future development works), remediation measures may be required to be undertaken in order to mitigate the offsite migration of landfill gas.

3.4 Validation and auditing

The remediation works undertaken at the site to date (i.e.capping) have been the subject of external validation and subsequent review by the Site Auditor who will prepare a Site Audit Statement following review of the relevant site validation documents. For further information please refer to the validation reports and site audit statements as detailed in the references at the end of this plan.

The design and construction of measures to mitigate the offsite migration of landfill gas, as well as the assessment of appropriate ongoing maintenance/monitoring requirements, will be undertaken in consultation with the NSW EPA.

3.5 Contamination issues and mitigation

The landfill and contaminated material present on the site presents a risk to human health due to the presence of:

- Elevated levels of heavy metals, Poly Aromatic Hydrocarbons, Total Petroleum Hydrocarbons, and asbestos fragments
- Landfill gas, primarily in Stage 1[1] filling

[1] The investigations undertaken prior to the remediation works indicated that the generalised subsurface profile at the site comprises two stages of filling. These two stages include Stage 1 (earlier filling) comprising miscellaneous waste with putrescible waste, and Stage 2 filling (later filling) comprising construction rubble and spoil but no significant putreciable waste or wastes that could generate landfill gas. When the VENM cap is taken into account, the depth from top of cap (ground level) to the top of Stage 2 fill is expected to be in the order of 1m to 3m.

Exposure of site users could occur through one or all of the following pathways if the cap is breached or landfill gas ingresses buildings:

Table 3.5 : Pathways for exposure of site users to contamination

Exposure Pathway	Staff	Public	Visitors	Maintenance Work	Construction Work
Inhalation of contaminated dust	No potential exposure*	No potential exposure*	No potential exposure*	Potential Exposure	Potential Exposure
Dermal contact with contaminated soil or groundwater	No potential exposure*	No potential exposure*	No potential exposure*	Potential Exposure	Potential Exposure
Ingestion of contaminated soil or groundwater	No potential exposure*	No potential exposure*	No potential exposure*	Potential Exposure	Potential Exposure
Explosion or asphyxiation due to landfill gas in confined spaces (e.g. buildings and service pits)	No potential exposure+	No potential exposure+	No potential exposure+	Potential Exposure	Potential Exposure

*While the cap remains in place

+ While the cap in place or appropriate gas mitigation measures are provided.

The presence of the cap and gas mitigation measures (where applicable), and monitoring of their condition influence how these issues are mitigated. For details of the Occupational Health and Safety requirements for maintenance and construction workers please refer to section 6.

It is noted that if any mitigation measures implemented at the site in association with the management of landfill gases are damaged or breached, this may provide a potential exposure pathways for site users.

4 RESPONSIBILITIES

This section summarises the responsibilities in bullet point form of the various persons and parties which have a responsibility under this Site Environmental Management Plan. The responsibilities have been allocated according to the party best placed to manage the requirements.

Responsibilities may be delegated where appropriate but this should be done in writing and notified to all affected parties.

Table 4 : Responsibilities of key parties

Party	Responsibility of party
Director Technical Services (During Council ownership of the property)	• Overall responsibility for implementation of The Plan • Will review the effectiveness of The Plan on an annual basis and following any incident or other issues that suggest that The Plan is ineffective. • Will record any review of The Plan undertaken and ensure that any improvements deemed necessary are implemented and communicated to the relevant parties. • Will ensure that sufficient resources are allocated to comply with the requirements of the plan.
Manager Property (During Council ownership of the property)	• Will ensure that Contractors or Marrickville Council Maintenance units engaged to undertake any works are notified of the existence of The Plan and its implications. • Will monitor landfill gas and the integrity of the cap in accordance with a monitoring program and undertake any remedial measures where problems are identified. • Will ensure that existing and potential leaseholders are aware of the existence of The Plan and it's implications by: - Providing a copy of the SEMP to each tenant - Referring to the SEMP in lease agreements - Briefing tenants on the requirements of the SEMP and of any changes to the SEMP - Require tenants to nominate a representative with whom to liaise on issues relating to the SEMP • Will ensure that the existence of the SEMP and extent of capping are noted on the Section 149 certificate and a copy is lodged with the Development and Environmental services (planning services) department. This will ensure that the requirements of the SEMP are passed on to potential purchasers and that the Monitoring Services department undertake an auditing role following any transfer of ownership • Will ensure that potential purchasers of property on the site are aware of remediation works that have been undertaken and the need to develop their own ongoing management measures to ensure that the integrity of the cap is not compromised. • Will ensure that any issues that suggest that the plan is ineffective are reported to the Director Technical Services immediately.

