Appendix H:
Advice on EIS

Cardno

Advice on EIS

Blocks 9 & 11 Section 8, Fyshwick

50518021

Prepared for

Capital Recycling Solutions (CRS)

February 2018

Cardno
Shaping the Future

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1	06/11/17	EIS	Tara Lu	Gerard Zafico
2	21/11/17	Update Based on Client Comments	Tara Lu	Gerard Zafico
3	08/02/18	Update Site Diagram and Amendments based on Final EIS Scoping Document	Tara Lu	Gerard Zafico

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Appendices

2 Glossary of Terms

AADT	Annual Average Daily Traffic
APC	Air Pollution Control
CRS	Capital Recycling Solutions
DA	Development Application
DBYD	Dial Before You Dig
EIS	Environmental Impact Statement
EPSDD	Environment, Planning and Sustainable Development Directorate
GHD	GHD Pty Ltd
JHR	John Holland Rail
MDF	Main Distribution Frame
MRF	Material Recovery Facility
NCC	National Construction Code
RFT	Rail Freight Transport
TCCS	Transport Canberra and City Services
VPD	Vehicles Per Day
VPH	Vehicles Per Hour
WAE	Work as Executed
WSA	Water Services Association

3 Introduction

3.1 Background

Cardno has been engaged by Capital Recycling Solutions (CRS) to provide engineering advice on the nominated scope of EIS for the proposed development on Blocks 9 & 11, Section 8, Fyshwick. This report is intended to present preliminary investigations, feasibility studies and technical references for required subjects in the EIS scoping document to form a part of the Client's final EIS submission.

The Client has advised that there will be two separate EIS, and this report will focus on the requirements of development and operation of the Material Recovery Facility (MRF) and the Rail Freight Transport (RFT) Facility.

3.2 Project Appreciation

Blocks 9 and 11 Section 8 Fyshwick are located south of the existing railway with an existing driveway access from Ipswich Street from the west through Block 9 and another access to Lithgow Street to the east through block 11. The unoccupied industrial site is approximately 32,660m^2 combined and zoned as IZ2 (Industrial Mixed Use).

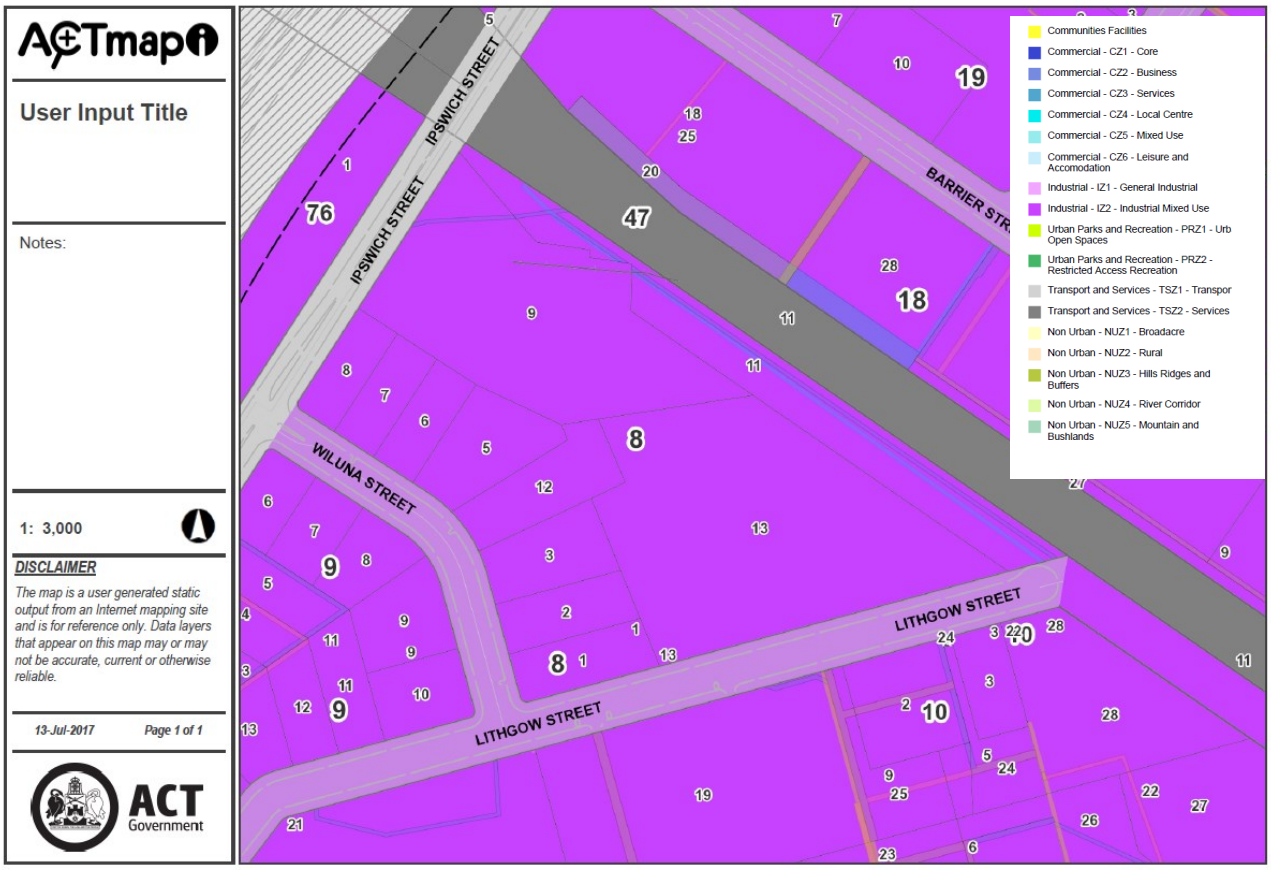


Figure 3-1 Development Zoning of the Site (Source: ACTmapi)

Block 9 Section 8 Fyshwick was previously used by Shell Co as a fuel depot. CRS purchased the block late 2015 with the view of redeveloping the site as a new rail terminal for the ACT. The NSW government then committed $1 million to support redevelopment of the rail siding and track upgrade. The 7,275 m^2 MRF building, along with supporting facilities including a carpark hardstand, an administration office and a research centre will be constructed east of Block 9. The major vehicular access and weighbridges will be along the southern boundary of this block.

It is understood that CRS intends to rehabilitate this block noting that it is currently used for dumping and crossing the railway; both of which are prohibited activities. A hardstand and siding structure will be

constructed (consent received, DA NO: 201630668). CRS have negotiated with John Holland Rail (JHR), the licensee of Block 11 Section 47, with regard to a third party access agreement to enable access from Block 11 Section 8 to the rail line. The conceptual site plan (Appendix A) is provided below.

Figure 3-2 Conceptual Site Plan (Source: CRS)

3.4 Nominated EIS Scope

As provided by Cardno Fee Proposal (48950518-0001) dated 25 Aug 2017, advice will be provided on the flowing EIS Scope.

EIS Scoping Document Reference	Subject	Activities
8.1.3	Utilities	• Describe the existing utilities located on the subject site • Describe any new utilities, removal or realignments required as a result of this development • Include details of intended connection to the existing network/s and proposed substation location, capacity and type • Provide evidence of an agreement, between the proponent and the relevant utility, endorsing feedback into the existing network • Provide details of non-domestic sewerage (liquid trade waste) that will be present during operation and whether the network is capable of processing the waste and/or other methods for disposal • Discuss existing stormwater pipe capacity y and whether the proposal will impact on the existing or future demand • Provide details of any proposed changes to the current network/s
8.1.7	Water Quality and Hydrology	• Describe the current groundwater quality and measures proposed to maintain and monitor groundwater quality • Describe the present and potential water uses and users within the affected catchment of the proposal. Include a map of the catchment • Outline the potential impacts on Jerrabomberra Creek and wetlands • Provide information on stormwater management both during construction and during operation including any on site detention and water quality protection measures
8.1.11	Hazards and Risks (Flooding)	• Describe the potential for flooding hazard and risk associated with the construction and operation of the project.
13.4	Information Sources	Cardno shall include (as a minimum) the following information in the reporting: • Source of all background information used in the assumptions, calculation and conclusions of the report; • Date of source information • Risks associated with the source information
13.5	Study Team	Cardno shall include in the reporting the details and qualifications of the project team involved in the design and investigations.
13.6	Specialist Studies	Cardno shall include specialist investigations and reports (if any) in the reporting.
Attachment A6	TCCS	• Condition assessment of the existing pipes, particularly the existing 1350dia steel reinforced concrete pipe. • Crosscheck alignment and pipe sizes of existing stormwater pipes noting that these assets are to be maintained for the future augmentation as described in the GHD reports *"South Fyshwick Stormwater Augmentation"* and *"South Fyshwick Stormwater Options"*. • Traffic analysis of the development's traffic generation and its impact on the external road network • Investigate the requirements to facilitate heavy vehicle access to the site. Truck turning movements to be submitted as part of the reporting. • Loading and parking arrangements to be investigated and details provided to TCCS for approval.

Table 3-1 Nominate EIS Scope from the EPSDD Scoping Document (Source: Cardno / EPSDD)

4 EIS 8.1.3 Utilities

4.1 Existing Utilities

A summary of the existing services information has been completed for the subject site. The detailed analysis includes Dial Before You Dig (DBYD) enquiries, WAE records, correspondence with service authorities, visual site inspections and preliminary survey provided by the Client.

The details, dimensions and alignments of existing services included in this report are indicative only, detailed survey / potholing (as required) will be conducted prior to detailed design. All services must be accurately located on site prior to any development proceeding.

All relevant and original correspondence with service authorities including DBYD information is included within **Appendix B and C**.

4.1.1 Electrical

The following electrical and streetlighting infrastructure information was compiled from DBYD information and advice from ActewAGL.

- There is an existing service connection to the subject site from POL70636 on Ipswich St;
- A high voltage Substation (S2617) is outside of the site entrance southwest of Block 9. Overhead high voltage power line run across Ipswich St from POL70636, and continues along the western verge of Ipswich St;
- Streetlighting infrastructure is present along both sides of Ipswich St.

4.1.2 Gas

The following natural gas supply information was compiled from DBYD information and advice from Jemena.

- There is no gas connection to the subject site;
- A DN100 high-pressure steel gas main is present within the western verge of Ipswich St;
- At this stage, a gas service connection is not required by the proposed facilities.

4.1.3 Telecommunications Services

The following telecommunication infrastructure information has been compiled from DBYD information and advice from Telecommunication service providers.

Telstra

- There is no currently active Telstra connection to the subject site, however, a telephone system and service cables are present in the existing office;
- Telstra conduits and manholes are present on both sides of Ipswich St near the proposed office building;
- There are also some abandoned underground service cables for the former Shell Co oil depot.

Others

- There are no existing NBN or TransACT services in the vicinity of the subject site;
- A Nextgen cable is available on the western verge of Ipswich St, in Telstra conduit.

4.1.5 Water Supply

The existing sewer service information has been compiled from DBYD and advice from ICON Water.

- There is an existing DN150 watermain leading into Block 9 off Ipswich St; a fire hydrant is present at the end of this watermain, within the subject site; a pressure enquiry was provided by ICON Water as below;

DN150 Ipswich Street (hydrant on service to block)	Fyshwick Section 8 Block 9 Hydrant (Elevation = 563.5 m)
Max Static Pressure (m)	91.5
Min Pr @ Peak Demand	54.72
Min Pr @ Peak Demand + 10 L/s (m)	53.19
Min Pr @ Peak Demand + 20 L/s (m)	51.39
Min Pr @ Peak Demand + 30 L/s (m)	49.41
Min Pr @ Peak Demand + 40 L/s (m)	47.07
Min Pr @ Peak Demand + 50 L/s (m)	44.55
Min Pr @ Peak Demand + 60 L/s (m)	41.76

Table 4-1 ICON Water Available Pressures (Source: ICON Water)

- The fire risk category for Light Industry is F4, requiring 60 L/s water flow at 10 m head from the network during peak demand, with 60 m hydrant spacing along the water main (ICON Water Supply and Sewerage Standards). The existing water supply network was indicated to have sufficient capacity for fire protection requirements by the subject site;
- A DN150 watermain is also present within Block 11 along the railway line. A relocation plan for this watermain is proposed in Section 4.2.4, along with approval in principle from ICON Water.

4.1.6 Sewer

The existing sewer service information has been compiled from DBYD information and advice from ICON Water.

- There is an existing DN100 sewer tie from subject site to the DN150 reticulated sewer main across Ipswich St.
- This reticulated main falls towards the south and into this DN300 main across Monaro Highway.

4.1.7 BP

BP infrastructure is identified on the opposite side of the railway corridor to the subject site. Although, the infrastructure is not directly impacted, the presence of these infrastructures may imply potential contamination near the subject site. A Site Audit Report completed by GHD has included details of potential contaminants and management plan attached at **Appendix C**.

4.2 Construction, Removal and Realignment of Utilities

Preliminary investigations on availability, capacity and constrains of utilities to service the subject site has been undertaken. The proposed construction, removal or realignment works on utilities are detailed in this section. Advice, comments or approvals in principle have been received from relevant service authorities.

4.2.1 Electrical

The electrical maximum demand is estimated by the proposed Gross Floor Areas (GFA) of the development and average power consumptions calculated in accordance with AS/NZS 3000 : 2007 Table C3 – Maximum Demand-Energy Demand Method for Non-Domestic Installations, as shown in the table below. The electrical maximum demand of installed electrical special plant and equipment is estimated based on Equipment List provided by CRS).

Description	Area (m^2)	Demand (VA/m^2)	Load (kVA)
Open Carpark (lighting)	1200	5	6.0
Office (lighting, power and air conditioning)	660	90	59.4
Production (lighting and power)	8382	20	167.6
Production Special Equipment (see attached)	NA	NA	1760.0
Allowance for Future Demand (Equipment)	NA	NA	200.0
Total Maximum Demand			2193 kVA

Table 4-2 Maximum Operational Power Demand Estimation (Source : Ahern Consulting Engineers)

ActewAGL has provided preliminary advice that the site required a new twin padmount substation with main switchboards. The civil engineering design will proposed a suitable location and sufficient space and clearance for the substation according to ActewAGL Standard Drawing 4943-03.

A Network Connection Application is to be submitted to ActewAGL following the completion of detailed design, including the following information:

- Site plan showing twin pad mount substation location with main switchboards;
- Details of consumer mains from each MSB;
- Electrical maximum demand calculations as per AS/NZS 3000:2007;
- List of equipment and technical data sheets;
- Operation details of the development.

4.2.2 Gas

Preliminary advice form Jemena (Appendix B - Dated 2017-09-27) suggests that Gas service can be connected to this site from the 100mm high-pressure steel gas main in the western verge of Ipswich Street.

However, a gas service connection is not likely to be required by the proposed facilities.

4.2.3 Telstra

Preliminary advice from Telstra (Appendix B - Dated 2017-09-28) suggests that network connection can be provided via existing Telstra manhole at Ipswich Street, as per Figure 4-1.

Telstra requires exclusive access to 1 X P100 lead in conduit near property boundary to connect to the Telstra network access point. Lead in conduit should provide access to MDF at the administration building. Provision of lead in conduit is the developer's responsibility. Telstra will install suitable size lead in cable(s) to the MDF at the administration building.

The civil consultant and contractor will liaise with Telstra Network Integrity team during detailed design and construction to ensure all existing Telstra asset affected by development are protected.

Figure 4-1 Proposed Telstra Network Access Point (Source: Telstra)

4.2.4 Water Supply

There is a DN150 watermain through Block 11, which needs to be relocated to allow the proposed development. Previous Cardno site investigation on water and stormwater (**Appendix D**) had proposed conceptual relocation and connection plan, as per Figure 4-2.

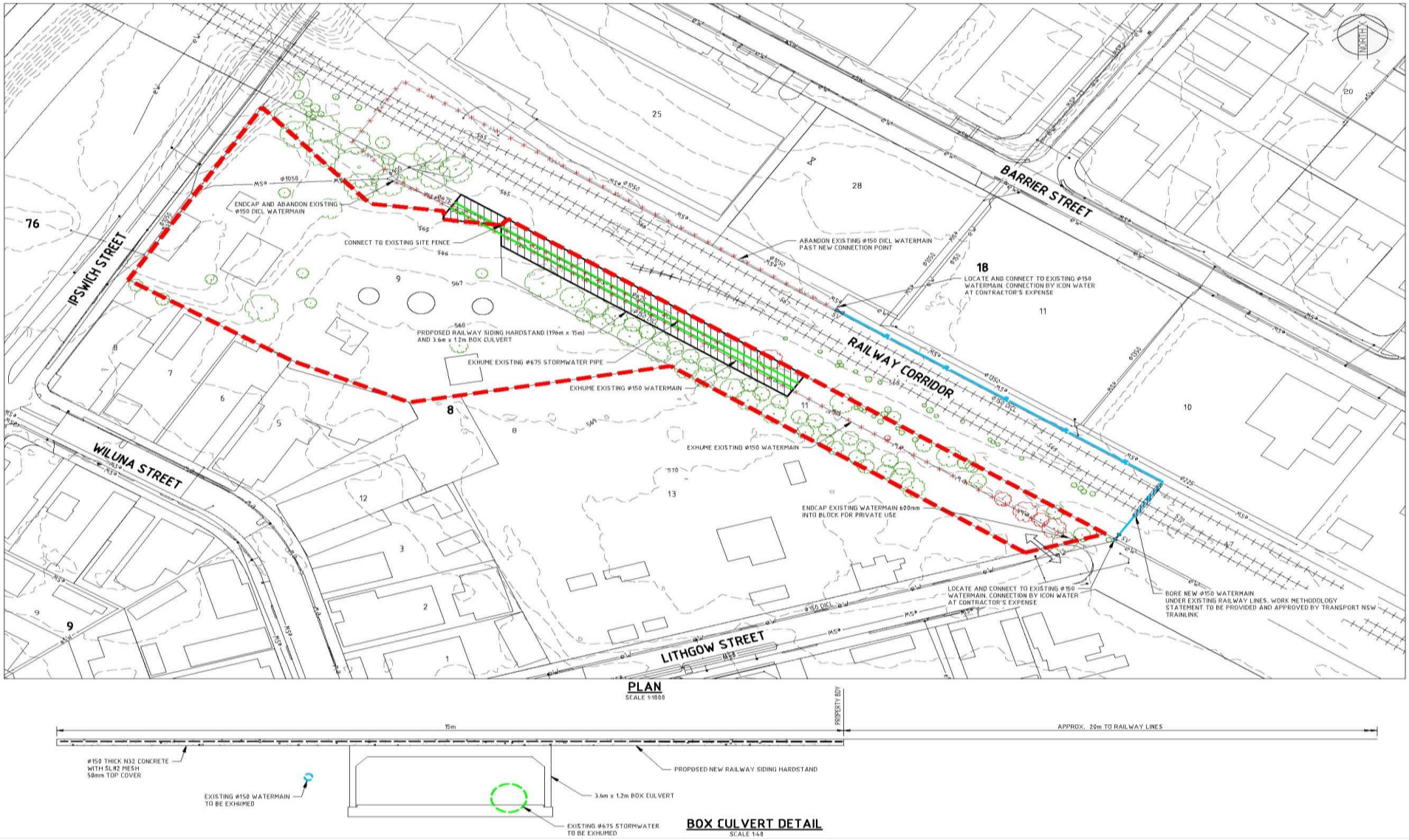


Figure 4-2 Cardno Site Investigation - Water and Stormwater Plan (Source: Cardno)

Further to previous advice, ICON Water has provided approval in principle and additional comments / requirements (Appendix B – Dated 2017-10-19) as the following:

- Any Watermain proposed to be disconnected is to be exhumed. If under significant trees then it can be grout filled, capped and left abandoned;
- The DN150 watermain is to be installed via open trench method, unless there is an engineering constraint hindering open trenching the service, and then alternative construction method such as boring can be permitted. All construction work shall be undertaken in accordance with WSS-012 requirements.
- Watermain from Barrier Street to be a straight line into new connection point, as opposed to the 'U bend' as shown on the conceptual plan (Figure 4-2), to minimise length and therefore maintenance (points of failure);
- A detailed External Services Plan will be required for ICON's formal approval. Detail of connection methodology for the Lithgow Street connection point shall be included in the ESP;
- Approval for the removal of the existing fire hydrants is to be sorted from the Fire Department; alternative fire hydrants may be required along the new watermain;
- The site layout shall comply with minimum clearance requirements from driveways, letter boxes and other relevant structures for the existing water service/tie (off Ipswich Street), in accordance with WSS-012.
- An updated conceptual plan for the proposed watermain relocation works is provided to comply with these comments / requirements.

All comments / requirements will be addressed and complied with during detailed design and construction.

Furthermore, the estimated water demand (operational) is 2.5 L/s based on occupancy yield and minimum sanitary facilities set out by NCC Volume 1, and facility demand according to AS3500.1 Table 3.2.1. Water pressure enquiry for the existing DN150 watermain into Block 9 indicate sufficient capacity of supply.

Water Demand Calculation			
Office GFA (m2)	637.5		
Production GFA (m2)	8167.5		
Person per Area (Factory)	50		
Design Occupancy	180		
Fixtures Required	Closet Pans	Urinals	Washbasins
Number of Fixtures Required	11	4	6
Flow Rate (L/s)	0.1	0.1	0.12
Subtotal Demand (L/s)	1.1	0.4	0.72
Demand (L/s)			2.22

Table 4-3 Water Demand Estimation (Source: Cardno)

4.2.6 Sewer

The sewerage load from operational facilities (admin and offices) is estimated to be 2.1 L/s using method set out by *WSA 02—2014−3.1 - Appendix B and C*.