Table 4 : Responsibilities of key parties

Party	Responsibility of party
Contractors and Marrickville Council Maintenance Units (During Council ownership of the property)	• Will ensure that risks have been assessed and suitable control measures implemented where the site cap, leachate containment system, leachate treatment system or irrigation system will be disturbed • Will ensure that all operatives are briefed on the presence of contaminated material below the cap, the potential for landfill gas in trenches, excavations or enclosed voids, and the use of treated leachate for irrigation on the site. • Will promptly notify any defects, ongoing trends or other issues of concern to the Marrickville Council representative that has engaged them.
Leaseholders/ Tenants	• Each tenant will appoint a representative and will notify the Manager Property if that person changes • Will ensure that no works that will disturb the cap are undertaken without approval from the Marrickville Council Manager Property • Will promptly report any issues of concern to the Manager Property
Marrickville Council Development and Environmental Services Department	• Following any transfer of ownership from Council to a third party will ensure that the requirements of the plan are being implemented through inspection by the Monitoring Services team.

The responsibility of implementing mitigation measures, as well as any ongoing maintenance and monitoring requirements associated with the offsite migration of landfill gas will rest with Council regardless of land ownership.

5 MONITORING PROGRAMME

This section defines the monitoring program for the Tempe Lands site to ensure that the measures put in place during the remediation works continue to prevent a risk of harm to health or the environment.

If the monitoring program determines that works are required to rectify deficiencies then this must be undertaken promptly in order to avoid potential harm to the environment or human health.

The Manager Property is responsible for ensuring that monitoring is undertaken in accordance with this program, or a revised regime approved by the Director Technical Services.