Sewer Load from Offices	
Category	Local Commercial
EP per Hectare	75
Gross Hectare	0.8805
Equivalent Population (EP)	70
Load (L/s)	2.1

Table 4-4 Operational Sewer Load Estimation (Source: Cardno)

Based on information provided by the CRS Leachate Strategy, approximately 2000 L of leachate may be generated per day due to liquid within the waste and from washdown water. A 20,000 L leachate tank is proposed to be installed below the MRF shed to capture all leachate from the tipping floor, around the compactors and any washdown water. Leachate will be injected into the containers during the compacting process from the leachate tank. On average, 200 L of liquid can be contained in each container. The CRS MRF is anticipated to compact and dispatch at least 28 containers daily, equating to 5,600 L of leachate disposing capacity per day, which is in excess of the daily leachate generate.

Furthermore, an overflow outlet can also be designed for the unlikely emergency event of surcharging from the leachate tank to discharge into the ICON sewerage network. A Liquid Trade Waste Application (attached to the correspondence) can be submitted to ICON for approval to connect to the existing sewer tie.

ICON Water has confirmed (Appendix B – Dated 2017-10-19) capacity of the existing sewer network and service tie for an additional combine load of 7.5 L/s.

4.2.7 Stormwater

The Fyshwick South Stormwater Augmentation by TCCS (**Appendix E**) and previous site investigation conducted by Cardno (**Appendix D**) has determined the following stormwater upgrade work relevant to the subject site.

- A box culvert will be constructed under the proposed hardstand to connect to the existing channel within the northern boundary of the subject site;
- A section of existing stormwater pipe across the north western corner is to be made redundant;
- An existing culvert is present outside of the southwestern corner, draining the flow to Jerrabomberra Creek.

Based on the conceptual layout of the site and level contours, Block 11 and the open space on the northwestern Conner can drain to the channel via overland flows. Kerb & Gutter may be construction along the southern boundary to direct stormwater to the southwestern corner, an inlet sump and stormwater pipe may be construction under the pavement outside of the office and driveway to connect to the culvert under Ipswich St. The carpark may be constructed with Kerb & Gutter and an inlet sump at the southwestern corner to allow connection to the culvert as well. Conceptual Drainage Diagram provided as below.

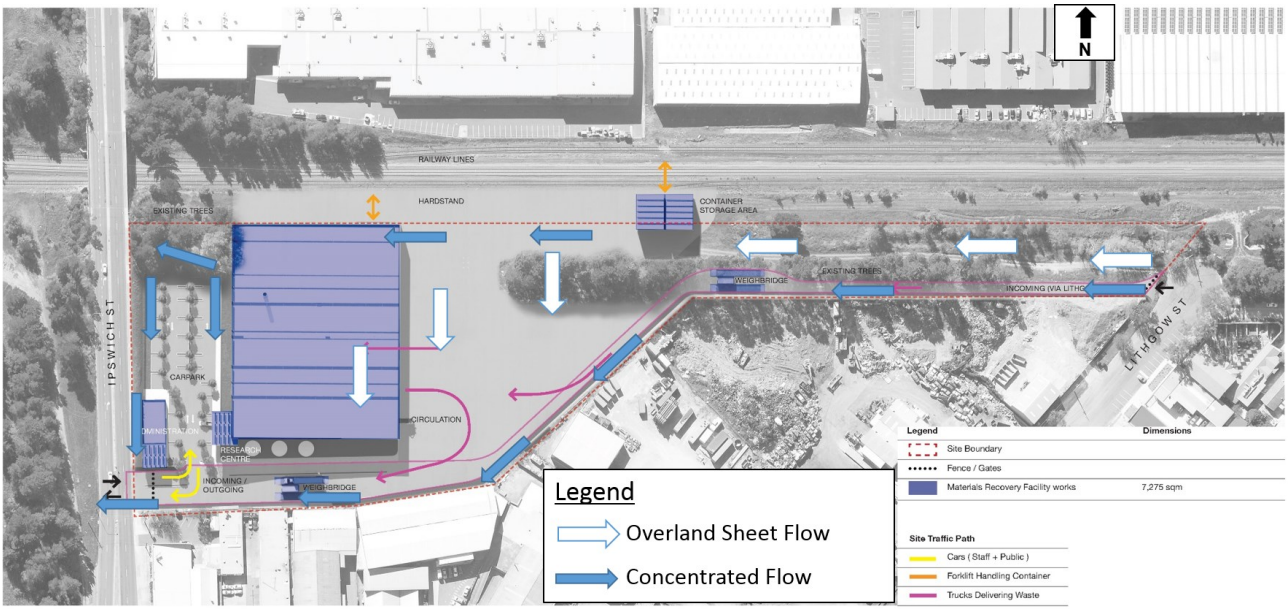


Figure 4-3 Conceptual Drainage Diagram (Source: Cardno / CRS)

The above drainage strategy has been modelled by DRAINS program and been proven to have capacity to contain 1 in 100 flood level. The proposed stormwater upgrades are in-line with The Fyshwick South Stormwater Augmentation Plan; and improve the overall stormwater network capacity in the area.

5 8.1.4 Materials and Waste

Cardno has engaged Arcadis to conduct specialist studies on hazardous materials and waste management. Reports are provided within:

- Appendix F HAZMAT Report;
- Appendix G Waste Repot.

6 8.1.7 Water Quality and Hydrology

Up on review of a number of investigation and groundwater monitoring programs, the Site Audit Report by GHD (**Appendix C**) has demonstrated that the site is suitable for continued commercial / industrial land use, in accordance with the requirements of the *Environmental Protection Act 1997*.

The auditor (GHD) has further noted that construction of building over areas of significant impact shall be appropriately controlled by a site or environmental management plan. The EMP drafted by ECS that was reviewed by this audit will be further reviewed and updated prior to construction.

Cardno has engaged Arcadis to conduct an independent literature review on the GHD Site Audit Report and provided further advice on water quality and hydrology with in Appendix H.

7 8.1.11 Hazards and Risks (Flooding)

The drainage strategy described in Section 4.2.7 is modelled by DRAINS. Simulation results suggest existing and / or proposed infrastructure by Fyshwick South Stormwater Augmentation can effectively contain 1 in 100 years flood level. Therefore, the risk of flood is low providing stormwater infrastructure upgrade is designed and constructed as a part of the development.

8 13.4 Information Sources

Cardno has reviewed, risk-assessed and registered all external information and sources referenced in the report. An Information Source Register is provided as below.

Date	REF NO	Title	Source	Ref in EIS	Risk
30/06/2017	Section 3.4	EIS Scoping Document	EPSDD	General Scope	Low
25/08/2017	Section 3.4	Cardno Fee Proposal (48950518-0001)	Cardno	General Scope	Low
22/11/2017	Section 4.2.1	Copy of Equipment for MRF Modified	CRS	Electrical Demand	Low
2/11/2017	Appendix A	Conceptual Site Plan	CRS	General Scope	Low
15/09/2017	Appendix B	Dial Before You Dig	DBYD	8.1.3	Low
3/07/2017	Appendix C	Site Audit Report By GHD	GHD		Low
18/01/2017	Appendix D	Cardno Site Investigation Water and SW	Cardno	8.1.3	Low
22/03/2017	Appendix E	Fyshwick South Stormwater Augmentation	GHD / TCCS	8.1.3	Low
12/09/2017	Appendix F	HAZMAT Report	Arcidas	8.1.4	Low
27/10/2017	Appendix G	Waste Report	Arcidas	8.1.4	Low
16/11/2017	Appendix H	Water Quality and Hydrology Review	Arcidas	8.1.7	Low
3/11/2017	Appendix I	Team Qualifications	Cardno / Arcidas	13.5	Low
12/07/2017	Appendix J	Site Survey	LANDdata	A6	Low
28/09/2017	Appendix K	TCCS Traffic Data	TCCS	A6	Low
29/09/2017	Section 10	Traffic Generation Estimation	CRS	A6	Low

Table 8-1 Information Source Register

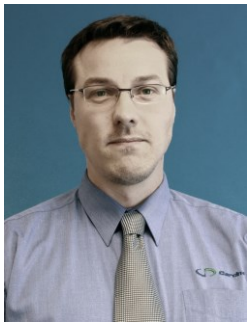
9 13.5 Study Team

Cardno has been involved in the successful delivery of numerous industrial and brownfields projects of varying sizes throughout Canberra and NSW.

Our expertise in design, documentation, construction and liaising with the ACT Government, local Councils and other relevant authorities means we can achieve an efficient approval process with the best outcomes for our clients.

Cardno's engineering team involved works in relation to the EIS, brings a wealth of expertise to the project in development approvals and masterplanning in an industrial estate setting. All nominated personnel have been involved in similar developments where attention to local authority requirements are of utmost importance to the successful delivery of the project.

The nominated team for the project is listed below outlining each's specific skill set and experience that demonstrates their capability in undertaking the design roles for the development. CV's of the personnel nominated to work on this development are attached at **Appendix I** for further information.

JOHN SAMOTY – SENIOR CIVIL ENGINEER, PRINCIPAL	
Qualifications	Bachelor Engineering (Civil)(Honours)
	John is a Chartered Professional Civil Engineer with 17 years' experience in geotechnical and pavement condition assessments, hydraulic services masterplanning and design, and pavement design. John has worked on a range of land development projects including: > Hume West Industrial Estate Stages 1 and 3 (Project Engineer) > Hume West Stage 2 > Gungahlin Town Centre East Roads > Coombs and Wright Residential Estates > Gungahlin Business Park John has been responsible for managing the detailed design and documentation of various residential, commercial and industrial subdivision projects across the ACT and NSW. These projects also included managing sub-consultants and dealing directly with the client and service authorities from concept and master planning through to completion. All of these projects were delivered within their tight timelines and budget constraints to a standard that exceeded the expectations of the client.
Involvement in the project	John will act as the Project Director for the duration of the project. He will coordinate all works to be undertaken on the project with Purdon Planning and Access Recycling to ensure all design and engineering intentions are achieved. John's vast wealth of experience in civil engineering and hydraulics design will be a key asset to the successful delivery of this project.

MANA NAGHSGHGAR– PROJECT CO-ORDINATOR	
Qualifications	Bachelor Degree in Project Management (Eng) Diploma of Project Management Diploma of Building & Construction
	Mana is a professional project manager with 6 years of experience. This has included providing project control and program management for a range of industries including oil and gas, utility, construction and educational institutions. Mana is proficient in integrating and controlling complex schedules for procurement, construction, installation, developments and maintenance programs. Her logical and efficient style of project management sees Mana effectively delivering timely, high quality projects.
Involvement in the project	Mana is nominated as the Project Manager and will ensure the delivery milestones are met. She will be the main contact for the project and coordinate deliverables with other consultants.

GERARD ZAFICO – SENIOR DESIGN ENGINEER	
Qualifications	B Eng (Civil)
	Gerard has over 19 years' experience in civil infrastructure and subdivision design. He has worked with international engineering consultancies in the Philippines, Ireland and Australia. Gerard's responsibilities have included the design of roads, stormwater and sewer drainage, utilities and urban planning Since joining Cardno, Gerard has been responsible for the design and documentation management of a number of medium to large scale residential developments in both regional NSW and the ACT.More recently, Gerard has performed in a Senior Design Management role liaising directly with the client and relevant stakeholders on the 600+ lot Coombs Residential Estate Development. As part of this role, Gerard was tasked with coordinating designs from all relevant disciplines. Significant Projects: > Hume West Stage 1 and 3 (Civil Designer) > Hume West Stage 2 (Design Manager/Senior Designer) > Casey 3 Residential Estate (Design Manager/Senior Designer) > Gungahlin Town Centre East Roads (Design Manager)
Involvement in the project	Gerard will act as the Design Manager for the project and will be responsible for all aspects of design, engineering and documentation to ensure all deliverables and milestones are met. He will also liaise with EPSDD and/or TCCS to establish engineering standards applicable to the development.

CRAIG ALLEN – PROJECT ENGINEER	
Qualifications	Advanced Diploma of Engineering (Design)
	Craig is a Project Officer with Cardno with over 7 years' experience. Craig graduated from CIT in 2009 and has since been working as a Project Administrator/Coordinator in the Canberra Region. Craig has been involved in all aspects of this role from prequalification and system management, through to project tendering, administration and management. Craig has now undertaken numerous project engineering roles for small to medium civil infrastructure projects for the Canberra office. He has proven himself as a valuable member of the team, willing to take 'the extra step' to achieve project timeframes whilst maintaining a high level of accuracy. Significant Projects (Land Development): > Valley View Estate, Cowra (Project Engineer/Designer) > Fairley Estate, Murrumbateman (Assistant Project Engineer/Surveillance Officer) > Coombs Residential Estate (Engineering support) > Walgrove Residential Estate, Yass (Project Engineer) > Gungahlin Town Centre East Roads (Engineering Support)
Involvement in the project	Craig is nominated in the project engineer role, and will be responsible for all engineering design and reporting. He will also be responsible for the hydraulics investigation and modelling to be incorporated into the report.

TARA LU – PROJECT ENGINEER	
Qualifications	Bachelor of Systems Engineering (Hons)
	Tara is a project engineer commenced with Cardno in May 2017. Tara brings 4 years' worth of design and construction project engineering experience along with knowledge in utility coordination, technical compliance and quality assurance. As a project engineer, Tara works closely with senior engineers to perform various design, analyse and review tasks across all civil disciplines, with a focus on the interconnections and constraints amongst complex systems and technical requirements. Tara was qualified as a Systems Engineer and had been working in the utility industry for the over three years on various Design and Construction projects prior to joining Cardno. Significant Projects (Land Development): > Bowral Distributor Road Upgrade Utilities Coordination – Project Engineer > Radford College – Haydon Drive Carpark Design Documentation – Project Engineer > Shannon Drive Run-O-Waters DA Documentation and Submission – Project Engineer > Greenway Site Servicing Design Documentation – Project Engineer > Tharwa Multiple Blocks Site Investigation Reports – Project Engineer > Mawson Block 6 Section 57 Site Investigation Report – Project Engineer
Involvement in the project	Tara is nominated in the project engineer role, and will be responsible for all engineering design and reporting. She will also be responsible for the hydraulics investigation and modelling to be incorporated into the report.

PHILLIP JEWELL – SENIOR DESIGNER & DRAFTSPERSON	
Qualifications	RMS Select / Modify Control Plans (Red Card) RMS Design & Inspect Traffic Control Plans (Orange Card)
	Phillip is a civil designer and draftsperson with over 13 years of practical experience across a wide array of civil design infrastructure and urban components. Phil's particular speciality is the design of traffic controls, temporary traffic management, underground services and shared trenches. Phil is able to marry his practical civil knowledge with experience in construction site surveillance and design support to Superintendents in the field during construction. Phil has undertaken the TaMS Training Course 'Designing for Cyclists and Pedestrians' and he is accredited in the selection/modification of traffic control plans (RMS Red Card) and. designing & inspecting traffic control plans (RMS Orange Card). Significant Projects: > Bicycle lane and road marking review for the 2014/2015 road resurfacing program > Bicycle lane and road marking review for the 2013/2014 road resurfacing program > Speed Reduction Measures in the Parliamentary Zone > North St Murrumbateman Residential Estate and Barton Highway intersection upgrade > Anzac Parade and Constitution Avenue Intersection Upgrade, ACT
Involvement in the project	Phil will be responsible for the overall drawing documentation of the project. He will ensure all drawings and design comply with current standards.

10 A6 TCCS

10.1 Condition Assessment of DN1350 Stormwater Pipe

In the EIS Scoping document, *'It is suggested that prior to any works being undertaken that the Design Consultant undertakes a condition assessment of the pipes prior and post any works over the pipes'*. Condition assessment as a part of a dilapidation report will be produced prior to detailed design. Cardno has obtain a quotation and confirmation of capacity to undertake CCTV condition assessment by a local contractor.

10.2 Cross Check Alignment of Stormwater Infrastructure

Site investigation has been conducted on the stormwater infrastructure by Cardno. There is also an existing site survey by LANDdata (**Appendix J**) showing alignment of the stormwater easement. A preliminary plan as per Figure 10-1 and **Appendix D** shows relatively accurate alignment of the stormwater infrastructure.

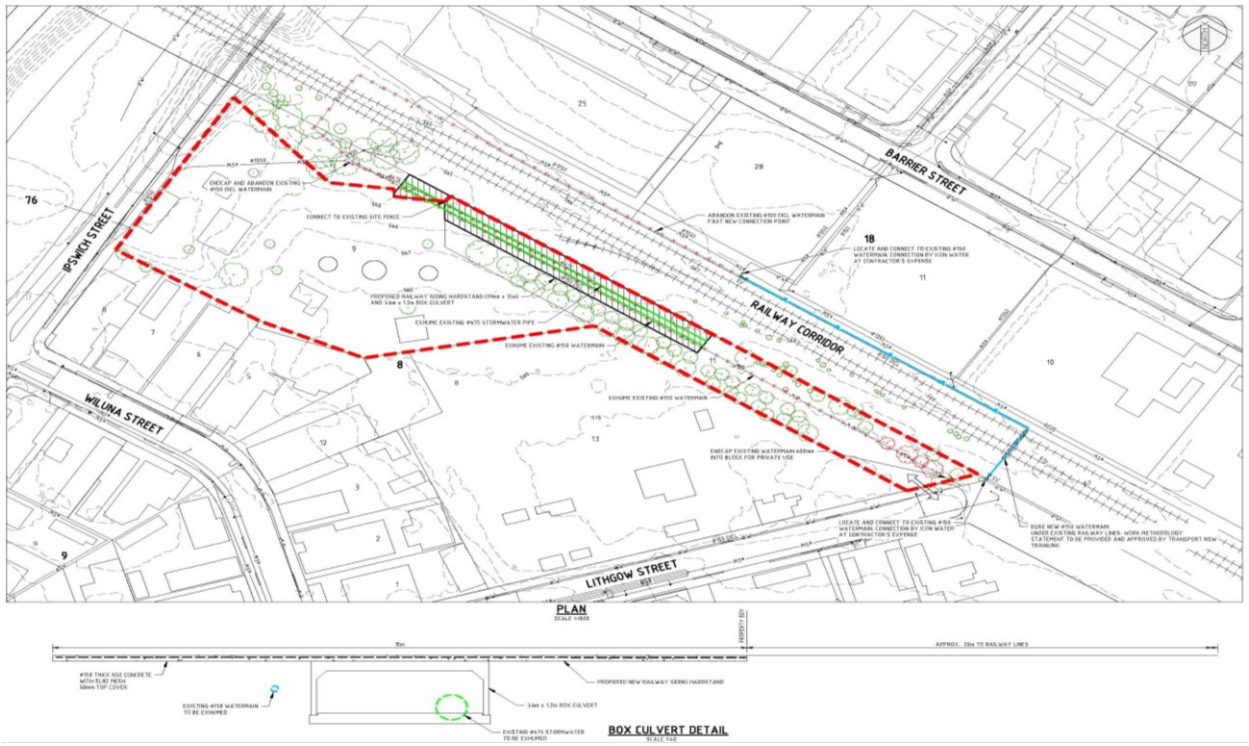


Figure 10-1 Cardno Site Investigation - Water and Stormwater Plan (Source: Cardno)

10.3 Traffic Analysis

An independent *Traffic and Transport Assessment* has been conducted by CRS's other consultant (AECOM), which will form a part of the EIS documentation.

10.4 Heavy Vehicle Movement

The Conceptual Vehicle Movement Plan (Figure 10-2) has shown proposed vehicle movement plan on site. All heavy vehicles will be entering the site from the designated entrance off the Lithgow St Cul-de-sac and travel on the one-way heavy vehicle lane along the southern boundary. Vehicle will stop at the first weighbridge, then into the MRF shed through the northmost roller door for drop off, then exit from the south most roller door, make a U-turn, then continue through to the weighbridge and exit site onto Ipswich St. All access and egress motions are to be 'Left in Left out', by on-site traffic control signage. The Conceptual Vehicle Movement Plan provides designated heavy vehicle path and minimises cross paths with light vehicles.

A detailed Vehicle Movement Plan will be a part of detailed design, including required traffic control signage and pavement marking.

Figure 10-2 Conceptual Vehicle Movement Plan

10.6 Loading and Parking

An on-site carpark is proposed west of the site for light vehicles for employees and visitors. Heavy vehicles enter the site continuously for drop-off only, unloading will take place within MRF shed, no other loading / parking area is required. Packed waste from the site will be transported by rail; the rail side hardstand is the designated forklift-operating zone, to load on to trains.

Figure 10-3 Loading and Parking

Blocks 9 & 11 Section 8, Fyshwick

APPENDIX A

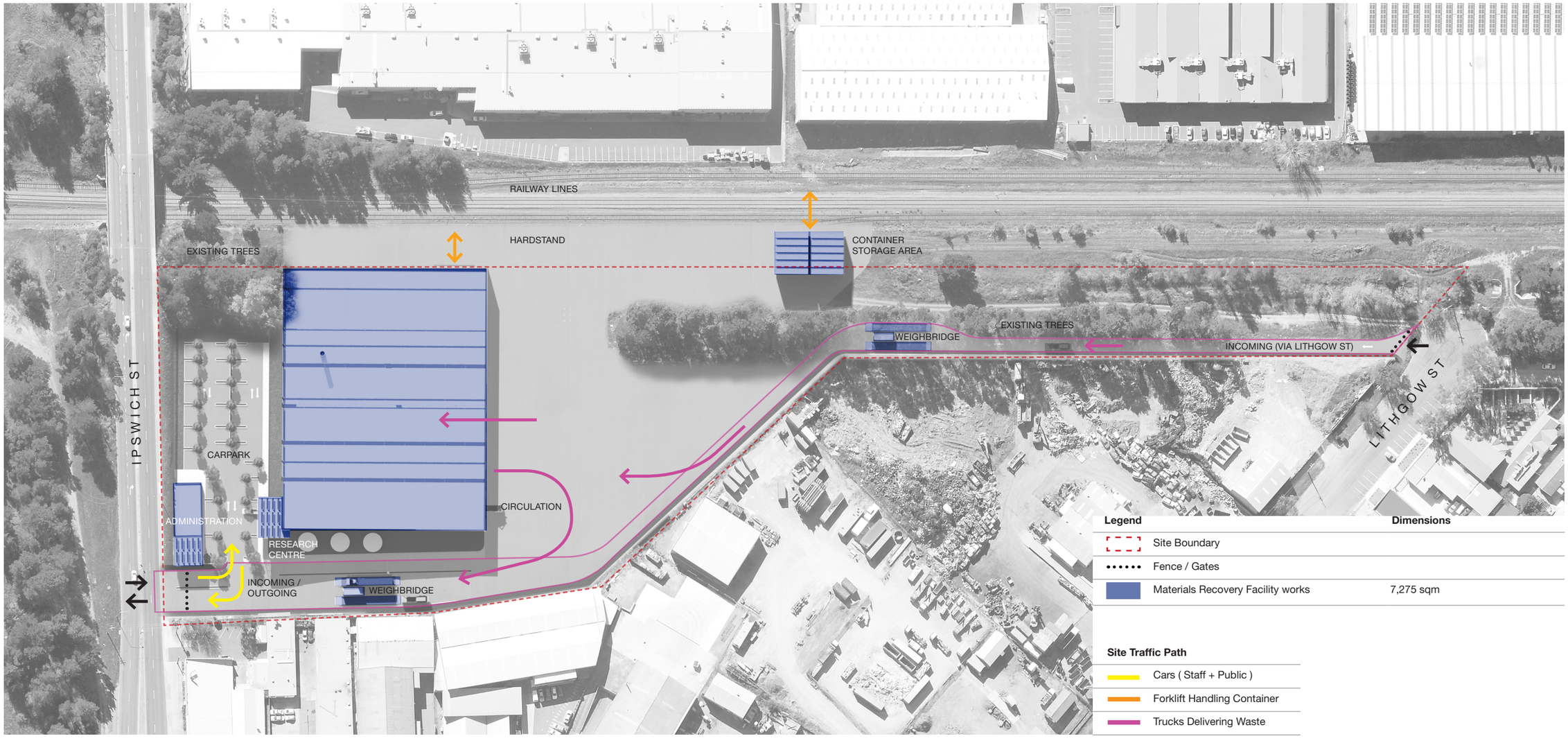
CONCEPTUAL SITE PLAN

Cardno
Shaping the Future

Advanced Waste Management

MATERIALS RECOVERY FACILITY

Capital Recycling Solutions
The Home of ACT's Renewable Energy



Legend	Dimensions
Site Boundary	
Fence / Gates	
Materials Recovery Facility works	7,275 sqm

Site Traffic Path

- Cars (Staff + Public)
- Forklift Handling Container
- Trucks Delivering Waste

SCALE 1:1500 @ A3

0 15m 45m 90m

N

Blocks 9 & 11 Section 8, Fyshwick

APPENDIX B

DBYD

Cardno
Shaping the Future

Job No 12946730

Phone: 1100
www.1100.com.au

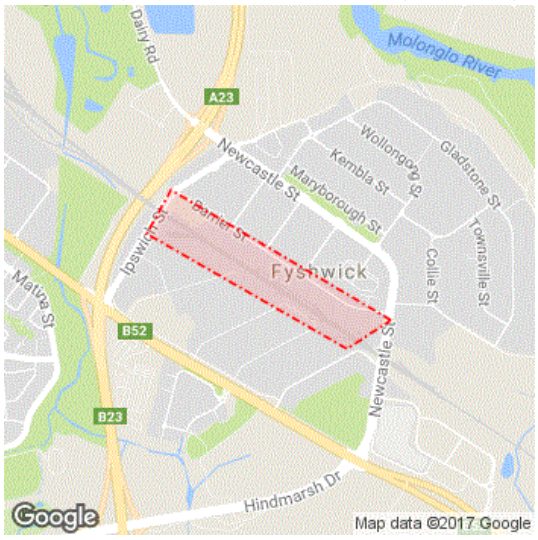
Caller Details

Contact: Miss Tara Lu
Company: Cardno
Address: 14 Wormald Street
Symonston ACT 2609

Caller Id: 1725620 **Phone:** 02 6112 4524
Mobile: Not Supplied **Fax:** Not Supplied
Email: tara.lu@cardno.com.au

Dig Site and Enquiry Details

WARNING: The map below only displays the location of the proposed dig site and does not display any asset owners' pipe or cables. The area highlighted has been used only to identify the participating asset owners, who will send information to you directly.



User Reference: Fyshwick B9 & B11 S8
Working on Behalf of:
ACT Government

Enquiry Date:	Start Date:	End Date:
14/09/2017	19/09/2017	31/12/2017

Address:
Barrier Street
Fyshwick ACT 2609

Job Purpose: Design
Onsite Activity: Planning & Design
Location of Workplace: Both
Location in Road: CarriageWay,Footpath,Nature Strip

- Check that the location of the dig site is correct. If not you must submit a new enquiry.
- Should the scope of works change, or plan validity dates expire, you must submit a new enquiry.
- Do NOT dig without plans. Safe excavation is your responsibility. If you do not understand the plans or how to proceed safely, please contact the relevant asset owners.

Notes/Description of Works:
- CONTINUED FROM JOB: 12945940 -

Your Responsibilities and Duty of Care

- If plans are not received within 2 working days, contact the asset owners directly & quote their Sequence No.
- ALWAYS perform an onsite inspection for the presence of assets. Should you require an onsite location, contact the asset owners directly. Please remember, plans do not detail the exact location of assets.
- Pothole to establish the exact location of all underground assets using a hand shovel, before using heavy machinery.
- Ensure you adhere to any State legislative requirements regarding Duty of Care and safe digging requirements.
- If you damage an underground asset you MUST advise the asset owner immediately.
- By using this service, you agree to Privacy Policy and the terms and disclaimers set out at **www.1100.com.au**
- **For more information on safe excavation practices, visit www.1100.com.au**

Asset Owner Details

The assets owners listed below have been requested to contact you with information about their asset locations within 2 working days. Additional time should be allowed for information issued by post. It is **your responsibility** to identify the presence of any underground assets in and around your proposed dig site. Please be aware, that not all asset owners are registered with the Dial Before You Dig service, so it is **your responsibility** to identify and contact any asset owners not listed here directly.
** Asset owners highlighted by asterisks ** require that you visit their offices to collect plans.
# Asset owners highlighted with a hash require that you call them to discuss your enquiry or to obtain plans.

Seq. No.	Authority Name	Phone	Status
64482383	ActewAGL / Icon Water	0262935770	NOTIFIED
64482384	BP Australia Pty Ltd, Remediation Management NSW	0392683025	NOTIFIED
64482385	NBN Co, NswAct	1800626762	NOTIFIED
64482381	Nextgen, NCC - NSW	1800032532	NOTIFIED
64482382	Telstra NSW, South	1800653935	NOTIFIED
64482379	Transact Communications	0262298009	NOTIFIED
64482380	Transact Communications	0262298009	NOTIFIED

END OF UTILITIES LIST

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ActewAGL Electriciy Network

ActewAGL

Cadastral information has been provided by the ACT Planning and Land Authority (ACTPLA). Cadastral data should not be used externally to ActewAGL without written permission from ACTPLA. Copyright (c) ACT Government 2013.

0 10 20 40 60 80 M

N W E S

ArcMap Template: T:\Mapping\ArcMAPTemplates\Electricity\Electricity A0Portrait.mxd

ActewAGL House 40 Bunda Street Canberra ACT 2600 | GPO Box 366 Canberra ACT 2601
t 13 14 93 | actewagl.com.au

WARNING – HIGH PRESSURE GAS PIPELINE IN THE VICINITY

Applicant/Contractor **Job No. 12945940** **DBYD Sequence No. 64478104**

Company: Cardno
Contact: Miss Tara Lu
Telephone: 02 6112 4524 **Mobile:** Not Supplied **Fax:** Not Supplied
Address: 14 Wormald Street Symonston ACT 2609
Email: tara.lu@cardno.com.au

Work Details

Suburb: Fyshwick
Address: Barrier Street
UBD Ref: 70C8,70C9,70D6,70D7,70D8,70D9,70E10,70E6,70E7,70E8 ...
Description: Not Supplied

Enquiry Date: 14-Sep-2017 **Issue Date:** 14-Sep-2017

The records of ActewAGL Gas Networks indicate that High Pressure Underground Assets/Pipes ARE present in the vicinity of and/or surrounding area of the above enquiry. Please read all the information and conditions below.

No excavations within 15 metres of this asset are permitted without the prior approval of Jemena
PHONE 1300 503 237

IN THE EVENT OF A GAS EMERGENCY CALL 13 19 09 (24 hours)

CONDITIONS FOR WORKS IN THE VICINITY OF ActewAGL GAS NETWORK ASSETS

Any information provided is valid only for 90 days from the date of issue. If the work operation extends beyond this period, or if the designs are altered in any way, you are requested to re-submit your proposal for re-assessment.

Consistent with the requirements of Part 2 General – Section 8 of the Utility Networks (Public Safety) Regulations 2001 No. 28, ActewAGL require that:

- The requestor shall ensure that all workers on site are aware of the presence of natural gas.
- The requestor shall ensure that under no circumstances will mechanical excavation be carried out within 1.0 metres of a gas main without there being a Jemena Representative on site.
- The requestor shall be responsible to maintain the presence / visibilities of all gas markings.
- **No live or Isolated gas pipes shall be cut, altered or removed without APPROVAL from Jemena.**

Note: Individual customer gas connections are generally not shown on the accompanying maps. For information regarding individual gas connections we recommend that you request a site meeting / inlet service location.

You can obtain additional information or arrange a site meeting by contacting Jemena on **1300 503 237**. **Note that 24 hours notice is required for site meetings.**

1. High Pressure Pipelines

No excavations or heavy construction are permitted within 15m of these pipelines without notification to and authorisation from Jemena. If separation distance is 15m or less, you are required to notify Jemena of your works.

Prior to commencing works near or over the High Pressure Gas Mains you must supply Jemena with your proposal of works including design plans. You must allow four weeks for Jemena to review your works. Please mail your proposed works details to: Jemena Asset Management Pty Ltd, Land Services Dept, PO Box 6507, Silverwater, NSW, 2128.

Once Jemena has reviewed your proposal and design plans and you have received Jemena's approval to proceed, you must organise for a Pipeline Technician to be on Stand-by during your works (charges may apply).

To arrange for a Pipeline Technician to be on site please call the High Pressure Coordinator on 1300 665 380 two working days prior to the works commencing.

2. High Pressure Steel and Large Diameter Medium Pressure Plastic Pipelines

You **must** contact a Pipeline Technician to conduct a survey **before** commencing any work in this area. You can arrange a survey by contacting the High Pressure Response Coordinator on **1300 665 380**. **Please note that two working days notice is required to arrange a survey.** For all works in the vicinity of High Pressure Gas Mains you are required to arrange for a Pipeline Technician to attend. Charges apply for attendance of any works outside the hours of 7am to 4pm, Monday to Friday ("Standard Business Hours") and for any attendance during Standard Business Hours that is longer than 2 hours.

WARNING. It is essential that ALL these documents be handed to the principal contractor carrying out the work. A photocopy may be taken for office records. All documents must be on site at the time of excavation. The information provided is to be used as guide only and does not absolve third parties in their "Duty of Care" obligations to take additional precautions where the work has the potential to impact on gas assets and the safety of people.

All work that may impact upon the ActewAGL Gas Network should be carefully planned with notification to Jemena well in advance of commencement. This includes excavation of gas pipelines, crossings of pipelines by other underground infrastructure (drains, power cables, etc), road works or structural installations.

ActewAGL plans have been provided to show the position of underground gas mains and equipment in public gazetted roads only. Individual customers' services are not generally included on these plans. These plans have been prepared solely for ActewAGL's own use and indicate the position of underground mains and installations relative to boundaries and kerbs as at the time the mains were installed, and do not necessarily reflect any subsequent changes eg: changes to road alignments.

ActewAGL and / or Jemena will accept no liability for inaccuracies in the information or lack of information on such plans for any cause whatsoever arising. Persons excavating or carrying out other earthworks will be held responsible for any damage caused to underground mains and equipment, and the costs associated with replacement or repair.

Please note that the information contained on the map provided is not a method of determining gas availability for the purposes of connection to a natural gas supply. Please contact a gas retailer to determine the availability of gas as an energy source.

IN THE EVENT OF A GAS EMERGENCY CALL 13 19 09 (24 hours)

Extinguish all sources of ignition and keep the area clear of all persons. Any attempt by third parties to repair damaged gas mains or services may result in prosecution under the Utility Networks (Public Safety) Regulations 2001.

ActewAGL Gas Network

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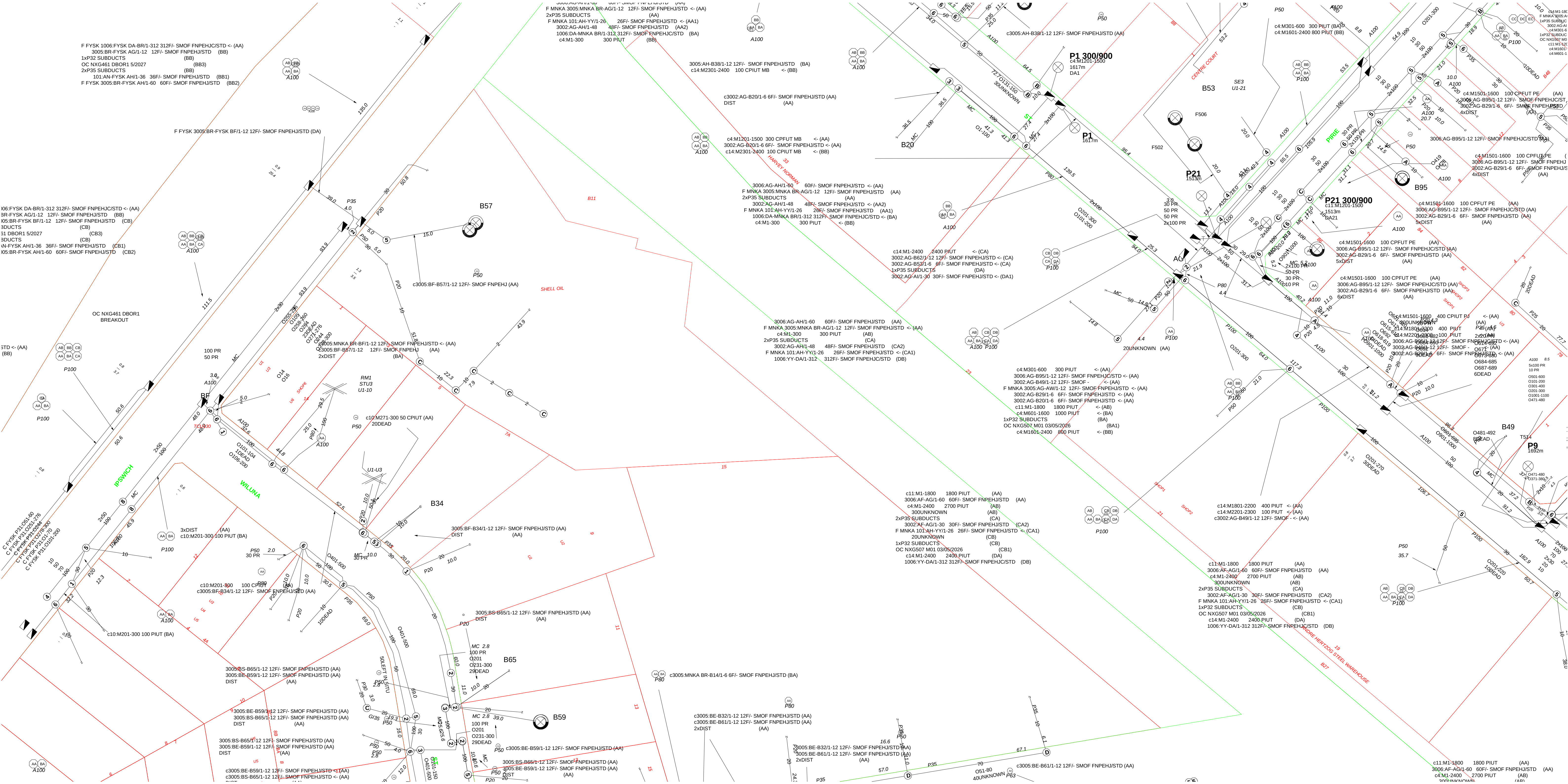
0 15 30 60 90 120 M

ActewAGL

ArcMap Template: C:\Users\d_thurtell\Desktop\Gas1415_Master_Prd03..mxd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OC NXG461 DBOR1 5/2027 (BB3)
2xP35 SUBDUCTS (BB)
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F FYSK 3005:BR-FYSK AH/1-60 60F/- SMOF FNPEHJ/STD (BB2)
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OC NXG461 DBOR1
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B57
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SHELL OIL
B11
RM1
STU3
U1-10
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2xDIST (BA)
IPSWICH
WILUNA
B34
3005:BF-B34/1-12 12F/- SMOF FNPEHJ/STD (AA)
DIST (AA)
3xDIST (AA)
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DIST (AA)
B65
MC 2.8
100 PR
O201
O231-300
29DEAD
B59
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DIST (AA)
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2xDIST (AA)
c3005:BE-B61/1-12 12F/- SMOF FNPEHJ/STD (AA)
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2xP35 SUBDUCTS (AA)
F MNKA 101:AH-YY/1-26 26F/- SMOF FNPEHJ/STD <- (AA1)
3002:AG-AH/1-48 48F/- SMOF FNPEHJ/STD (AA2)
1006:DA-MNKA BR/1-312 312F/- SMOF FNPEHJC/STD (BA)
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3005:AH-B38/1-12 12F/- SMOF FNPEHJ/STD (BA)
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c3002:AG-B20/1-6 6F/- SMOF FNPEHJ/STD (AA)
DIST (AA)
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P1 300/900
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1617m
DA1
P1
1617m
B53
SE3
U1-21
CENTRE COURT
F506
F502
P21
1513m
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1513m
DA21
B95
AG
PIRIE
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P9
1692m
O481-492
12DEAD
O201-270
30DEAD
O201-220
10DEAD
ROHRE HERTZOG STEEL WAREHOUSE
c4:M1501-1600 100 CPFUT PE (AA)
3006:AG-B95/1-12 12F/- SMOF FNPEHJC/STD (AA)
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c4:M1501-1600 100 CPFUT PE (AA)
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6xDIST (AA)
c11:M1-1800 1800 PIUT (AA)
3006:AF-AG/1-60 60F/- SMOF FNPEHJ/STD (AA)
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Icon Water Network

N W E S

0 15 30 60 90 120 M

icon WATER

ArcMap Template: T:\Mapping\ArcMAPTemplates\Water\WaterA0Landscape.mxd
User Name: d_thurlell

Icon Sewer Network

DEPT. ADMIN. SERVICES - PRIVATE OWNER
FYSHWICK VILLAGE
CENTRE COURT
FYSHWICK SQUARE
CHILDCARE CENTRE
TOILETS
LYELL CENTRE
ARKO BUILDING
POLICE SECURITY COMPOUND
MOLONGLO MALL
GARAGE
ACTEW DEPOT
BUILDING MAINTENANCE DEPOT
CANBERRA EYE HOSPITAL
CANBERRA SOUTHSIDE VILLAGE
NAMROD HOUSE
CUSTOMS DOG TRAINING CENTRE
TELEPHONE EXCHANGE
COLLIE STREET
IRON KNOB STREET
NEWCASTLE STREET
ISA STREET
MARYBOROUGH STREET
KEMBLA STREET
UNNAMED
BARKER STREET
PIRIE STREET
LYELL STREET
MOLONGLO MALL
WOLLONGONG STREET
LITHGOW STREET
GEELONG STREET
YALLOURN STREET
CANBERRA AVENUE
WORALLA STREET
FAULDING STREET
WORNALD STREET
WILLIAM STREET
TOBMAN STREET
MONARO HIGHWAY

N W E S

0 15 30 60 90 120 M

icon WATER

Icon Water Network

Fyshwick
Section 8 Block 9
(Ipswich Street)

N
W E
S

0 4.75 9.5 19 28.5 38 M

icon WATER

ArcMap Template: T:\Mapping\ArcMAPTemplates\Water\WaterA3Landscape.mxd

Dial Before You Dig (DBYD)
BP Nominated Infrastructure or Area Location Information

BP Australia Pty Ltd
717 Bourke Street
Docklands, VIC 3008

To:
Cardno - Miss Tara Lu
14 Wormald Street
Symonston ACT 2609

Enquiry Details	
Utility ID	90146
Sequence Number	64482384
Enquiry Date	14/09/2017 13:38
Response	**AFFECTED**
Address	Barrier Street Fyshwick
Location in Road	CarriageWay,Footpath,Nature Strip
Activity	Planning & Design

Enquirer Details			
Customer ID	1725620		
Contact	Miss Tara Lu		
Company	Cardno		
Email	tara.lu@cardno.com.au		
Phone	02 6112 4524	**Mobile**	Not Supplied

Enquirer Responsibilities

This asset location information must be read in conjunction with the DBYD Response Form provided to you (the enquirer) by Mipela GeoSolutions on behalf of BP Australia. *(F0-RM-003 Response Form.pdf)*

When working in the vicinity of an asset you have certain legal obligations with which you must comply. The purpose of these obligations is to ensure safe work.