Table 5: Monitoring program for council managed property

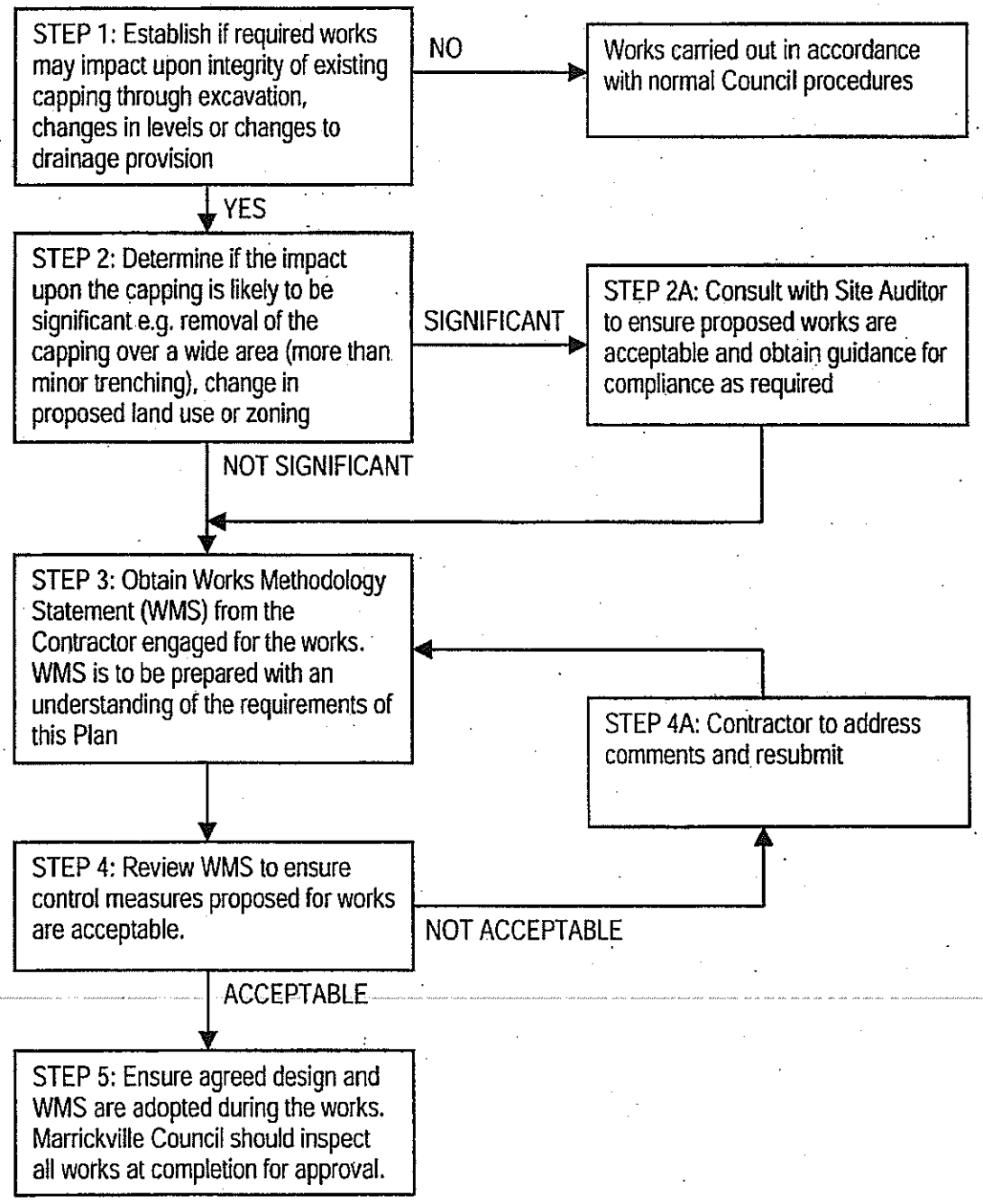
Area description	Inspection Frequency	Monitoring to be undertaken
Area 1A/1B Former container yard	3 monthly	• Visual inspection of the cap integrity, surface drainage lines and drainage conduits with respect to erosion or other impacts that may expose contaminated material. • The inspection should be recorded using a form developed for this purpose and in particular details of any deficiencies and action taken to resolve. The records should be retained by the Manager Property for inspection as required during reviews of the plans implementation.
Gas monitoring to wells in areas 1A/1B and off site	3 monthly	In accordance with EPA Waste Group landfill licence surrender conditions: • Quarterly gas sampling from gas wells by a suitably qualified consultant including provision of a summary report to monitor gas levels and if off site migration is occurring. • Notification of the EPA within 24 Hrs where methane levels exceed 1.25% • Annual summary report to be provided to EPA Waste group by 31 January each year for the previous year.
Gas monitoring from gas monitoring wells installed within Areas 1A/1B (see attached Figure)	As required	At present, the ongoing gas monitoring requirements are being managed through licence surrender conditions set by the NSW EPA for the surrender of the environment protection licence for the Tempe Waste Depot (only a portion of the Site), and through ongoing correspondence. The ongoing landfill gas monitoring requirements at the Site are likely to be subject to change depending on the results of the monitoring and subsequent liaison with the NSW EPA. In addition, some maintenance requirements may be applicable following the implementation of offsite gas migration mitigation measures. Council is to maintain a register which provides a summary of the current gas monitoring and gas mitigation system maintenance requirements,

		and to ensure that the necessary works are undertaken. The gas monitoring is to be undertaken by a suitably qualified and experienced environmental consultant in accordance with the methodology presented in Coffey Geosciences (2005) document titled *Remediation And Development Of Tempe Lands, Reference 164csa001, Landfill Gas Monitoring Plan, Tempe, NSW* (ref: S21090/7-DG, 13 January 2005), a copy of which is attached. Coffey's (2005)

6 CONTROL OF FUTURE WORKS

Future maintenance or construction works on the Tempe Lands site need to be assessed for their potential to compromise the remediation measures. Any proposed works should be assessed by the Council's Manager Property using the following flow chart.