In commencing work in the vicinity of an asset following receipt of this DBYD Response Form, you are deemed to have accepted the terms and conditions attached.

An example of the type of visible infrastructure that you may encounter is shown in the attached Photo A.

Photo A

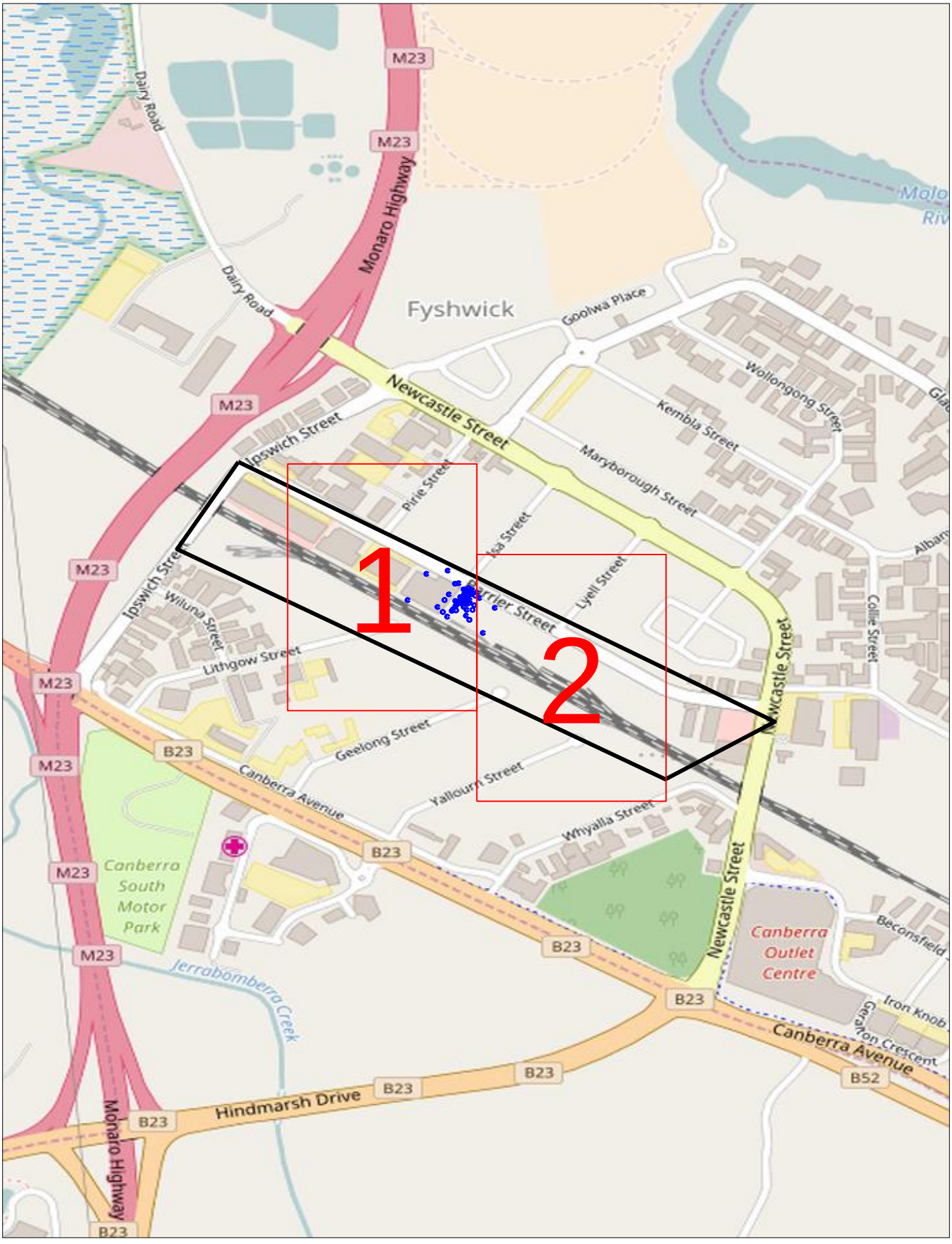
bp

Date: 14/09/2017

Overview Map

Sequence No: 64482384

Barrier Street Fyshwick



BP Australia makes every effort that the information contained on this map is up to date and correct but accepts no responsibility for this information.

The information is provided as a guide only.

0 0.1km

Imagery sourced from Open StreetMaps

LEGEND:

1 Detail Map

BP Area Location

DBYD Work Area

Powered by dbyd

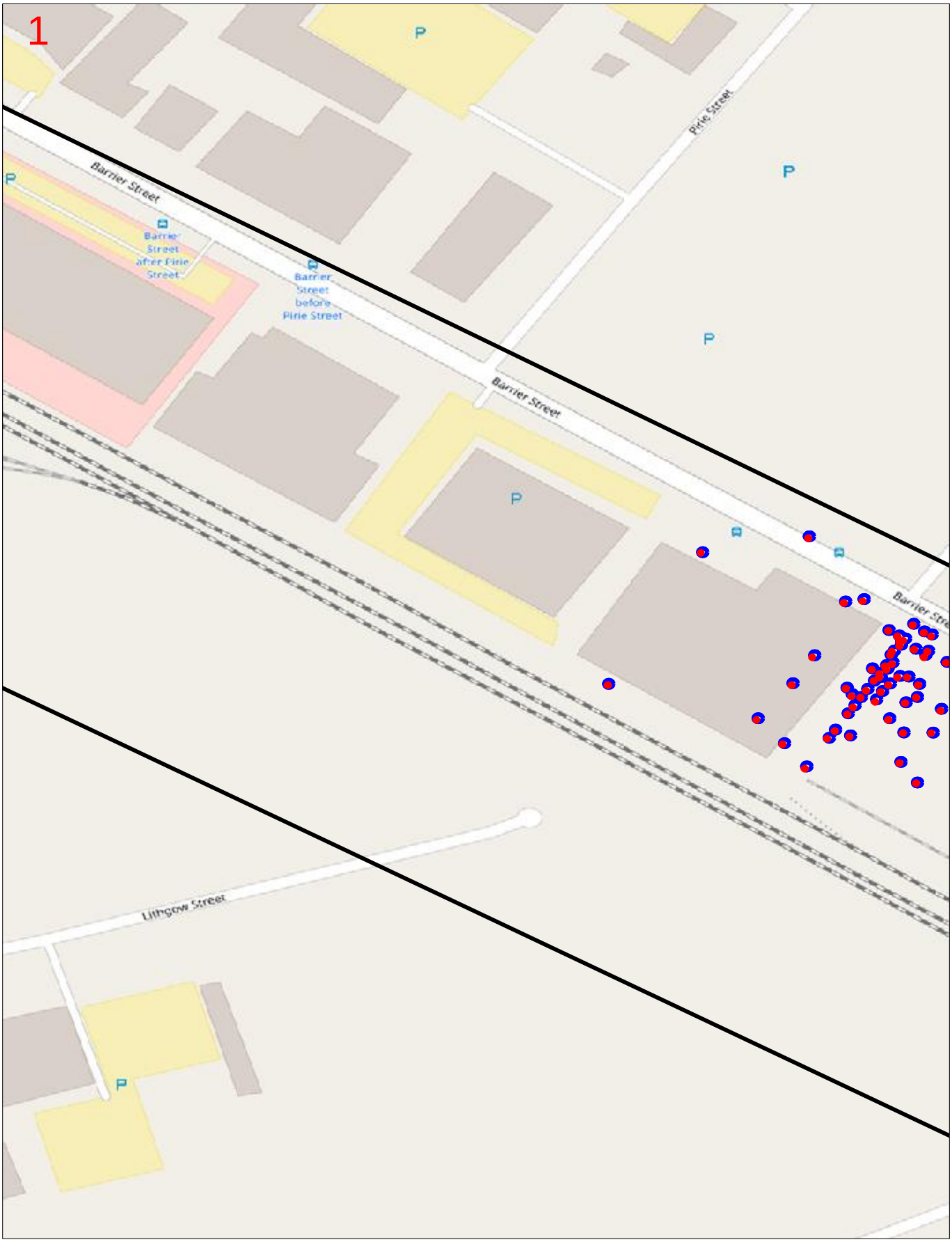
bp

Date: 14/09/2017

Map 1

Sequence No: 64482384

Barrier Street Fyshwick



BP Australia makes every effort that the information contained on this map is up to date and correct but accepts no responsibility for this information.

The information is provided as a guide only.

N W E S

0 0.02km

Imagery sourced from Open StreetMaps

LEGEND:

BP Area Location

BP Infrastructure

DBYD Work Area

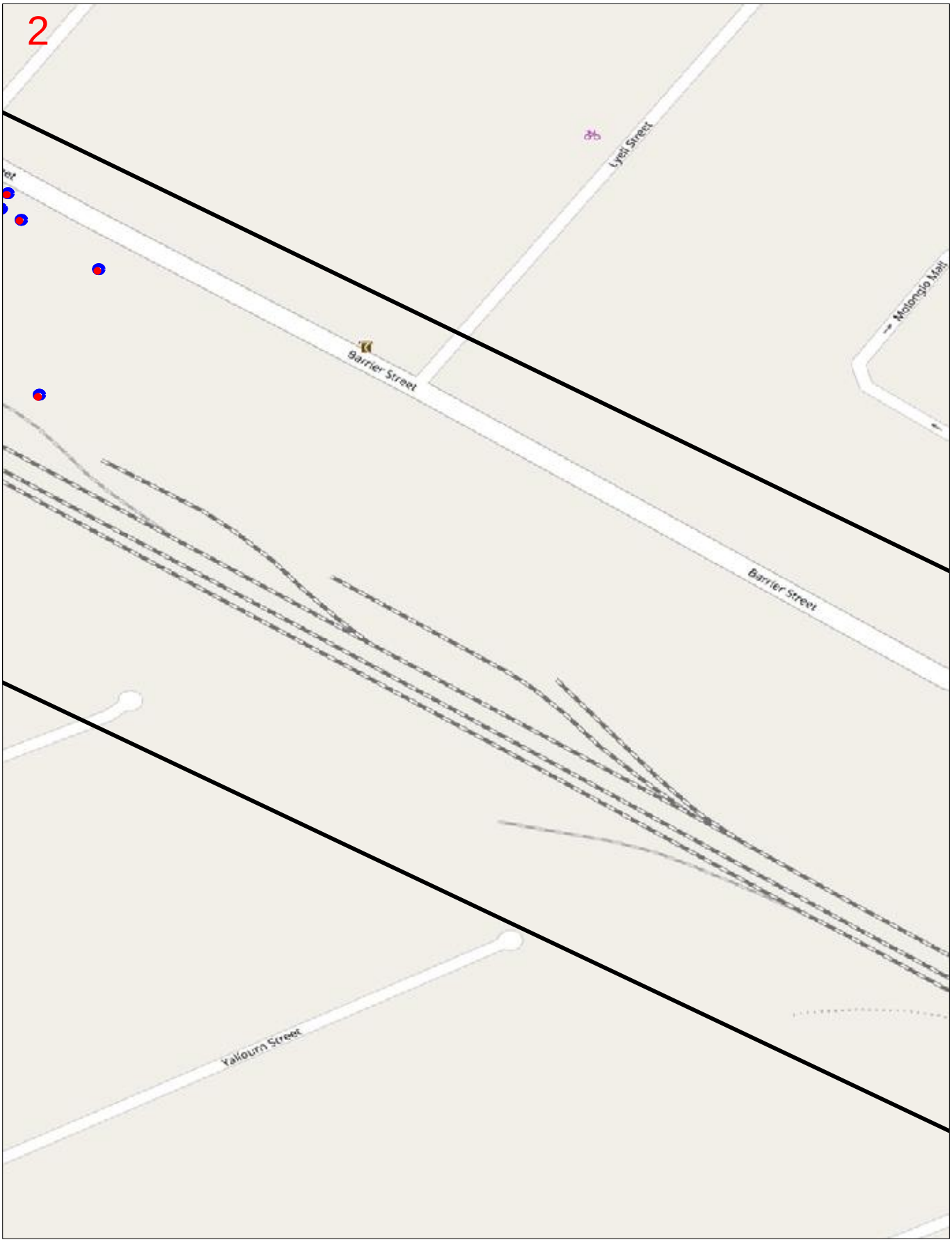
bp

Date: 14/09/2017

Map 2

Sequence No: 64482384

Barrier Street Fyshwick



BP Australia makes every effort that the information contained on this map is up to date and correct but accepts no responsibility for this information.

The information is provided as a guide only.

N
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0 0.02km

Imagery sourced from Open StreetMaps

LEGEND:

BP Area Location

BP Infrastructure

DBYD Work Area

Powered by dbyd

Blocks 9 & 11 Section 8, Fyshwick

APPENDIX C

SITE AUDIT REPORT BY GHD

Cardno
Shaping the Future

Access Trading Company Limited

16 Ipswich Street, Fyshwick, ACT

Site audit report

3 July 2017

Table of contents

Table index

Appendices

Glossary

AHD – Australian height datum

ANZECC – Australian and New Zealand Environment and Conservation Council

AST – Above-ground storage tank

Auditor – Accredited Contaminated Site Auditor under NSW *Contaminated Land Management Act* 1997 (and recognised under the ACT Environment Protection Act 1997)

BTEX – Benzene, Toluene, Ethyl-benzene and Xylene

CLM – Contaminated Land Management Act 1997

CoPC – contaminants of potential concern

CRC-CARE – Cooperative Research Centre for Contamination Assessment and Remediation of the Environment

DA – Development application

DQOs – Data Quality Objectives

EPA – ACT Environment Protection Authority

ENM – Excavated natural material

EIL – Ecological investigation level

ESL – Ecological screening level

ESA – Environmental site assessment

GME – groundwater monitoring event

HIL – Health investigation level

HSL – Health screening level

km – kilometre

LNAPL – Light non aqueous phase liquids

LOR – limit of reporting

m – metre

m bgl – metres below ground level

mg/kg – milligrams per kilogram

NEPC – National Environment Protection Council

NEPM – National Environmental Protection Measure – issued in April 2013

OCP – Organochlorine Pesticide

OPP - Organophosphorous Pesticides

PAH – Polycyclic aromatic hydrocarbons

PID – Photo ionisation detector

ppm – parts per million

PQL - Practical quantitation limit

PSH – Phase separated hydrocarbons

QA/QC – Quality Assurance/Quality Control

RAP – Remedial action plan

RPD – Relative percentage difference

SAQP – Sampling analysis and quality plan

SAR – site audit report

SOP – Standard operating procedures

SWL – Standing water level

TDS – Total dissolved solids

TPH – Total petroleum hydrocarbons

TRH – Total recoverable hydrocarbons

TSS – Total suspended solids

µg/L – micrograms per litre

UCL – Upper Confidence Limit of the arithmetic average contaminant concentration

UPSS – Underground petroleum storage systems

UST – Underground storage tank

VENM – Virgin excavated natural material

VOCs – Volatile organic compounds

1. Introduction

1.1 Site audit details

This Site Audit Report (SAR) has been prepared for Access Trading Company Limited (Access Recycling) following a number of investigation and groundwater monitoring programs at the site formerly known as the Shell Canberra Depot, 16 Ipswich Street, Fyshwick, ACT 2059 (the site). A site location plan is provided in **Appendix A** (Figure F1 of AECOM Delineation Environmental Assessment Report).

The audit was non-statutory and was undertaken to demonstrate the site is suitable for continued commercial/industrial land use. A copy of the draft audit report was issued to the ACT EPA for comment prior to submission of the final version. The ACT Environment Protection Authority (EPA) stated in an email of 26 June 2017 that as the audit was not a requirement of the *Environment Protection Act 1997* (the EP Act) or another Act of the Territory, the (EPA) will not be providing comment on the draft documents.

This audit has been undertaken in accordance with the requirements of the *Environment Protection Act 1997*. The details of this audit are presented in **Table 1**.

Table 1 Site Audit Details

Information required	Details
Site Auditor	Mr Andrew Kohlrusch
NSW EPA Site Auditor Accreditation No[1].	0403
ACT EPA Site Audit Statement No.	ACT02-2126014
Audit Category	Non-statutory
Local Government Area	Fyshwick, ACT
Address of Site	16 Ipswich Street, Fyshwick, ACT 2609
Site Area	Approximately 20,500 m^2
Legal Property Description	Block 9, Section 8, Division of Fyshwick in DP 5469 Vol: 832 Folio: 21, as shown in Figure 2 of this site audit report
Site Owner	Access Trading Pty Limited
Land use	Commercial/Industrial

1 The auditor is accredited in NSW under Contaminated Land Management Act 1997 and is thereby duly approved as an environmental auditor in the ACT under Section 75 of the Environment Protection Act 1997.

The site has been investigated and groundwater monitoring conducted as part of the site divestment by Shell Company of Australia to Access Recycling for continued commercial / industrial land use (i.e. waste to oil generation and/or metal recycling). Given light non-aqueous phase liquid (LNAPL) was reported in the groundwater, ACT EPA requires a site audit report and statement for the suitability of the site land use as per the provisions of the *Environment Protection Act* 1997.

1.2 Purpose of the audit

The site audit was undertaken to establish the suitability of the site for the proposed continued commercial / industrial land use.

Under the EP Act, an ***environmental audit*** for assessment or remediation of contaminated land is an audit by an auditor:

(a) that relates to an assessment or remediation carried out (whether under this Act or otherwise) in relation to actual or possible contamination of land; and

(b) that is conducted for the purposes of deciding any 1 or more of the following:

(i) the nature and extent of the assessment or remediation undertaken;

(ii) the nature and extent of any contamination or remaining contamination of the land;

(iii) what further assessment or remediation is necessary before the land is suitable for any specified use or range of uses.

(iv) the appropriateness of any remediation plan, long-term management plan, assessment proposal or remediation proposal.

This audit was conducted to determine whether the previous investigation stages, groundwater monitoring and site validation report provided sufficient information to demonstrate that the site was suitable for the commercial/industrial land use.

1.3 Reports reviewed

This site audit report (SAR) has been prepared following review of and/or consideration of information in the following documents (the Documents):

- AECOM (5 February 2010) *Delineation Environmental Assessment, Shell Canberra Depot (ACM107C), 16 Ipswich Street, Fyshwick* (Ref. P30021002) – (**DEA Report)**
- AECOM (6 April 2011) *Human Health and Ecological Risk Assessment, Shell Canberra Depot (ACM107C), 16 Ipswich Street, Fyshwick (Ref. P30021003)* – (**HHERA Report**). The HHERA Report was preceded by a HHERA prepared in 2007 by URS and included additional data collected by AECOM and report in the DEA Report.
- ECS, *Site Validation Report, Former Shell Canberra Depot, 16 Ipswich Street, Fyshwick ACT* (March 2017) (**Site Validation Report**) – the auditor acknowledged that the report was not a validation report per se, but rather a confirmation of groundwater quality (given that the last groundwater sampling program has been completed in 2009) both on and off site, including a comparison of the resultant data to the most relevant investigation levels endorsed by the ACT EPA. An addendum to this report was issued in May 2017 (*Site Validation Addendum Report Former Shell Canberra Depot 16 Ipswich Street, Fyshwick ACT*). No new information was presented in this addendum, only explanations of comments raised by the auditor in the review of the Site Validation Report.
- ECS (June 2017) *Environmental Management Plan 16 Ipswich Road (sic) Fyshwick, ACT*. The auditor noted that an earlier version of the EMP was issued in May 2017, but was updated to reflect requirements of the *Environmental guidelines for preparation of an Environment Management Plan* (ACT EPA May 2013).

ECS also issued a report entitled *Site Remediation Shell Fuel Deport, 16 Ipswich Road, Fyshwick, ACT* (9 August 2016). All information in this report was included and further discussion on the results presented in the Site Validation Report.

The site auditor acknowledged that other reports in addition to those listed had been prepared following investigation works at the site. However, the DEA Report included the last comprehensive stage of investigation of the site (comprising confirmatory groundwater monitoring and additional soil sampling), the results of which were incorporated into the HHERA report (2011). The auditor also notes that all investigations and/or reports had been completed before the auditor was engaged apart from the work completed by ECS.

The Site Validation Report included the results of additional groundwater sampling conducted both on and off site and an evaluation of these and previous data to investigation levels presented in the NEPM 2013. This was necessary to evaluate the trends of previously identified groundwater contamination and to ensure that data had been compared to the most relevant ACT EPA endorsed investigation levels.

The scope of work, site condition and surrounding environment information, site history review, information on potential areas of environmental concern, regulatory background and applicable guidelines, field and laboratory investigations, results, discussion and conclusions presented in the Documents were compared to the requirements as outlined in NSW EPA *Guidelines* for *Consultants Reporting on Contaminated Sites* (the *Consultant Guidelines* – 2011) and the NSW EPA *Guidelines for the NSW Site Auditor Scheme* (the *Auditor Guidelines* – 2006). These NSW EPA guidelines have been endorsed for use in the ACT by the EPA through the ACT Environment Protection Authority, Contaminated Sites Protection Policy 2009.

1.4 Proposed and permitted land uses

The reviewed reports did not provide the site zoning. The site was a Shell depot and has been proposed to be developed into a waste to oil generation and / or metal recycling facility. The auditor checked the ACT Government's web site ACTmapi on 31 May 2017 and confirmed the site was zoned as ICZ2 – Industrial Mixed Use Zone. The following land uses are listed as permitted under this zoning, but is it understood from the ACT EPA that any change of use of the site from a fuel depot would require appropriate planning approval:

- Ancillary use
- Bulk landscape supplies
- Bulky goods retailing
- Car park
- Caretaker's residence
- Club
- Community Use
- Communications facility
- Craft workshop
- Consolidation
- Drink establishment
- Defence establishment
- Demolition
- Development in a location and of a type identified in precinct map as additional track development
- Emergency services facility
- Freight transport facility
- Funeral parlour
- General industry
- Indoor recreation facility
- Indoor entertainment facility
- Industrial trades
- Light industry

- Liquid fuel depot
- Major road
- Minor road
- Major utility installation
- Municipal Depot
- Minor Use
- Non retail commercial use
- Outdoor recreation facility
- Public transport facility
- Parkland
- Pedestrian plaza
- Plant and equipment hire establishment
- Recyclable materials collection
- Recycling facility
- Restaurant
- Scientific research establishment
- Shop
- Service Station
- Subdivision
- Store
- Sign
- Temporary Use
- Transport Depot
- Vehicle Sales
- Veterinary Hospital
- Varying a lease (where not prohibited codes track or impact track assessable
- Waste transfer station
- Warehouse

The auditor noted that ACT Planning defines the following Community Uses:

- **Child care centre** means the use of land for the purpose of educating, supervising or caring for children of any age throughout a specified period of time in any one day, which is registered under the *Children and Young People Act 2008* or authorised pursuant to the *Education and Care Services National Law (ACT) Act 2011* and which does not include residential care
- **Community activity centre** means the use of land by a public authority or a body of persons associated for the purpose of providing for the social well being of the community.
- **Religious associated use** means the use of land for the activities conducted by religious organisations other than for worship or for *offices* and may include residential accommodation by ministers of religion
- **Educational establishment** would be acceptable providing the facility is not used for a kindergarten, preschool, primary school or secondary college.
- **Community theatre** means the use of land for a theatre, cinema, concert hall, auditorium or theatrette run by non-profit organisations.
- **Cultural facility** means the use of land for the purpose of cultural activities to which the public normally has access, but does not include a *shop* for art, craft or sculpture dealer.
- **Health facility** means the use of land for providing health care services (including diagnosis, preventative care or counselling) or medical or surgical treatment to outpatients only.

- **Hospital** means the use of land for the medical care (including diagnosis, preventative care and counselling) of inpatients, whether or not out-patients are also provided with care or treatment, and may include associated residential accommodation.
- **Place of worship** means the use of land for the primary purposes of religious worship and associated activities by a congregation, religious group or members of the public whether or not the premises are also used for religious instruction, tuition, meetings, training and other community activities.

1.5 Site visit

The auditor conducted a site visit on 31 March 2017 to gain an understanding of the site and surrounding conditions. The following observations were made:

- The site was abandoned and was largely concrete paved apart from a gravel area in the centre of the site and railway siding. There was a single storey office and amenities building along the western boundary and a storage shed in the south eastern portion of the site. It was not known whether this shed contained any equipment or stored any chemicals. The only chemical storage area apart from above ground storage tanks was a fire fighting cupboard containing three 20 litre drums of 3M Lightwater® fire fighting foam.
- The three above ground storage tanks in the centre of the site were prominent and located within lined bunds. There was no evidence of leaks in the bunded areas. It was not known whether the tanks still had any product. The pipework and associated infrastructure that lead from the tanks to the gantry to the west was still present.
- There was a gentle downward slope to the north. Site drainage was generally directed to stormwater grates on site. It was unclear where the stormwater drainage discharged.
- No odours were observed during the site visit and there was no evidence of stained soils or former spillages.
- The railway siding that is located along the northern perimeter of the site had largely been dismantled apart from some relict aboveground pipework and railway lines and concrete bollards. The concrete platform on which the siding was located had been removed and the area was largely unsealed with the surface comprising gravel and clay. The railway line from which the siding had formerly bifurcated was located further to the north and was separated from the siding by an open space area. The open space area was a low lying area and seemed to be acting as a drainage swale/channel. Water was noted to be flowing to the west in the lowest part of the open space area. The area in the immediate vicinity of the drainage swale was largely grass covered and featured healthy looking trees up to four metres in height. There were no defined drainage lines from the site to the open space area.
- Other surrounding activities included a Harvey Norman warehouse and goods receiving area to the north of the Canberra-Queanbeyan railway line, Ipswich Road to the west and a recycling yard and other commercial premises to the east and south respectively.

1.6 Site audit report structure

This report documents the audit of the relevant investigation and assessment works conducted by AECOM and Environmental Consulting Services as presented in the reports referenced in **Section 1.3**. Where the auditor has provided comments on the work completed by AECOM / Environmental Consulting Services, these are highlighted in blue shaded dialogue boxes.

The remainder of this report is organised as follows:

Section 2 Site condition and environmental setting

Section 3 Data quality objectives

Section 4 Site history

Section 5 Potential chemicals of concern

Section 6 Conceptual site model

Section 7 Assessment criteria

Section 8 Environmental investigations

Section 9 Environmental management plan

Section 10 Evaluation of QA/QC procedures

Section 11 Compliance with regulatory guidelines and directions

Section 12 Potential migration of chemicals of interest

Section 13 Ecological considerations

Section 14 Auditor's opinions and conclusions

Section 15 Disclaimers

1.7 Limitations of the site audit report

All information and opinions given in this SAR are based on reviewing information presented in the documentation referenced in **Section 1.3** and other supporting information provided by the client, AECOM and Environmental Consulting Services. The auditor has not carried out any independent investigations in relation to the condition of the site. The audit has been based on the limitations presented in **Section 15** of this report.

The auditor assumes no responsibility or liability for any errors or omissions in the information provided in the reports reviewed or that the consultant did not confer any reliance on the reports to the auditor.

The purpose of this SAR was to assess the suitability of the subject site for the specified future use based on the information provided by others. No other warranties, expressed or implied, are made. This SAR relates only to below ground contamination at the site, but does comment on identified off-site impacts from surface water, groundwater or soil vapour or the evaluation of geotechnical issues or any other issues associated with the site.

1.8 Guidelines used

This SAR was prepared using the following guidelines made or approved by the ACT EPA:

- NSW EPA (2014), *Technical Note: Investigation of Service Station Sites;*
- NEPM (2013),*National Environment Protection (Assessment of Site Contamination) Measure 2013, National Environment Protection Council (NEPC);*
- ACT EPA (2011), *Information Sheet No. 1 Decommissioning, Assessment and Audit of Sites Containing Above Ground or Underground Fuel Storage Tanks*;
- ACT EPA (2011), *Information Sheet No. 2 Requirements for the Assessment and Validation of Former Service Station Sites in the ACT;*

- ACT EPA (2011), *Information Sheet No. 3 Requirements for the Assessment and Validation of sites containing above ground or underground fuel storage tanks in the ACT*;
- ACT EPA (2009), *Contaminated Sites Environment Protection Policy*;
- NSW DEC (2006), *Contaminated Sites: Guidelines for NSW Site Auditor Scheme;*
- ANZECC (2000), National Water Quality Management Strategy, Paper No. 4,Australian and New Zealand Guidelines for Fresh and Marine Water Quality, October 2000, Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ).

2. Site conditions & environmental setting

2.1 Site identification

The site is located at 16 Ipswich Street, Fyshwick, ACT and at the time of the audit was occupied by a former petroleum depot, including rail siding, seven above ground storage tanks (ASTs), one underground storage tank (UST), a fire water tank and foam plant, a garage and truck wash and a site office and interceptor. It is legally identified as Block 9, Section 8 – Division of Fyshwick in DP5469 vol: 832 Folio: 21. The area of the site is approximately 20 500 m^2. The site location is shown in **Appendix A** (Figure F1 from AECOM DEA Report).

2.2 Audit boundary

The site audit report relates to the site boundary detailed on Figure F2 in AECOM's DEA Report (**Appendix A**).

2.3 Site description

AECOM referenced an ENSR (2008) report and described the site as follows:

- Concrete / bitumen surface cover for the majority of the site except the rail siding area;
- A rail siding linked to the Canberra-Queanbeyan railway in the north portion of the site.
- Seven above ground storage tanks (ASTs) and one underground storage tank (UST):
- two ASTs were used to store diesel, one AST was used to store unleaded petrol, one AST for storage of lead replacement petrol and two ASTs for storage of heating oil. The UST was for oil recovery.
- A tanker filling gantry and aboveground fuel lines in the western portion of the site.
- A fire water tank and foam plant in the south western portion of the site, with associated above ground fire hydrant lines located across the site.
- A garage and truck wash in the southern portion of the site.
- A site office and interceptor in the south western cover of the site, next to the entrance to Ipswich Street. A network of bunding and underground drains lead to the interceptor.
- Storerooms in the south east and south west of the site.

These features are shown on Figure F2 in AECOM's DEA Report (**Appendix A**). No information has been on the exact date when the site ceased operation as a fuel terminal, but photographs provided to the auditor suggest that the site was still in operation in 2005.

2.4 Surrounding land uses

The site is located within a predominantly commercial / industrial area. The site is bounded as follows:

- North: an open vegetated land was located between the northern site boundary and the Canberra-Queanbeyan Railway which was located approximately 30 m from the northern site boundary. This parcel of land contains existing groundwater monitoring wells that have been previously recorded with PSH. Commercial properties including Harvey

Norman are located immediately beyond the railway line, approximately 70 m from the site boundary.

- South: light commercial properties including an appliance retail outlet and an engineering workshop.
- West: Ipswich Street was located immediately adjacent to the western site boundary, beyond which there is undeveloped land.
- East: A scrap metal yard (including a pile of car bodies and possible old USTs / ASTs) was located immediately adjacent to the eastern site boundary.

Potentially sensitive areas located near the site include:

- A stormwater system which runs under the site from the north to the west
- Jerrabomberra Creek, which is located approximately 550 m north west of the site.

2.5 Topography

The reviewed reports didn't comment specifically on the site topography. However the monitoring well survey data included in the DEA Report suggest that the elevation of the site is approximately 565 to 570 metres AHD with the highest elevation being in the south.

2.6 Hydrology

Jerrabomberra Creek is located approximately 550 metres north west of the site. The open space area to the north of the site has a small drainage line in which water was observed to flow during the auditor's site inspection of 31 March 2017. The water flowed in a westerly direction. Stormwater culverts observed in the drainage line suggest that it is an area designed for regional stormwater management rather than an area of ecological importance. There was no evidence of any drainage lines, swales or culverts that could direct surface water run off from the site to the drainage line in the open space area.

2.7 Geology

Published information suggests that the area of Fyshwick is underlain by the following geological units:

- Permian aged 'Fyshwick Gravel' consisting of quartz pebble gravel and coarse sandstone.
- Middle Silurian aged calcareous shale, limestone, sandstone, tuff, porphyry and altered acid lavas.
- Quaternary sediments consisting of soil, clay, silt, sand and gravel.

Interpretation of the Canberra 1:250,000 Geological Series Sheet (1960) suggests the site is underlain by the Permian aged sandstone and is in close proximity to a south west running fault, as well as the middle aged Silurian formation and Quaternary age sediments.

Intrusive works documented in the AECOM 2010 DEA Report and past investigation reports indicated that the subsurface conditions beneath the site comprised shallow clay soil on top of weathered siltstone.

2.8 Hydrogeology

The HERA report referenced to an earlier investigation report for the information obtained from the Bureau of Mineral Resources, Geology and Geophysics that indicated the groundwater within the Fyshwick area is suitable for domestic, agricultural and irrigation uses with salinity ranges of between 500 and 1,000 mg/L. The estimated yield is however low at less than 0.5 litres per second. The regional deeper aquifer is located with the Canberra formation at depths greater than 7m bgl.

Based on past investigations the HHERA report suggested that an aquifer exists in the weathered bedrock profile at the site and it confined by an overlaying clay layer. Perched shallow groundwater appears to occur in the clay and clayey gravel layers in the up-gradient area of the site.

The DEA report stated that the static water level (SWL) for 20 shallow groundwater monitoring wells ranged from 0.097 m below top of casing (m btoc) (MW137S) to 6.331 m btoc (MW131S), or from 558.423 m AHD (MW130S) and 564.917 m AHD (MW107S). The interred shallow groundwater flow direction was to the north.

The DEA report documented that PSH was observed in three deep monitoring wells (MW126D, MW14 and MW117D). MW14 and MW117D are located off-site. The standing water level (or piezometric surface) for 19 deep groundwater monitoring wells ranged from 3.482 m btoc (MW129D) to 9.269 m btoc (MW15), or 556.661 m AHD (MW13) and 562.046 m AHD (MW112D). The inferred deep groundwater flow direction was to the north.

Figures F3 and F4 of the DEA Report (**Appendix A**) show the interpreted groundwater flow direction in the shallow and deeper aquifers respectively.

In general, the information presented in the DEA, HHERA and Site Validation reports and other supporting documentation was adequate in describing the site setting and the surrounding properties. Inspection of the site by the auditor confirmed that site conditions were consistent with details presented in the AECOM and ECS reports.

3. Data quality objectives

Data quality objectives (DQOs) were presented in all reports reviewed as part of this audit. The DQOs generally followed the process established in the *Auditor Guidelines* or guidelines applicable at the time of reporting.

The DQOs in the Validation Report were based on results from previous investigations (conducted by ENSR/AECOM), the nature of the development and relevant investigation levels accepted by the ACT EPA for urban redevelopment.

The auditor considered that the DQOs presented by ECS (and associated quality control elements such as data quality indicators) were acceptable for the purposes of confirming the extent of hydrocarbon contamination in groundwater. Further information on the evaluation of specific QA/QC procedures is provided in Section 10 of this report.

4. Site history

A review of site history by AECOM (HHERA Report) was based on earlier investigations. A summary of information of the site history (and information identified in relevant references) is presented in Table 2.

Table 2 Summary of site and associated historical activities

Year	Site activities
1958	The site was purchased for development as a fuel terminal and had formerly been unleased Crown Land.
After 1965	The majority of the site was constructed
1981	The site usage changed from terminal to depot operations
1991 (August)	Ten semi-buried tanks (SBTs) were removed from the site. No information was provided in the HERA on the location of where these tanks were located. Earlier documentation referenced in the HHERA stated that the SBTs had been located to the west of the bunded area. There was no validation data presented in any of the reports (or supporting documentation) reviewed as part of this audit.
1993 to 1998	A number of fuel losses – via spillages – were recorded, ranging from 5 L to 900 L (the most significant occurring in 1994). No documentation was provided in relation to the locations of the spills. Spillages were anecdotally reported to be associated with the delivery of diesel and petroleum fuel at the former railway siding.
2005	The site was still in operation

The site history reviews provided sufficient evidence that the site's primary historical usage which had the potential to result in groundwater contamination was fuel losses at the site.
The auditor did note there was no discussion on the frequency of use or the significance of the foam plant that was located on the mid southern boundary of the site. Given that three 20 litre drums AFFF were identified during the site inspection by the auditor, there would be an expectation that groundwater monitoring events should have included per and poly fluoroalkyl substances (PFAS).
Notwithstanding the absence of PFAS characterisation, the various sources of historical information were sufficient to characterise the former uses of the site and the potentially contaminating activities on the site.
The distribution of the sampling locations used to characterise the extent of contamination (discussed in Section 8) was sufficient to identify areas of concern.
The identified contaminants of potential concern for the assessment programs, namely total petroleum hydrocarbon (TPH), benzene, toluene, ethylbenzene and xylene (BTEX) and polycyclic aromatic hydrocarbon (PAH) were consistent with the documented historical use.

5. Potential chemicals of concern

The potential contamination activities identified were the use of the site as a fuel depot with related storage of fuel in above and underground storage tanks. As such, the DEA, HERA and Site Validation reports stated that the identified key contaminants of concern comprised hydrocarbons, with the potential for other contaminants including metals.

The identified potential contaminants of concern were:

- Total Petroleum Hydrocarbons (TPH) / Total Recoverable Hydrocarbons (TRH)
- Polycyclic aromatic hydrocarbons (PAHs)
- Phenols
- Benzene, Toluene, Ethyl Benzene and Xylenes (BTEX)
- Heavy metals including lead, zinc and chromium

Based on the site history and previous investigation results, the suite of analytes selected for the site characterisation, risk assessment and Validation Report were generally appropriate. PFAS however was not identified as a potential chemical of concern and was not tested in soils or groundwater.

6. Conceptual site model

The DEA Report did not include a conceptual site model. A conceptual site model (CSM) was however included in the HHERA report (AECOM 2011) which provided a comprehensive evaluation of the sources that could present an increased risk of exposure to receptors (both human health and the environment) and the pathways by which the receptors could be exposed. A copy of this CSM (Figure F1 of the HHERA) is included in **Appendix A**.

Identified primary sources included identified product storage and site operations, former spill areas, the fire and foam tank and associated pipelines, the rail siding and associated pumping infrastructure. Pathways included leaching of soil contaminants that could affect groundwater quality, wind erosion and atmospheric dispersion of soil, groundwater flow and vapour migration.

Some heavy metals were identified above the relevant ANZECC freshwater guidelines in the surface water in the drainage line to the north of the site (along with trace amounts of petroleum hydrocarbons). Ecological receptors were discounted as being at risk from site based impacts as it was considered unlikely that impacted groundwater would reach either Jerrabomberra Creek or the associated wetlands.

The site setting (including surface cover and depth to groundwater) was considered in defining potential pathways to human exposure. The key exposure pathways were direct exposure to chemicals in soil, inhalation of chemicals in wind blow dust and inhalation of vapours from soil or groundwater into indoor air.

A conceptual site model was provided in the Site Validation Report (ECS 2017) which identified petroleum hydrocarbons in the soil and groundwater on-site and off-site as the contaminants of potential concern. The CSM provided details on exposure pathways and receptors.

The development of a CSM essentially provides the framework for identifying the potential sources of contamination and how potential receptors may be exposed, either in the present, or the future.
Based on the information provided in both the HHERA and Site Validation Report, the likely complete and potentially complete pathways between the known or potential sources and receptors were suitably defined to allow risks of exposure to be evaluated.

7. Assessment criteria

7.1 DEA Report (AECOM 2010)

The DEA reported adopted investigation levels documented in the following guidelines:

- NSW EPA 1994, *Guidelines for Assessing Service Station Sites*
- NSW DEC 2006, *Guidelines for the NSW Site Auditor Scheme* (2nd Edition)
- NEPC 1999, *National Environmental Protection (Assessment of Site Contamination) Measures 1999* (NEPM)
- ANZECC 2000, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*.

Considering the site was used for commercial / industrial land use, the following soil screening criteria were adopted:

- TPH and BTEX from the *Guidelines for Assessing Service Station Sites*
- Metals, PAH and phenols from the Auditor Guidelines.

Given the closest surface water body was a freshwater creek, ANZECC trigger levels for protection of 95% of freshwater species were used for both groundwater and surface water. Given there was no NSW EPA endorsed high reliability assessment criteria for TPH in groundwater, AECOM chose the laboratory reporting limits for TPH as screening criteria.

The HHERA also adopted the same investigation levels for soil, surface water and groundwater as Tier 1 screening values as well as values listed in the *Australian Drinking Water Guidelines* for the BTEX compounds.

7.2 Site Validation Report (ECS 2017)

The Site Validation Report adopted the NEPM (2013) *National Environmental Protection Measure – Assessment of Site Contamination* to assess the concentrations of the targeted chemicals of concern in soil and groundwater.

The soil criteria used during the validation process are summarised below:

- NEPM health screening levels for commercial/industrial (vapour intrusion) – HSL D (vapour), all depths (clay)
- The groundwater assessment criteria included values from:
- NEPM health screening levels for commercial/industrial (vapour intrusion) – HSL D (vapour), depth intervals 2 to 4m and 4 to 8m (clay)
- ANZECC (2000) *Guidelines for the Protection of Aquatic Ecosystems*, namely protection of 95% of freshwater species.

The auditor considered that soil and groundwater screening criteria adopted in the DEA (and HERA) report were appropriate at the time the investigation was conducted.

The auditor acknowledged that many of the threshold levels in the *Guidelines for Assessing Service Station Sites* have been superseded, but prepared a comparison of the "old" hydrocarbon values to similar "new" hydrocarbon values. Consequently, the auditor compared the various fractions of TPH in the soil sampling data set presented in the HHERA

to the HSL fractions for F1 and F2 as listed in in NEPM (2013). The comparison showed that the HSLs (vapour intrusion) for sand for the F1 and F2 fractions were not exceeded for any samples except from those collected at three locations (MW136 and 138 in the south western corner of the site and MW125 within the former rail siding). All three locations had been recognised in the HHERA as presenting potential vapour intrusion risks should buildings be constructed in these areas.

ECS considered the HSL screening criteria for soils and groundwater for a commercial/industrial land use as listed in the NEPM. Although the nominated exposure scenario was correct, there were some errors in the selection of screening levels, namely:

- No discussion on the relevant soil type was provided (i.e. ECS selected clay, but provided no justification – soils on site are largely clayey);
- The nominated groundwater HSL for vapour intrusion was 3 mg/L, yet the relevant HSL should have been 30 mg/L.

The use of the ANZECC water quality guidelines was consistent with ACT EPA requirements.