6.1 Assessment process



6.2 Contaminated material management

Any landfill or contaminated material exposed by excavation during construction and maintenance works must be properly managed during the works in order to prevent:

- Contamination of the capping surface (use plastic sheeting or similar as a separation layer)
- Dispersion by wind blown dust (use covers or maintain the material in a damp condition)
- Dispersion by stormwater run off (proper management of stormwater)
- Tracking of material offsite by vehicles (cleaning of vehicle wheels)
- Release of contaminated groundwater to the environment (control of pumping and drainage routes and disposal via licensed means)

Upon completion of the works the cap must be reinstated with VENM of at least the same thickness and compaction level used for the original capping. Source documentation for the VENM must be provided to the Council's Manager Property including assessment by a suitable consultant that the material can be classified as VENM. The material should also be inspected at point of delivery for any signs of contamination such as odours, staining, presence of rubbish etc. The VENM materials should also be validated by a consultant and documentation provided to the Manager Property.

Any excavated contaminated material must be properly disposed of. This could be achieved by reburial under a suitable cap or disposal offsite following waste classification. Documentation should be provided by the Contractor to the Manager Property for any material disposed of off site including:

- Material testing
- Waste tracking (consignment authorisation and waste transport certificate)

6.3 Outline OH&S requirements for construction and maintenance works

During construction and maintenance works it is likely that workers may come in to contact with contaminated material or locations with the potential presence of landfill gas. The following outline Occupational Health and Safety requirements are presented for guidance. It is essential that a risk assessment and work methodology statement are prepared and reviewed to assess the specific risks associated with the proposed works.

6.3.1 Site Control

For the purpose of containing and controlling the potential transfer of contaminated soil the following zones are to be set up and maintained:

Work Zone - this is the area in which excavations will be carried out which is to be flagged off and only people who are necessary for undertaking the work should enter this zone;

Decontamination Zone - at the completion of the work, all equipment used for excavation, storage and transfer of contaminated soil is to be cleaned within the Work Zone. Decontamination of equipment shall comprise physical removal using scraping or brushing of all soil adhering to excavation implements, wheelbarrows etc. on to the piles of soil which are to be removed.

6.3.2 Site Hazards

Potential hazards exist through dermal contact, ingestion or inhalation of soil or groundwater that may contain chemical contamination or asbestos fragments.

Recommended personal protective equipment (PPE) may include disposable coveralls, gloves and suitably rated dust masks. Glasses may be required if there is a risk of soil or groundwater contact with the eyes.

Hazards associated with landfill gas include explosive atmospheres or asphyxiation due to gas displacing oxygen within confined spaces such as trenches, stormwater drains, pits and enclosed sub floor areas within buildings. A calibrated gas monitor should therefore be used by suitably trained personnel prior to entry and during works in locations where landfill gas may collect. The gas monitor should be capable of providing alarms for explosive atmospheres or low oxygen situations.

6.3.3 Safe Work Practises

The following safe work practises should be employed as a minimum during any excavation work that penetrates the cap:

- Eating, drinking, chewing gum or tobacco, smoking or any practice that involves hand to mouth transfer increases the probability of ingestion of foreign matter into the body. Personnel should ensure that hands are thoroughly washed before eating, drinking or smoking with an appropriate sanitizer (such as Chlorohexidine);
- Any clothing that becomes dirty from on site work should be disposed of or washed separately from other clothes
- Smoking should be avoided due to the potential for presence of landfill gas
- Monitoring for explosive or low oxygen atmospheres in confined excavations.

6.4 Contingency plan

It is important that the Contractor has in place contingency plans should any environmental issues arise during the works. Potential issues and contingency measures are provided in table 6.4 below.