8. Environmental investigations

8.1 Delineation Environmental Assessment (AECOM 2010)

The stated objectives of the delineation environmental assessment (DEA) were to

- assess whether underground storage tanks (USTs) were present in the on-site car park area and assess soil and groundwater conditions in this area.
- delineate previously identified phase separated hydrocarbons (PSH) and dissolved phase contamination identified in off-site monitoring wells.

The scope of work completed by AECOM included:

- Review previous investigation reports.
- Completion of a ground penetration radar (GPR) survey in the car park area of the site. Drilling three on-site bores (BH136S, BH137S and BH138S) in the on-site car park area which were subsequently converted into shallow monitoring wells.
- Drilling four off-site bores (BH132S, BH133S, BH134D and BH135D) in the car park at Harvey Norman which were subsequently converted to monitoring wells. These wells were installed to delineate previously identified off-site petroleum impacts at MW117D and MW14.
- Completion of a groundwater monitoring event (GME) of the seven new monitoring wells and 39 existing on-site and off-site wells.
- Collection of three PSH samples from MW14, MW117D and MW126D for fingerprinting analysis.
- Collection of three surface water samples from the stormwater channel located off-site to the north of the site.
- Analysis of all soil and groundwater samples for a combination of the following analytes:
  - BTEX
  - TPH
  - Lead
  - PAH
  - Dissolved 13 metals (groundwater only)
- Collection of quality assurance / quality control samples, comprising duplicate samples, equipment blank (rinsate) samples and trip blanks.
- Survey of the elevation and location of the new monitoring wells. Given many of the wells went dry during purging or sampling, the permeability of the aquifer was likely to be low.
- Preparation of a factual delineation ESA report.

The DEA report made the following conclusions:

- The ground penetration radar (GPR) survey indicated the presence of two potential USTs beneath the on-site car park located in the south western portion of the site.
- TPH (C6-C9) impact in shallow soil was detected at three locations (BH136, BH137 and BH138) in the on-site car park. However, petroleum hydrocarbon impact to groundwater was not detected in the monitoring wells installed in these areas.

- No petroleum hydrocarbons were detected above the LOR in soil and groundwater samples from the locations drilled in the Harvey Norman car park.
- Dissolved phase petroleum hydrocarbons impact were detected in a number of existing wells.
- PSH was detected in three deep wells, with a recorded thickness of approximately 8 m in MW126D (on-site) 1.4 m in MW14 (off-site) and 0.067 m in MW107D (off-site).
- Concentrations of TPH (C6-C9) and TPH (C10-C36) were detected in the surface water samples collected from the offsite channels.
- Groundwater flow direction in the shallow and deeper zones of the aquifer was deemed to be generally to the north. The groundwater flow velocity was calculated to be in a range of 0.033 to 12.099 m/year.
- MNA parameters such as methane, nitrate, carbon dioxide, iron II, sulfate and manganese were tested in groundwater collected from MW1, MW4, MW115 and MW12.

Figure F5 for the DEA Report (**Appendix A**) shows the results of the groundwater monitoring both on site and off site. Tables from the DEA (as presented in the HHERA) are shown in **Appendix B.**

8.2 Auditor comments on AECOM DEA Report

The DEA report confirmed that former activities at the site had contaminated soils and groundwater. The primary chemicals of concern were TPH and BTEX compounds.

The distribution of the sampling locations and types and depths of samples collected was sufficient to define the areal extent of impact, the most significant being in the vicinity of the former railway siding in the northern portion of the site and to the immediate north in the open space area. The sampling conducted in the Harvey Norman car park demonstrated that migration of hydrocarbons had not extended beyond the Canberra-Queanbeyan railway line.

The report did not present details on how the groundwater flow direction was calculated. The general flow direction probably reflects that of the topography which slopes down to the north The mounding of the groundwater table may be in response to the various elevations on the site and accumulation of perched water in the tanks pits and more permeable soils/fill (e.g. gravels to the west of the tank farm.

The range of calculated groundwater flow velocities was large with the lower end of the range likely to be representative of the aquifer characteristics given the observations of the many of the wells becoming dry during purging and sampling.

Although AECOM collected samples for analysis of MNA parameters, there was no discussion on their significance and only four locations were selected for sample collection. The auditor did note that indicators of biological degradation such as the presence of methane and carbon dioxide were recorded in some of the samples. Along with electron acceptors such as sulfate, Fe II and nitrate, it appears that the aquifer has the capacity to support biodegradation of the hydrocarbons in the groundwater.

8.3 Human health and Ecological risk assessment

8.3.1 URS (2007)

In 2007, AECOM prepared a Human Health and Ecological Risk Assessment (HERA) for on-site and off-site impacts originating from the site. AECOM followed the approach recommended in NEPM (NEPC 1999) and enHealth (2004) *Environmental Health Risk Assessment, Guidelines for Assessing Human Health Risks from Environmental Hazards*.

The objective of the HERA was to assess whether measured concentrations of chemicals of concern (principally PSH, TPH, and BTEX) in soil and/or groundwater had the potential to represent an unacceptable risk to human health or the environment for existing land uses, both on and off site. The HERA included the following elements:

- Compilation of relevant soil and groundwater data.
- Identification of primary sources that included identified product storage and site operations, former spill areas, the fire and foam tank and associated pipelines, the rail siding and associated pumping infrastructure. Pathways included leaching of soil contaminants that could affect groundwater quality, wind erosion and atmospheric dispersion of soil, groundwater flow and vapour migration.
- Exposure assessment including definition of scenarios that may apply to the site and surrounds. The human health exposure scenarios were considered to be current or future commercial workers on site, off site commercial workers; and workers undertaking intrusive activities on and off site. The site setting (including surface cover and depth to groundwater) was considered in defining potential pathways to human exposure. The key exposure pathways were direct exposure to chemicals in soil, inhalation of chemicals in wind blow dust and inhalation of vapours from soil or groundwater into indoor air.
- Quantitative exposure assessment.
- Hazard assessment.
- Risk characterisation.

Some heavy metals were identified above the relevant ANZECC freshwater guidelines in the surface water in the drainage line to the north of the site (along with trace amounts of petroleum hydrocarbons). Ecological receptors were discounted as being at risk from site based impacts as it was considered unlikely that impacted groundwater would reach either Jerrabomberra Creek or the associated wetlands.

As per the NEPM, AECOM conducted the risk assessment in two tiers; the first being a screening process to identify chemicals of potential concern (COPCs) followed by the second tier, a quantitative risk characterisation of receptors that may have an unacceptable exposure to site contamination.

The tier 1 screening phase identified that measured soil and groundwater concentrations for BTEXN and TPH exceeded the relevant HSLs. The presence of PSH was also considered to be a potential exposure hazard.

The tier 2 quantitative risk assessment focused on exposure to inhalation of vapours in the outdoor or indoor air from soil, groundwater, or PSH. The potential exposed receptors included on and off site commercial workers, intrusive workers undertaking excavation, and visitors.

The HERA concluded that there were complete source-pathway-receptor linkages. These inlcuded exposure to current and potential future on-site commercial workers from incidental

ingestion and/or dermal absroption of soil, inhalation dust and inhalation of vapur derived soil or groundwater following transport to indoor or outdoor air.

The HERA estimated that there were potentially unacceptable threshold (hazard index of 1.27) and non-threshold (incremental cancer risk 8.13E-05 (1 in 12,500)) risks to potential future site users occupying buildings constructed over areas of significantly contaminated soil from inhalation of benzene vapours derived from soil contamination. Groundwater contamination was not estimated to give rise to unaccpetable threshold risks. Current (at the time of reporting in 2007) site users were not considered to be at unacceptable risks as the risk-driving pathway was via indoor inhalation of vapours derived from soil contamination, as the existing buildings are located in areas where soil contamination was not observed above the SSTLs derived in the HHERA.

For off site human receptors, no soil or groundwater contamination was detected at the Harvey Norman site. For receptors in the rail corridor, unacceptable risks of exposure were only estimated to be possible if a building is constructed over identified areas of soil contamination.

Overall, the risk assessment presented a comprehensive summary of the data used to prepare a source-pathway-receptor conceptual site model for current exposures and future exposures that are identical to the current exposures. The auditor considered that the potential receptors at risk of exposure were appropriately identified based on the site specific data used and many of the assumptions used in the risk characterisation were relevant. There were however some matters that the auditor considers require further explanation or justification. These are presented as follows:

1. The document was dated 13 February 2007, and uses references that were current in 2007, e.g., USEPA Region 9 PRGs. However, many screening levels and toxicity values have been updated subsequent to the Document date and the Region 9 RPGs have been replaced with the USEPA RSLs (most recent version dated May 2016). Further evaluation is necessary to confirm the identification of COPCs is appropriate and that the toxicity values used in the risk characterization are current.
2. Section 3.4.1 states that the areas of greatest soil impact have not been assessed. This statement limits the utility and applicability of the Document. The Document should clearly state how this limitation in the soil characterization data impacts the results of the risk characterization and how these limitations affect the interpretation of the results and conclusion that risks are acceptable.
3. Section 3.4.2 discusses the potential for off site migration of PSH and groundwater and includes discussion of the concentrations of TPH detected in these media. The evaluation of these data concludes that surface water need to be adequately delineated to complete the environmental assessment. In the absence of additional data the Document should instead conservatively evaluate the concentrations in PSH and groundwater assuming these concentrations are measured in the surface water. If such an evaluation does not identify the need for additional action, then the lack of surface water data does not result in a gap through the lack of an environmental assessment.
4. Section 3.6 screens site data using generic screening criteria for drinking water and soil direct contact; however, no screening criteria appropriate for evaluating potential vapour intrusion are used. Further screening using criteria for the vapour intrusion route of exposure is necessary to confirm the appropriate COPCs are included in the risk characterization.

5. Section 3.6.3 lists at least one maximum detected concentration from the first 0.5 m. However, direct contact (incidental ingestion and dermal contact) for commercial workers and intrusive workers is not quantitatively evaluated in the risk characterization. It is necessary to include the quantitative assessment of these routes of exposure or explain the current (and assumed future) site conditions that preclude these calculations.
6. Section 4.4.1 states that the higher TPH fractions "have been slipt conservatively assuming a 50/50 ratio for aromatic and aliphatic". Additional discussion is necessary in the Document to describe why this assumption is conservative. Alternatively, the TPH could be assumed to be 100% aromatic and 100% aliphatic fractions.
7. Section 4.5 includes a reference to "Section 3.4.4", which is not a section in the Document. The reference to this section discusses the use of the vapour model as a screening level tool. It is necessary to include the correct reference to clearly document how the vapour model was used.
8. The risk estimates in Table 6-1 and Table 6-2 sum the risks for both indoor and outdoor inhalation exposures by media. This results in an assumed exposure time of 10 hours/day, every working day, for a chronic exposure duration. This assumption results in risks that are beyond the reasonable maximum exposure (RME). It is necessary for the document to adequately characterize the conservative nature of these results based on the assumptions implicit in this summation.
9. The risk estimates in Table 6-1 further sum the risks for soil and groundwater. This results in an assumed exposure time of 20 hours/day, every working day, for a chronic exposure duration, which is well beyond the RME for workers. It is necessary to either remove this unnecessary conservatism or to document the extremely conservative nature of these results.
10. The toxicity data used in the on site calculations in Appendix A are two times lower than the values in Table 5-1, after unit conversion that assumes a standard breathing rate of 20 m^3/day and a standard body weight of 70 kg. It is necessary to explain how the toxicity values in these tables were calculated.
11. Table 3 of Appendix C assumes saturated vapour concentrations emanate from the PSH. This is an extremely conservative assumption that is unnecessary. Raoult's Law should instead be used to calculate the concentration in the vapour phase from the PSH.
12. Appendix C does not describe whether the inputs to the indoor air vapour model are conservative, reasonable, etc. relative to the current on-site buildings. It is necessary to either include this discussion so the results of the risk characterization can be correctly interpreted or to explain the conservative default values are used to account for future conditions where different buildings could be present over the areas investigated.

Given that the auditor was engaged after the risk assessment process had been completed, comments on its contents could not be addressed. Consequently, the auditor requested ECS prepare a site management plan to inform site users of the hazards associated with the contaminated soil and groundwater contamination and the conditions required to avoid exposure. Auditor commentary on the site management plan is presented in Section 9.

8.3.2 AECOM (2011)

In 2011 AECOM prepared another human health and environmental risk assessment (HHERA to assess whether the hydrocarbon contamination detected on site and off site could present an unacceptable risk of exposure to human health and environmental receptors. This was

considered necessary as additional site characterisation had been completed since the 2007 HHERA resulting in a change to the Conceptual Site Model. The HHERA also included a fate and transport model to predict the behaviour of the hydrocarbons in groundwater beneath the site.

AECOM followed the approach recommended in NEPM (NEPC 1999) and enHealth (2004) *Environmental Health Risk Assessment, Guidelines for Assessing Human Health Risks from Environmental Hazards*. The process used by AECOM was consistent with the approach used in preparing the 2007 HHERA and used data presented in the following reports:

Comprehensive Environmental Site Assessment Shell Canberra Depot (ACM107C) 16 Ipswich Street, Fyshwick, ACT (ENSR, 2008).

Delineation Environmental Assessment, Shell Canberra Depot (ACM107C) 16 Ipswich Street, Fyshwick, ACT (AECOM, 2010) – the auditor noted that all relevant data from the Comprehensive Environmental Assessment has been incorporated into the DEA report.

Summary tables showing the data used in the HHERA are presented in **Appendix B**.

The HHERA assessment considered the risks to current and potential future on-Site commercial workers via exposure from incidental ingestion and/or dermal absorption of soil, inhalation of dust and inhalation of vapours derived from soil or groundwater following transport to indoor or outdoor air. Ecological receptors were discounted as being at risk from site based impacts as it was considered unlikely that impacted groundwater would reach either Jerrabomberra Creek or the associated wetlands.

Potentially unacceptable non-threshold risks to potential future site users occupying buildings constructed over areas of the most significantly contaminated soil from inhalation of benzene (Hazard Index (HI) of 1.27) and toluene (HI of 1.14) vapours derived from soil contamination. Groundwater contamination was not estimated to give rise to unacceptable threshold risks.

Current site users were not considered to be at unacceptable risk as the risk-driving pathway was via indoor inhalation of vapours derived from soil contamination. Soil contamination has not been observed above the Site Specific Target Levels (SSTLs) derived in the HHERA in the area sampled around the current buildings. The presence of PSH was not considered to pose an unacceptable vapour intrusion risk at the site.

For off site human receptors, no soil or groundwater contamination was detected at the Harvey Norman site. For receptors in the rail corridor, unacceptable risks of exposure were only estimated to be possible if a building is constructed over identified areas of soil contamination.

The fate and transport model demonstrated that migration of hydrocarbons would not travel further than 50 metres from the site.

The auditor considered that the 2011 HHERA was prepared in a manner consistent with relevant guidelines. The preparation of a conceptual model and the selection of likely pathways and receptors was sufficient to complete a robust exposure assessment. Coupled with the toxicity assessment, the risk characterisation allowed appropriate identification of the risks to human health and the environment.

The auditor's risk assessment specialist independently cross checked AECOM's findings and used the maximum detected concentrations in soil and groundwater to calculate cancer risk and noncancer hazard index estimates. This process confirmed that the maximum detected concentrations in soil would not result in cancer risk estimates greater than 1E-5 or hazard index estimates over 1 for a worker contact scenario.

The cross checking also confirmed that vapour intrusion from groundwater would not result in significant risk estimates, but that the maximum detected concentrations in soil could result in significant vapor intrusion exposure. In addition, the vapour intrusion potential from all detected chemicals in on-site soil indicated that xylenes and naphthalene (not a COC for soil) could also contribute to significant risk estimates. Both of these chemicals had their maximum detected concentrations at location BH/MW-125S, which is where the highest concentration of benzene was also detected. SSTLs for xylenes and naphthalene may therefore need to be calculated.

As mentioned in relation to outcomes of the 2007 HHERA, a site management plan was considered by the auditor to be an appropriate means of informing site users of the hazards associated with the contaminated soil and groundwater contamination and the conditions required to avoid exposure. Auditor commentary on the site management plan is presented in Section 9.

8.4 Site validation report (ECS 2017)

ECS completed additional environmental investigations to assess the suitability of the site for ongoing industrial use that was included in it's Site Validation report. While not a validation report per se, it did focus on confirming the presence/volume of PSH, the area of dissolved phase impact and reevaluated data in relation to contemporary guidelines.

The tasks completed ECS included:

- A site inspection
- Review of historical data
- Groundwater monitoring (onsite existing monitoring wells) in June 2016
- Groundwater monitoring (offsite existing monitoring wells at Harvey Norman car park) in January 2017.
- Product recovery trial

Twenty one on-site monitoring wells (15 shallow and six deep) were sampled in June 2016 and the collected groundwater samples were analysed for TRH and BTEXN.

Three off-site deep monitoring wells in the Harvey Noman car park were sampled in January 2017 and the collected groundwater samples analysed for TRH and BTEXN.

ECS presented a summary of the previous and new data and compared the data set to relevant NEPM (2013) screening levels. This comparison is presented in **Appendix B**.

A product recovery trial was undertaken in June 2016. Three monitoring wells (MW101S, MW126D and MW14) were selected for the trial based on the occurrence of petroleum product in those wells. Each well was pumped for a period of at least 60 minutes. No product was recovered from MW101S (where 0.02m of product had been recorded. MW126D (with an initial PSH thickness of 0.67m) recovered a total of three litres of product while 8.2 litres of product was removed from MW14 (initial PSH thickness of 1.84m). Subsequent gauging of the product thickness in these wells in January 2017 did not record the presence of PSH except a minor amount (two millimetres) in MW126D.

ECS made the following conclusions:

- There had been no significant changes to the conditions of the site since the investigations conducted by AECOM. The majority of the hydrocarbons in groundwater

continues to be present in the vicinity of the railway siding and to the immediate north. A figure showing the interpreted extent of measured and potential extent of groundwater contamination was prepared and ECS stated that the potential extent did not appear to have changed over the duration of investigations.

- The product recovery trial on the three chosen wells demonstrated that active groundwater remediation would not result in significant removal of PSH.
- Given there was little change to the locations and concentrations of hydrocarbons in groundwater (and PSH), ECS considered there were still potentially unacceptable risks to potential future site users occupying buildings constructed over areas of the most significantly contaminated soil from inhalation of benzene vapours derived from soil contamination. Phase separated hydrocarbons (PSH) could present a vapour intrusion risk for benzene and volatile TRH to site users occupying buildings constructed over areas with presence of PSH within groundwater.
- Remediation or management are considered necessary if building are constructed over the areas of significant impact which are:
  - Above the north of the gantry
  - Above the USTs in the car park area (BH123S)
  - Above or to the north of the railway siding.
- The site was considered suitable for commercial / industrial purposes (metal recycling) excluding the construction of buildings over areas of significant soil and/or groundwater impact.

8.5 Auditor comments on ECS Report

The auditor considered that a groundwater monitoring program (GMP) of existing wells both on site and off site was a necessary task given the time that had elapsed since theinvestigations completed by AECOM in 2009/2010 (the data from which were subsequently used in the 2011 HHERA).

The sampling locations and the analytes selected for the GMP were sufficient to allow the extent of the plume to be characterised and allow a meaningful comparison to previous data sets. The range of data presented by ECS was consistent with the range of the data sets collected by AECOM and demonstrated that the plume shape and extent is relatively stable. This is probably a reflection of the low permeability of the geology (the majority of the groundwater wells were purged dry during sampling activities) and that there has been no activity on the site for almost a decade. The results of the sampling program were also a means of verifying the fate and transport model prepared by AECOM.

The product recovery was a useful exercise in evaluating the feasibility of implementing an active PSH removal program. The volume of PSH was probably at or near its maximum given that it was over six years since the wells were gauged and/or sampled by AECOM. The low volumes of product that were recovered (most likely a combination of the PSH that was present in the well and the sand annulus) and the absence of PSH in the wells six months later demonstrate that PSH removal is not likely to be practicable.

No discussion or commentary has been presented on treating dissolved phase hydrocarbon contamination. The following lines of evidence suggest that active remediation of the dissolved phase hydrocarbon contamination at the site is not warranted:

- The plume is well defined and has been demonstrated to be stable in it's extent and shape;
- There are no activities at the site that could contribute any further to the contaminant load
- The risk assessments prepared by AECOM predicted that groundwater contamination did not present an unacceptable exposure risk to site occupants
- A site management plan has been prepared that identifies the location of contamination soil and groundwater and informs site users of the actions that should be implemented to avoid exposure to the contamination.
- There is currently no extraction and/or use of groundwater in and around the plume. Extraction rates of groundwater would be expected to be low as evidenced by most wells running dry during sampling.
- There is evidence that biodegradation of the hydrocarbons is occurring
- The measured depth to groundwater was generally greater than seven metres below ground level and there is little likelihood that it could discharge into the drainage line that is located to the north of the site.

Although the report stated that the site was suitable for industrial/commercial use provided there was no construction of buildings over areas of significant impact, there was no mechanism to inform site users of this constraint. Consequently the auditor requested that a site management plan (SMP) be prepared. Discussion on the SMP prepared by ECS is presented in Section 9.

9. Environmental management plan

9.1 Background information

The Site Validation Report stated that further remediation or management were considered necessary if buildings were constructed over the areas of significant impact (based on the outcome of the HHERA). To provide appropriate notification to site users of this constraint, ECS prepared *Environmental Management Plan 16 Ipswich Road Fyshwick ACT* (EMP June 2017) to assist in the ongoing management of the site as a commercial / industrial facility.

A copy of the EMP is provided in **Appendix C**.

9.2 Purpose of the EMP

The purpose of the EMP is to manage potential environmental risks associated with the contamination at the site which may result from excavation activities or construction works. The EMP applies to activities that involve disturbance or exposure to contaminated soil and / or groundwater such as:

- Demolition and removal of pavements
- Underground utility installation, maintenance or removal
- Excavation activities other than maintenance of landscaped areas
- The construction of any buildings or placement of temporary structures.

The EMP stated the identified contamination did not pose a risk to human health or the environment if undisturbed with the current site improvements.

9.3 Responsibilities and control measures

The EMP did not list who was responsible for its implementation, but it is assumed that the owner of the site (Access Trading Company Pty Ltd) would have a legal responsibility to adequately inform any individual or organisation of the hazards that need to be managed.

The control measures discussed in the EMP included preparation and implementation of a safe work method statement (SWMS) for activities that could result in exposure to contaminated materials (e.g. excavation of contaminated soils or contact with groundwater). Construction of buildings / enclosed spaces is prohibited owing to the potential vapour inhalation risks.

The SWMS should be prepared by a competent person, who has acquired through training, qualification or experience, the knowledge and skills to identify, investigate and assess the risks associated with the proposed works at the site and who is able to develop appropriate risk management and control measures for the work. The EMP required the following information to be included in the SWMS:

- Potential human health risk resulting from exposure to contaminated soil / groundwater
- Waste management
- Site reinstatement
- Contingency measure for unexpected finds

9.4 Revision of the EMP

A revision of the EMP is needed when the conditions related to the site conditions change.

The auditor noted that the EMP did not provide a detailed discussion on potential exposure pathways and procedures for management, but it did provide a figure of the areas showing the contamination distribution. This at least informs site users of the potentially hazardous areas.

The EMP identified the likely activities that could disturb site soils, but did acknowledge that other site disturbance or construction activities may need to be considered. A safe work method was the step considered necessary to manage exposure to human and the environment and waste management and site reinstatement.

The auditor informed Access Recycling of the requirements of ACT EPA's *Policy on Institutional Controls and EMP Enforcement* (2014), in particular:

Following the environmental assessment, remediation and audit of contaminated sites there are instances where ongoing site management is required. These management requirements may be passive or active and must be implemented to ensure any residual contamination is appropriately managed and does not pose an ongoing risk to human health and/or the environment.

For an independently audited site the Auditor must, as a requirement of their accreditation, ensure that any ongoing management plan is legally enforceable.

For sites audited by the Environment Protection Authority (EPA) there must also be measures in place to ensure any ongoing management plan is legally enforceable.

and

Where the EPA and/or an independent auditor requires that privately leased land be managed in accordance with an ongoing site management plan the lessee must request, through Lease Administration of the ACT Planning and Land Authority, a lease variation.

The variation application must request that the conditions of the site's lease be updated to include a condition that the site be managed in accordance with an EPA/Auditor endorsed site management plan (SMP) and that management continue until the EPA (and the Auditor for independently audited sites) agrees in writing that the SMP is no longer required.

Following the variation of the lease the EPA must register a Miscellaneous Application Encumbrance (example in Attachment 1) for the site with the Land Titles Office. The application must reference, and include a copy of, the SMP (and the Site Audit Statement, for audited sites).

Adam Perry in an email of 26 May 2017 stated in response to being informed of this requirement:

Yes we will. I am one of 3 partners who own the land (held in a company – Capital Recycling Solutions P/L).

10. Evaluation of QA/QC procedures

The majority of the investigative work that has been conducted at the site was completed before the auditor was engaged. Consequently, comments on the quality assurance and quality control procedures have taken into account that there was no means of addressing them and whether there were flaws in the scope of works that could have affected the conclusions made regarding site characterisation and identification of risks. The evaluation of the QA/QC procedures has been able to identify the validity of data used to characterise the site and draw conclusions regarding potential exposure risks and site management.

In this regard, the key reports for which the QC procedures were reviewed were the DEA Report and the Validation Report.

10.1 Delineation Environmental Assessment Report (DEA)

The evaluation of the QA/QC procedures relevant to the sampling program presented in the DEA report has been conducted with reference to Appendix V of the *Guidelines for the NSW Site Auditor Scheme (2nd edition)*.

The outcome of this review is summarised in the following tables:

- **Table 3** presents the degree of QA/QC pertinent to the field program;
- **Table 4** presents the degree of QA/QC pertinent to the laboratory program; and
- **Table 5** assesses the data quality indicators of precision, accuracy, representativeness, comparability and completeness.

Table 3 Field QA/QC validation report

Criterion	Auditor's Comments
QA/QC program includes replicate samples	The following field quality control samples were analysed as part of the field work program. **Soil** AECOM reported that the following samples were analysed during installation of seven new groundwater wells: • 14 primary samples for TPH, BTEX, lead, PAH, phenols and metals • 1 duplicate sample for TPH, BTEX, lead, PAH, phenols and metals • 1 split duplicate for TPH, PAH, Phenols **Groundwater** • 36 primary groundwater samples for TPH, BTEX, lead, PAH, phenols and metals • 4 primary samples for natural attenuation parameters (Type 5) • 5 duplicate samples for TPH, BTEX, lead, PAH, phenols and metals • 3 split samples for TPH, BTEX, lead, PAH, phenols and metals • 2 rinsate blanks for TPH, BTEX, lead, PAH, phenols and metals • 3 trip blanks for TRH (C6-C9) and BTEX

Criterion	Auditor's Comments
	PSH: Three samples of PSH were collected for fingerprinting analysis. **Surface water**: Three samples were collected from down gradient stormwater channel. Based on the total number of samples collected, the target frequency of one intra-laboratory duplicate sample in 20, and the target frequency of one inter-laboratory duplicate in 20 were met. The auditor considered that sufficient number and type of quality control samples had been collected to evaluate the precision and accuracy of the field program. An assessment of the RPDs reported in Table T12 of the Delineation Report showed that there were more RPD exceedances than noted in Section 6.2. No explanation was provided by the assessor for the difference. Several errors were noted in the RPD results in Table T12. For example the following omissions were noted: • $TPHC_6$-C_9 results for BH138S_0.3-0.4 / DUP01 were 300 mg/kg and <20 mg/kg respectively, not noted as an RPD exceedance. • TPHC6-C9 results MW128D / DUP06 of <20 ug/L and 10,000 ug/L respectively. • The auditor considers that these omissions could have led to duplicate sample results not being included in the interpretation of the data where the duplicate results were higher than the primary, however this was not noted in the evaluation of the data in the report.
All relevant media assessed	Soil samples were collected during installation of new monitoring wells. Groundwater samples were collected from 36 of the existing monitoring wells on site. PSH samples were also collected and analysed from three monitoring wells. Surface water samples were collected from stormwater channels located offsite. The auditor agreed that the sampling scope was appropriate given the purpose of the investigation was to delineate previously identified groundwater impacts and address identified data gaps.
Appropriateness of sampling strategy	The sampling strategy was considered generally appropriate based on site history, the identified areas of concern and data gaps from previous investigations. The number and location of soil and groundwater sampling locations was considered suitable to delineate the extent of off site impacts and previously identified data gaps.
Sample collection, handling and transportation procedures	Minimal detail was provided by AECOM on sampling methodologies. No information on sample collection procedures was specified for surface water samples or PSH samples. It is noted that groundwater samples were collected using bailers can cause volatile losses. AECOM noted that groundwater samples were purged prior to sampling and that field parameters were monitored and allowed to stabilise to within 10% prior to sampling. Field sheets were

Criterion	Auditor's Comments
	provided in Appendix E. It is noted that the majority of wells were purged dry prior to sampling. AECOM noted that samples were collected in appropriate laboratory supplied containers and were kept chilled until received by the laboratory. A review of the COC documentation confirmed that samples were generally received in appropriate condition. The auditor has reviewed AECOM standard procedures previously on other occasions and accepts that they allow collection of representative samples. The auditor considered the sample collection, handling and transportation were completed in general accordance with standard industry practice.
Sampling is representative of site conditions	Groundwater samples were collected from new monitoring wells immediately (one day) after installation, however were also analysed a week after.
Field QA/QC plan	The Delineation report recorded that the samples collected and analysed using sampling methods considered to be consistent with accepted industry practice. No information was provided on decontamination procedures. The auditor considered that the lack of decontamination procedures could not result in false negatives. AECOM reported that samples were placed in a chilled, insulated container following their collection. The container with the samples was submitted to NATA accredited laboratories under chain of custody procedures. The Delineation report supplied copies of the chain of custody forms identifying the samples collected, the requested analytes and the date of collection. The trip blanks were analysed for volatile hydrocarbons. No chemicals were detected in any of the trip blanks. Rinsate blank were collected from the interface probe. No CoPC were identified in the analysis of these samples. It is noted that no rinsate or trip blank samples were obtained during soil sampling. Calibration records for PID and water quality meter, were provided in Appendix D. Overall, the auditor considered that AECOM conducted the sampling program(s) in a manner that generated data upon which appropriate decisions could be made

Table 4 Laboratory QA/QC validation report

Criterion	Auditor's Comments
Appropriate methodologies used for sample analyses	The primary laboratory used for analysis of the field soil and groundwater samples was: MGT Environmental Laboratories– NATA Registration No. 1261 The secondary laboratory used for analysis of the split duplicate soil samples was: LabMark Environmental Laboratories – NATA Registration No. 1645 The laboratory reports were NATA stamped and signed by a NATA signatory. The secondary laboratory used for analysis of the groundwater split duplicate samples was ALS Environmental. The ALS report was not provided in the appendices of the AECOM report. Leeder Consulting was used for fingerprinting analysis of PSH samples. The Leeder report for fingerprinting analysis was not provided in the appendices of the AECOM report, and it is likely that this methodology is not NATA accredited. Given the range of calculated ages of the PSH and the varying composition, the information provided by the PSH fingerprinting was considered academic and did not assist with the site characterisation.
Appropriate practical quantitation limits	All soil, groundwater and surface water sample results were generally reported with PQLs below the site investigation levels.
Laboratory QA/QC plan	Copies of signed chain of custody forms were presented in the Delineation report (apart from split duplicates sent to ALS). All samples were received and analysed within specified laboratory holding times. Samples were received by the project laboratories chilled and intact, and were extracted and analysed within acceptable holding times. The analytical methods (apart from fingerprinting) used were accredited by NATA. Laboratory quality control samples included internal duplicates, matrix spike and matrix spike duplicates and method blanks. The types of QA/QC samples analysed by the laboratories for the documented samples were considered sufficient to assess the precision and accuracy of the laboratory methods used. AECOM noted that all laboratory QA/QC met the required criteria and did not note any exceedances. The auditor reviewed 10% of laboratory QA/QC and did not find any exceedances.

Criterion	Auditor's Comments
	The statistical data presented in the laboratory QA/QC reports were considered adequate in demonstrating the precision and accuracy of the methods used to analyse field samples.

Table 5 Overall Sampling and Analysis Methodology Assessment

Field Considerations	Laboratory Considerations
Precision requirements	
SOPs appropriate and complied with.	Analysis of: • laboratory and inter-laboratory duplicates; • field duplicates; and • laboratory prepared volatile trip spikes.
Precision comments	
SOPs were not presented in the Delineation Report. However, the auditor had previously reviewed them for other projects and the methods stated in the report were consistent with the SOPs. Field precision was documented through the collection of duplicate samples. Rinsate blanks were collected to assess the decontamination procedures and trip blanks were collected and analysed to assess the potential for cross contamination during sample storage. No trip spikes were collected and analysed to assess potential volatile loss during sample handling and transport. Given the trip blank samples results were less than laboratory detection limits, it is not considered that trip spikes would be a relevant or a necessary quality control component for this project.	Intra and inter laboratory samples were collected and analysed to assess field quality control during the field work program. The overall frequency of QA/QC samples reported exceeded 20%. The results of the comparison of the primary and duplicate analyses did show some discrepancies which were not considered by the auditor to affect the validity of the data sets.
Accuracy Requirements	
SOPs appropriate and complied with.	Analysis of: • Field blanks; • Rinsate blanks; • Reagent blanks;

Field Considerations	Laboratory Considerations
	• Method blanks; • Matrix spikes; • Matrix spike duplicates; • Surrogate spikes; • Reference materials; • Laboratory control samples; and • Laboratory prepared spikes.
Accuracy Comments	
No SOPs were provided in the Delineation Report.	All rinsate and trip blanks collected during groundwater sampling reported concentrations of analytes below the LORs There were no rinsate or trip blank quality control samples analysed during the soil program. No field blanks were prepared or analysed during the soil or groundwater sampling. Internal laboratory samples such as matrix spikes, matrix spike duplicates, laboratory and surrogate spikes were analysed by the primary and secondary laboratories.
Representativeness Requirements	
Appropriate media sampled according to SAQP. All media identified in SAQP sampled.	All samples analysed according to SAQP
Representativeness Comments	
The SAQP was not provided for review. The number of samples collected at the various areas of concern was sufficient to characterise the presence of contamination.	The sampling program was considered appropriate. The use of NATA accredited laboratories and the selection of chemicals of interest for the identified media of concern demonstrated due consideration for the aims of the delineation program.
Comparability Requirements	
Same SOPs were used on each sampling occasion. Experienced sampler.	Sampling analytical methods used. Sample PQLs used to report analyte concentrations. Same laboratories used to analyse samples.

Field Considerations	Laboratory Considerations
Impacts of climatic conditions on sample integrity; samples were chilled and received within holding times. Same types of samples collected from each media.	Same units used to report analyte concentrations.
Comparability Comments	
Fourteen soil samples, 42 groundwater samples (6 newly installed wells sampled twice) and three surface water samples were collected. The specific sampling team or the experience of the sampler was not outlined in the Delineation Report. No statements were made regarding the weather conditions and potential impact of climatic conditions on sample integrity. Soil, groundwater and surface water samples were collected by AECOM. The auditor considered that this was appropriate given the chemicals of concern and the possible transport mechanisms and exposure pathways.	The sample analytical methods used by the contracted laboratories were considered appropriate in measuring the concentrations of the targeted chemicals of interest. The PQLs reported by the laboratories were generally below the nominated site assessment criteria. The PQLs were equal to the assessment criteria for cadmium and chromium in groundwater. MGT was used for the analysis of all primary soil and groundwater samples. Results for all soil samples were reported in mg/kg on a dry weight basis. Results for groundwater samples were reported in ug/L or mg/L.
Completeness Requirements	
All critical locations sampled. All samples collected (from appropriate sampling density and at depth). SOPs appropriate and complied with. Experienced sampler. Documentation correct.	All critical samples analysed according to SAQP. All analytes analysed according to SAQP. Appropriate methods and PQLs. Sample documentation complete. Sample holding times complied with
Completeness Comments	
All sampling locations nominated and sampled by AECOM were considered suitable for the purpose of delineating the groundwater impact. Several wells were noted as dry and could not be sampled. SOPs were not presented in the Delineation report, however AECOM's	The field work completed by AECOM and outlined in the Delineation report were consistent with industry accepted practises. The methods used by the laboratories were considered appropriate for the selected chemicals of interest. All PQLs for the chemicals of interest were significantly less than

Field Considerations	Laboratory Considerations
standard field operating procedures have been reviewed previously and are considered appropriate. AECOM did not comment on the experience of the staff members that collected the samples. Chain of custody documentation and other supporting information was provided.	the site criteria, with the exception of cadmium and chromium which were equal to. Sample documentation including chains of custody was in good order. The data provided by the laboratories were reported within acceptable holding times.

Apart from some omissions (such as the lack of SOPs and methodology for surface water sampling and some under reported RPD exceedances), the DEA Report contained sufficient data to demonstrate that the soil and groundwater monitoring program collected samples representative of the site conditions in a manner consistent with standard industry practice. The auditor considered that the data presented in the DEA Report was sufficiently precise, accurate, representative, complete and comparable.

10.2 Site Validation Report

The evaluation of the QA/QC procedures relevant to the sampling program presented in the Validation Report has been conducted with reference to Appendix V of the *Guidelines for the NSW Site Auditor Scheme (2nd edition*

- **Table 6** presents the degree of QA/QC pertinent to the field program;
- **Table 7** presents the degree of QA/QC pertinent to the laboratory program; and
- **Table 8** assesses the data quality indicators of precision, accuracy, representativeness, comparability and completeness.

Table 6 Field QA/QC Site Validation report

Criterion	Auditor's Comments
QA/QC program includes replicate samples	ECS collected and analysed the following groundwater samples: • 18 primary samples were collected on 21 to 22 June 2016 and analysed for TRH/BTEX • Three primary samples were collected on 17 January 2017 and analysed for TRH/BTEX The auditor notes that no field QA/QC samples including duplicates were collected. The generally accepted target frequency of one intra-laboratory duplicate sample in 20, and one inter-laboratory duplicate in 20 were not met. The auditor considered that given the results of the groundwater sampling were generally consistent with the previous monitoring rounds, the lack of quality control samples did not materially affect the findings of the investigation.

Criterion	Auditor's Comments
All relevant media assessed	Groundwater samples were collected from accessible wells. This was appropriate given the purpose of the investigation.
Appropriateness of sampling strategy	The sampling strategy was considered appropriate based on site history and the identified areas of concern. The number and location groundwater sampling locations was considered suitable to validate the previous assessment of the suitability of the site and the extent of groundwater contamination.
Sample collection, handling and transportation procedures	The Site Validation Report stated that groundwater samples were collected using a stainless steel bailer. This is consistent with previous sampling methods at the site. Groundwater samples were placed into laboratory prepared bottles and stored in chilled coolers on site and during transport to the analytical laboratory. All samples were logged on a chain of custody form which was provided to the analytical laboratory. Copies of signed chain of custody forms and sample receipt advice were provided. All samples were noted as being received with appropriate sample containers, and in good condition with sample containers for volatile analysis received with zero headspace. Sample temperature of a random sample selected from the June 2016 samples as recorded by Eurofins | mgt Sample Receipt was 6.5 degrees Celsius, and from the January 2017 samples was 10 degrees Celsius. This demonstrates that samples were appropriately transported and chilled. The auditor considers the sample collection, handling and transportation were completed in general accordance with standard industry practice.
Sampling is representative of site conditions	The number and locations of groundwater samples collected was considered by the auditor to be representative of the site groundwater conditions.
Field QA/QC plan	The groundwater sampling completed by ECS did not include the collection of duplicate, blank or spiked samples. The purpose of this investigation was to assess any changes in groundwater levels and contaminant concentrations since previous monitoring, and the results were found to be fairly consistent with previous monitoring data sets. ECS stated that the ability to duplicate results with previous monitoring was considered to be the quality measure. Although this objective was achieved, the auditor considered it to be good practice to implement a more comprehensive QC program.

Table 7 Laboratory QA/QC Site Validation report

Criterion	Auditor's Comments
Appropriate methodologies used for sample analyses	Eurofins mgt was used for the analysis of groundwater samples. Eurofins is accredited for the analyses performed under NATA Registration No. 1261
Appropriate practical quantitation limits (PQLs)	Groundwater sample results were reported with PQLs below the site investigation levels.
Laboratory QA/QC plan	Copies of signed chain of custody forms were presented and all samples were received and analysed within specified laboratory holding times. Samples were received by the project laboratories chilled and intact, and in the appropriate sample containers, and were extracted and analysed within acceptable holding times. The analytical methods used were accredited by NATA. Laboratory quality control samples included internal duplicates, matrix spike and matrix spike duplicates and method blanks. The types of QA/QC samples analysed by the laboratories for the documented samples were considered sufficient to assess the precision and accuracy of the laboratory methods used. The auditor noted that all laboratory QA/QC met the required criteria. The data presented in the laboratory QA/QC reports were considered adequate in demonstrating the precision and accuracy of the methods used to analyse field samples.

Table 8 Overall Sampling and Analysis Methodology Assessment

Field Considerations	Laboratory Considerations
Precision requirements	
SOPs appropriate and complied with.	Analysis of: • laboratory and inter-laboratory duplicates; • field duplicates; and • laboratory prepared volatile trip spikes.
Precision comments	
SOPs were not presented in the Validation Report, but it did provide a brief summary of sampling procedures which were considered appropriate.	No duplicates or trip spikes were collected or analysed as part of the sampling program.

Field Considerations	Laboratory Considerations
Accuracy Requirements	
SOPs appropriate and complied with.	Analysis of: • Field blanks; • Rinsate blanks; • Reagent blanks; • Method blanks; • Matrix spikes; • Matrix spike duplicates; • Surrogate spikes; • Reference materials; • Laboratory control samples; and • Laboratory prepared spikes.
Accuracy Comments	
SOPs were not presented in the Validation Report, however it provided a brief summary of sampling procedures which were considered appropriate.	No field blanks were collected during sampling. Internal laboratory samples including laboratory matrix spikes, method blanks, laboratory control spikes, surrogate spikes and duplicates were analysed by the Eurofins | mgt and the results demonstrated the accuracy of the laboratory methods.
Representativeness Requirements	
Appropriate media sampled according to SAQP. All media identified in SAQP sampled.	All samples analysed according to SAQP
Representativeness Comments	
No SAQP was provided however the auditor considers the sampling to be representative of site conditions.	The sampling program was considered appropriate. The use of a NATA accredited laboratory and the selection of chemicals of interest for the identified media of concern were considered appropriate.
Comparability Requirements	
Same SOPs were used on each sampling occasion. Experienced sampler.	Sampling analytical methods used. Sample PQLs used to report analyte concentrations. Same laboratories used to analyse samples.