Table 6.4 : Contingency plan

Environmental Issue	Issue	Possible Control Measures
Discovery of Unknown Materials	Exposing potentially contaminated soil and/or material of unknown origin and composition to the surface	If potentially contaminated material is encountered during excavation (eg. drums, petroleum or other strong odours, etc), cease work and immediately notify Marrickville Council. In addition, expert advice should be sought from a suitably qualified environmental consultant as to the nature and origin of the material and potential health impacts associated with it.
Air quality	Excessive dust generated during excavation	Keep loose surfaces, stockpiles moist or covered. Monitor dust levels visually. Cease dust generating activities if excessive dust is being generated and during periods of high wind.
	Odours develop during penetration of the cap	If significant odours are encountered, work will temporarily be ceased while the odour dissipates to acceptable levels. If the odour continues to be present during excavation works, the work is to be stopped and the source and nature of the odour investigated by a suitably qualified environmental consultant.
Waste	Potentially contaminated excess soil generated for disposal	Avoid over excavation and reuse/retain soil within site where appropriate. If offsite disposal is required, undertake a waste classification in accordance with the NSW DEC guidelines. Then remove the excess soil and dispose of appropriately to a licensed landfill.
	Potentially contaminated groundwater generated for disposal due to dewatering of excavation	Where practicable, avoid excavations below the groundwater table and avoid dewatering. If offsite disposal is required, the water should be tested and disposed of appropriately to a licensed facility in accordance with the NSW DEC guidelines or a trade waste permit can be made with Sydney Water to dispose via pumping to a sewer system.

Table 6.4 : Contingency plan

Environmental Issue	Issue	Possible Control Measures
Spillages and leakages	Spillages of oils and lubricants from machinery contaminating the cap	Refuel plant and equipment using mobile tanker in a designated area away from landscaped areas, excavation or 'open cap' areas or near joins in the concrete pavement. Make available "spill kits" on site. Clean up spillage as soon as practicable using spill kits.
Soil and water	Erosion of disturbed capped areas, loose soils, stockpiles	Contractor to prepare a Soil and Water Management Plan prior to commencement of work to detail site-specific soil and water control measures and provide this to Council. Install sediment fencing down-slope of the excavation / construction areas and upslope of the wetlands or canal. Install silt traps or straw bails around stormwater drains/grates. Excavated materials resulted from small-scaled short term excavations should be temporarily placed adjacent to the excavations where appropriate. Where excavated materials could not be backfilled within one day, the excavated materials should be placed in designated stockpiles.
	Tracking of dirt from site onto public roads	Check vehicle tyres and clean off excess mud/soil and install a grate at entrance/exit. Install a wheel wash bay at entrance/exit if necessary.
Explosive Gases	Ingress of explosive gases into buildings and/or service pits constructed at the Site.	Future Development Applications for buildings and/or service trenches to be constructed at the Site should consider the potential ingress and accumulation of explosive gases, and if necessary (depending on the scope of the proposed works), ensure appropriate gas mitigation measures are implemented, where required.

7 PERIODIC REVIEW

This plan will be subject to periodic review by the Director Technical Services in order to verify that the controls and monitoring that are in place are adequate.

Periodic reviews should be undertaken on an annual basis or following the discovery of any major issues. The review should address the following items:

- Any issues identified by the ongoing monitoring
- The frequency and type of future monitoring
- The responsibilities of the parties involved and delegation of these

The outcome of the review and any actions should be recorded and notified to the relevant parties.

8 REFERENCES

The following reference documents have been used in the production of The Plan and should be consulted for more detailed understanding of the requirements contained herein as required.

Reference	Comments
Site Audit Report – Validation of remediation of areas 1A and 1B To be provided February 2006	Site Auditors review and sign off of validation conducted on the construction of capping to areas 1A and 1B of the Tempe Lands site.
Approval of the surrender of licence 6665 Notice No. 1041812, EPA, 09 December 2004	Conditions imposed by the EPA upon Marrickville Council during surrender of the POEO licence formally in place for landfill operation at Tempe Lands. In particular requirements for gas monitoring, leachate disposal and control of future development.
Coffey Geosciences (2005) *Remediation And Development Of Tempe Lands, Reference 164csa001, Landfill Gas Monitoring Plan, Tempe, NSW* (ref: S21090/7-DG, 13 January 2005).	Provides framework for gas monitoring and investigation works to be undertaken at the Site. It is noted that the document also applies to other areas within Tempe Lands apart from Areas 1A/1B.
Coffey Geosciences (2006) *Tempe Lands Remediation, Cap Validation Report, Areas 1A/1B* (ref: S21090/7 EH, April 2006)	Validation of capping works undertaken to area 1A/ 1B prepared for review by the NSW EPA Accredited Site Auditor (Contaminated Lands).Currently awaiting Site Audit Statement.
As built operation and maintenance records 509TR003, Tenix Projects, 14 February 2006	Combined resource including all as built operation and maintenance records from the Tempe Lands remediation and development works