Field Considerations	Laboratory Considerations
Impacts of climatic conditions on sample integrity; samples were chilled and received within holding times. Same types of samples collected from each media.	Same units used to report analyte concentrations.
Comparability Comments	
SOPs were not presented in the Validation Report, however it provided a brief summary of sampling procedures which were considered appropriate. Samples were reported as being chilled and were received within holding times.	The sample analytical methods used by the contracted laboratory were considered appropriate in measuring the concentrations of the targeted chemicals of interest. The PQLs reported by the laboratory were below the nominated site assessment criteria. Eurofins | mgt was used for the analysis of all groundwater samples. Results for groundwater samples were reported in µg/L.
Completeness Requirements	
All critical locations sampled. All samples collected (from appropriate sampling density and at depth). SOPs appropriate and complied with. Experienced sampler. Documentation correct.	All critical samples analysed according to SAQP. All analytes analysed according to SAQP. Appropriate methods and PQLs. Sample documentation complete. Sample holding times complied with
Completeness Comments	
The locations sampled by ECS were considered suitable characterise the current groundwater conditions at the site. Several wells were noted as dry and could not be sampled or could not be located. The Site Validation Report provided a brief summary of sampling procedures which were considered appropriate. Chain of custody documentation was provided and correctly filled out.	The methods used by the laboratory were considered appropriate for the selected chemicals of interest. The selected contaminants of concern were reduced from previous monitoring rounds to TRH/BTEX only. This was considered appropriate given the site history and previous groundwater data sets. The exclusion of naphthalene which was identified as a chemical of concern in the HHERA was not considered as a significant omission given that the groundwater wells where this chemical had been identified also had concomitant contaminants such as benzene which were key risk drivers.

Field Considerations	Laboratory Considerations
	All PQLs for the chemicals of interest were less than the site criteria. Sample documentation including chains of custody was in good order. The data provided by the laboratory were reported within acceptable holding times

The Site Validation reports provided a brief summary of sampling procedures which were considered appropriate. The sampling program did not include any analysis of field QA/QC samples. The auditor acknowledges that this is not best practice. However, the purpose of the investigation was to assess any changes to groundwater conditions since the previous monitoring, and the results of this investigation provided comparable results to the previous monitoring data sets. This supported the conclusion that there has been no significant changes to the conditions at the Site since the previous investigation and the Human Health and Ecological Risk Assessment in 2011.

The auditor considered that the data presented in the Site Validation report was sufficient to assess the suitability of the site for the intended land use and confirm the extent of the plume and draw comparisons with previous groundwater data sets.

11. Compliance with regulatory guidelines & directions

11.1 National Guidelines

National guidelines used for the assessment and management of contaminated sites relevant to the issues associated with the site are as follows:

- NEPC (1999) – *National Environment Protection (Assessment of Site Contamination) Measure 1999*
- NEPC (2013) – *National Environment Protection (Assessment of Site Contamination) Measure 1999*.
- ANZECC (2000), *National Water Quality Management Strategy, Paper No. 4, Australian and New Zealand Guidelines for Fresh and Marine Water Quality, October 2000, Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ)*.

11.2 ACT guidelines

The ACT EPA made or endorsed guidelines relevant to the assessment of this site were as follows:

- NSW EPA (2011) *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites*;
- ACT EPA (2011), *Information Sheet No. 1 Decommissioning, Assessment and Audit of Sites Containing Above Ground or Underground Fuel Storage Tanks*;
- ACT EPA (2011), *Information Sheet No. 2 Requirements for the Assessment and Validation of Former Service Station Sites in the ACT;*
- ACT EPA (2011), *Information Sheet No. 3 Requirements for the Assessment and Validation of sites containing above ground or underground fuel storage tanks in the ACT*;
- NSW DECC (2009), *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997;*
- ACT EPA (2009), *Contaminated Sites Environment Protection Policy*;
- NSW DEC (2006) *Contaminated Sites: Guidelines for the NSW Auditor Scheme.*
- ACT EPA (2013) *Environmental guidelines for preparation of an Environment Management Plan*

In addition to these guidance documents, the auditor also referenced the CRC Care (2011) *Health screening levels for petroleum hydrocarbons in soil and groundwater* (for HSLs relevant to intrusive maintenance worker scenario)

A review of the reports prepared by AECOM and ECS demonstrated adequate compliance with the requirements of guidelines made or endorsed by the ACT EPA.

12. Potential migration of chemicals of interest

Investigations conducted by AECOM and ECS identified hydrocarbons in soil and groundwater largely resulting from spillages during transfer of fuels to and from the former railway siding that serviced the former terminal. The investigations have confirmed that contaminated groundwater had migrated off site to the north.

The HHERA completed by AECOM identified there was no risk to off site human receptors through exposure to vapours from soil contamination except if buildings were constructed over such areas. The HHERA did not comment on risks of ingestion of groundwater and/or soil. No risks to off site ecosystems were identified. The data collected by ECS and presented in the Site Validation report confirmed that the magnitude and the extent of hydrocarbon concentrations in groundwater did not differ greatly from those used in the HHERA.

The exposure scenario applicable to the site is commercial/industrial. The land to the immediate north of the site is open space, beyond which is the Canberra-Queanbeyan railway.

Data presented by AECOM and ECS has shown:

- The plume is well defined and has been demonstrated to be stable in it's extent and shape. The direct measurement of hydrocarbon concentrations in groundwater has substantiated the outcome of a fate and transport model that calculated that the plume would not extend beyond 50 metres of the site boundaries.
- Off site vapour intrusion human health risks were not identified.
- Much of the site is paved and would restrict the movement of water through the affected soil profile and into the groundwater
- There is evidence that biodegradation of the hydrocarbons is occurring
- There is currently no extraction and/or use of groundwater in and around the plume. Extraction rates of groundwater would be expected to be low as evidenced by most wells running dry during sampling.
- Groundwater in the key affected off site areas occurs at a depth of more than seven metres below ground level.

Environmental

- Although the plume extends beyond the site boundary, the absence of any direct connection between groundwater and surface water indicates that there is little likelihood that the hydrocarbons in the groundwater would reach the surface. It would not be expected to discharge into surface water bodies further from the site.
- Some of the chemicals of concern exceeded trigger levels that are designed to protect environmental values (as defined in NEPC 2013) of the groundwater. However, there is no demonstrable connection between the surface water that runs in the drain to the north and the groundwater.

The auditor noted the presence of fire fighting foam products during his site visit. Coupled with the former foam plant, there is a potential that fire fighting training or storage activities could have resulted in impacts to soil or groundwater. No monitoring of either medium has

been conducted. PFAS impacts (if present) to surface water are not likely to occur given that groundwater beneath the site is not likely to discharge into the adjacent stormwater channel/drainage line.

Human Health

- Direct contact/ingestion by intrusive maintenance workers (maximum excavation depth of one metres below grade) with the hydrocarbons in groundwater is not likely given the depth at which the groundwater has been recorded. For all identified chemicals of concern, the HSLs (as presentd in CRC Care (2011) *Health screening levels for petroleum hydrocarbons in soil and groundwater*).are non limiting. The HSLs however do not apply to deeper trenches such as sewers as it would be assumed that confined space health and safety procedures would apply.
- Existing and realistic future use of the groundwater could be either for extraction for beneficial use for humans or discharge to an environmental setting. The presence of PSH and the dissolved phase hydrocarbons would preclude the use of groundwater as a potable supply or discharge into an environmental setting.
- Consequently, groundwater should not be extracted for any purpose (other than monitoring) without appropriate assessment and EPA approval.

13. Ecological considerations

The Validation Report did not comment on the applicability of the soil based ecological investigation or screening levels (EILs or ESLs) to the site data. The Validation Report did however present a comparison of previous monitoring data to relevant groundwater environmental values and a brief commentary on the mobility of the hydrocarbons. (primarily through overland flow from product spills or groundwater migration).

During the site auditor's visit on 31 March 2017, it was noted that the vegetation in the open space area to the north appeared to be healthy. It was also noted some of the well head monuments were directly below trees of three to four metres height that had grown since the installation of the wells by AECOM.

The exposure scenario applicable to the site is commercial/industrial. Appendix I of the NSW DEC (2006) *Guidelines for the NSW Site Auditor Scheme* does not require consideration of EILs/ESLs for commercial/industrial sites.

The auditor nonetheless compared the soil data to applicable NEPM ESLs/EILs. Using the flow chart for Tier 1 human health and ecological risk assessment of petroleum hydrocarbon contamination (schedule B1 of the NEPM), a small number of samples of the dozens of samples that had been collected (three at a depth of zero to two metres bgs) had concentrations of petroleum hydrocarbons F1 and/or F2 that exceeded the Environmental Screening levels (ESLs).

The flow chart recommends that where ESLs are exceeded, the presence of whether off site migration and ecological exposure pathways should be considered. The samples that exceeded the ESLs were generally localised and within the site boundaries. Little vegetation was present on the site at the time of the audit. Given the site use is commercial it would not be expected that substantial vegetation would be established and the majority of the site is covered with concrete hard stand. Consequently, the auditor considered that there is little potential for unacceptable ecological exposure and no further action is warranted in relation to the soil samples with concentration greater than the ESLs.

Further management or remediation of the groundwater contamination is not warranted in relation to environmental values as:

- The plume is well defined and has been demonstrated to be stable in it's extent and shape;
- Much of the site is paved and would restrict the movement of water through the affected soil profile and into the groundwater
- There is currently no extraction and/or use of groundwater in and around the plume. Extraction rates of groundwater would be expected to be low as evidenced by most wells running dry during sampling.
- The measured depth to groundwater was generally greater than seven metres below ground level and there is little likelihood that it could discharge into the drainage line that is located to the north of the site.
- There were no down gradient groundwater discharge points in close vicinity of the site.

It may be of benefit however to conduct groundwater monitoring for the presence of PFAS.

14. Auditor's opinion and conclusions

14.1 Consultant conclusions

ECS concluded in its Site Validation Report:

The Site is considered suitable to be used for commercial/industrial purposes (metal recycling), but excluding the construction of buildings over areas of significant impact.

14.2 Auditor's conclusion

In principle, the conclusion presented by ECS was appropriate given the existing (abandoned site) and proposed land use. However, the auditor noted that in order for there to be control on the construction of buildings over areas of significant impact there would need to be some form of site management. This control would be in the form of a site (or environmental) management plan – which was prepared by ECS subsequent to the Validation Report. The EMP defines the area that has to be managed, the reasons for management and steps that should be taken if there is exposure to contaminated soils and/or groundwater. The ACT EPA states (*Policy on Institutional Controls and EMP Enforcement* – 2014):

- *Where the EPA and/or an independent auditor requires that privately leased land be managed in accordance with an ongoing site management plan the lessee must request, through Lease Administration of the ACT Planning and Land Authority, a lease variation.*

The auditor requested confirmation from Access Recycling that it would initiate this request. Written confirmation that Access Recycling would fulfil this requirement was received from Adam Perry in an email of 26 May 2017 in response to being informed of this requirement:

Yes we will. I am one of 3 partners who own the land (held in a company – Capital Recycling Solutions P/L)

In evaluating the suitability of the site for commercial/industrial land use, the decision making process for assessing urban redevelopment sites (Appendix I of the *Auditor Guidelines*) has been followed. In using this process, the auditor has considered the information presented earlier in the SAR. **Table 9** presents this assessment.

Table 9 Decision making process for assessing urban redevelopment sites

EPA requirement	Auditor comments
All site assessment, remediation and validation reports follow the NSW EPA (2011) *Guidelines for Consultants Reporting on Contaminated Sites*.	The Validation report, with exceptions not considered to affect the outcome of the audit, were considered to have generally followed the *Consultant Guidelines*.
Any contaminant odours emanating from site soils have been adequately addressed.	Given that there are no exposed soils on site, emission of odours is not considered an issue requiring further management. The auditor did not observe any odours during his site visit of 31 March 2017.
Soils have been assessed against health-based investigation levels.	The Validation Report compared data gathered during the previous investigations as well as the

EPA requirement	Auditor comments
	monitoring conducted by ECS to the most current ACT EPA endorsed groundwater investigation levels. There was no comparison to soil investigation levels. The ENSR/AECOM (2008) report presented a comparison of soil data to health based investigation levels as outlined in the NEPM (1999). Given that the NEPM had been updated in 2013, the auditor compared the available, consolidated soil data set to relevant NEPM health screening levels. F1 (as calculated using the TPH and BTEX values) exceeded the relevant HSLs (sand) at one location (BH125S). There were two locations (BH125S and BH127S) where the benzene concentrations in soil exceeded the relevant HSL for sand (3 mg/kg). The highest concentration was 8.1 mg/kg.
Any issues relating to local area background soil concentrations that exceed appropriate site soil criteria have been adequately addressed in the site assessment report(s).	As the contaminated soils and groundwater on the site were deemed to be spillages from loading and unloading tankers on the rail line or the underground storage tanks in the north west and south west of the site, collection of background samples was not warranted as it would not be expected that hydrocarbon contamination of soils would be background.
The human health impacts of chemical mixtures have been assessed.	No specific assessment regarding impacts of chemical mixtures was presented in the Validation Report. However, given the contaminants of concern and the validation results, it was not considered by the auditor that chemical mixtures were an issue at the site.
The site management strategy is appropriate.	The site management plan is appropriate for the site.
Any evidence of, or potential for, migration of contaminants from the site has been appropriately addressed and reported to the site owner or occupier.	Dissolved phase hydrocarbons and PSH have migrated from the site to the north. Section 12 presents a discussion on the potential migration of hydrocarbons from the site.

On the basis of the information reviewed as part of this audit, the auditor considered that the site is suitable for commercial/industrial land use as per the existing zoning (IZ2 – Mixed Industrial) provided the position of site infrastructure does not change and there are no additional buildings constructed. A change from the existing site use as a fuel depot would also warrant planning approval. Storage of materials (as allowed under the existing permitted use) would be acceptable.

Activities as listed for IZ2 that would have different exposure scenarios to "standard" commercial practices (and therefore would be an exception) would include caretaker's

residence, outdoor recreation facility, sub division, restaurant, parkland and the following community uses as defined by ACT Planning and Land Authority:

- Child care centre means the use of land for the purpose of educating, supervising or caring for children of any age throughout a specified period of time in any one day, which is registered under the Children and Young People Act 2008 or authorised pursuant to the Education and Care Services National Law (ACT) Act 2011 and which does not include residential care
- Community activity centre means the use of land by a public authority or a body of persons associated for the purpose of providing for the social well being of the community.
- Religious associated use means the use of land for the activities conducted by religious organisations other than for worship or for offices and may include residential accommodation by ministers of religion.
- Educational establishment would be acceptable providing the facility is not used for a kindergarten, preschool, primary school or secondary college.

Groundwater however should not be extracted for any purpose (other than monitoring) without appropriate assessment and EPA approval.

15. Disclaimer

This Site Audit Report ("Report") and accompanying Site Audit Statement have been prepared in accordance with relevant provisions of the *Environment Protection Act* 1997. The Site Audit Statement represents the Auditor's opinion of the suitability and appropriateness of the reports listed in Section 1.3 of this Report to demonstrate that the site had been effectively remediated so that it was suitable for commercial use, based on the condition of the site at the date the Site Audit Statement is signed.

This Report:

- has been prepared by Andrew Kohlrusch and his support team as indicated in the appropriate sections of this Report ("GHD") for Access Recycling Pty Ltd;
- may be used and relied on by Access Recycling Pty Ltd;
- may be used by and provided to the ACT EPA and the relevant planning authority for the purpose of meeting statutory obligations in accordance with the relevant sections of the EP Act 1997;
- may be provided to other third parties but such third parties' use of or reliance on the Report is at their sole risk, as this Report must not be relied on by any person other than those listed above without the prior written consent of GHD; and
- may only be used for the purpose as stated in Section 1.2 of the Report (and must not be used for any other purpose).
- GHD and its servants, employees and officers (including the Auditor) otherwise expressly disclaim responsibility to any person other than Access Recycling Pty Ltd arising from or in connection with this Report.
- To the maximum extent permitted by law, all implied warranties and conditions in relation to the services provided by GHD and the Report are excluded unless they are expressly stated to apply in this Report.
- The services undertaken by the Auditor, his team and GHD in connection with preparing this Report:
- were undertaken in accordance with current profession practice and by reference to relevant guidelines made or approved by the ACT EPA.
- The opinions, conclusions and any recommendations in this Report are based on assumptions made by the Auditor, his team and GHD when undertaking services and preparing the Report ("Assumptions"), as specified throughout this Report.
- GHD and the Auditor expressly disclaim responsibility for any error in, or omission from, this Report arising from or in connection with any of the Assumptions being incorrect.
- Subject to the paragraphs in this section of the Report, the opinions, conclusions and any recommendations in this Report are based on conditions encountered and information reviewed at the time of preparation of this Report and are relevant until such times as the site conditions or relevant legislations changes, at which time, GHD expressly disclaims responsibility for any error in, or omission from, this Report arising from or in connection with those opinions, conclusions and any recommendations.

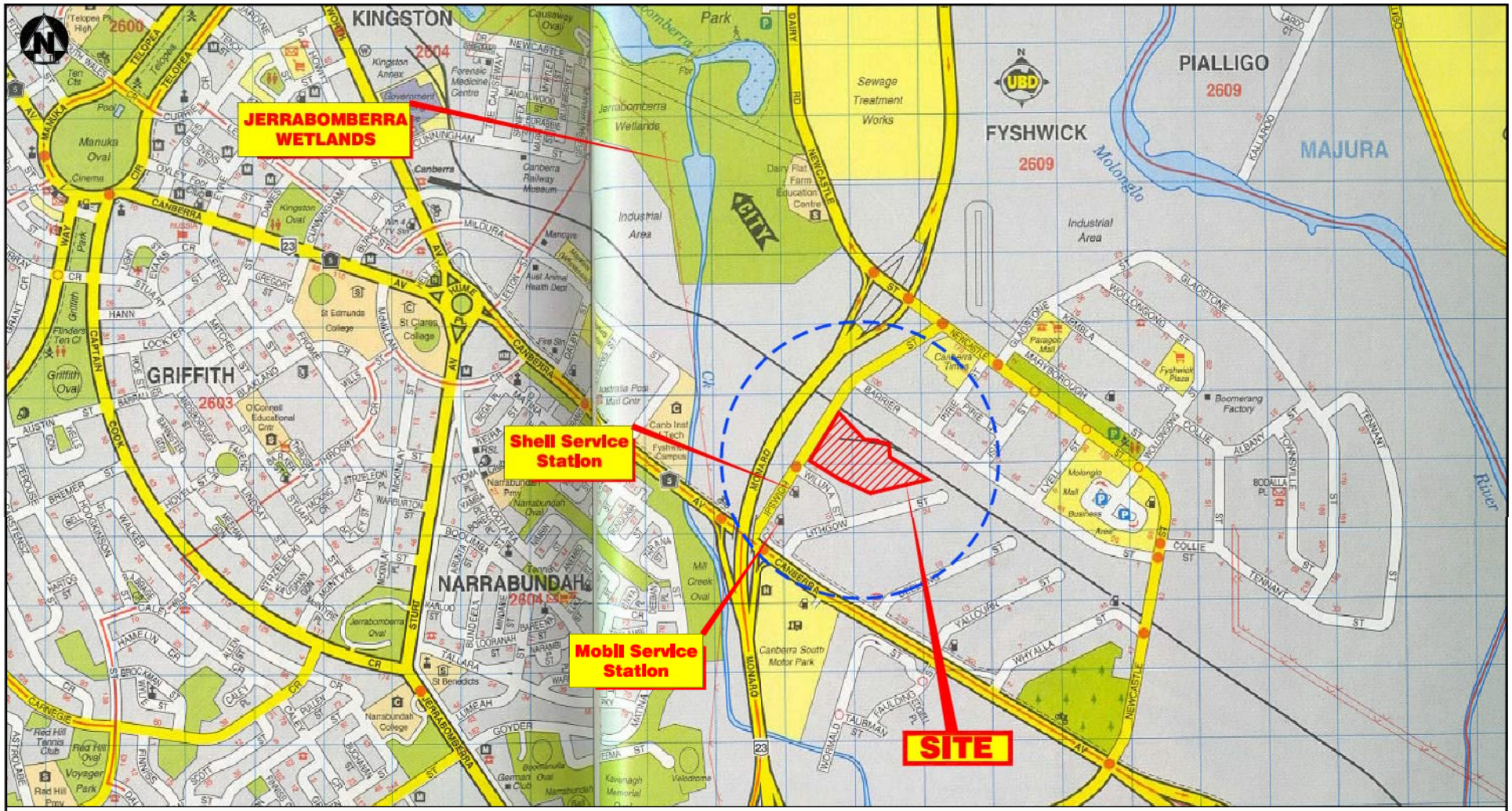
- The Auditor and GHD have prepared this Report on the basis of information provided by Access Recycling Pty Ltd and others who provided information to GHD (including Government authorities), which the Auditor and GHD have not independently verified or checked ("Unverified Information") beyond the agreed scope of work.
- The Auditor and GHD expressly disclaim responsibility in connection with the Unverified Information, including (but not limited to) errors in, or omissions from, the Report, which were caused or contributed to by errors in, or omissions from, the Unverified Information.
- This Report and Site Audit Statement should be read in full and no excerpts are taken to be representative of the findings of this Report.
- The opinions, conclusions and any recommendations in this Report are based on information obtained from, and testing (if undertaken as specified in this Report) undertaken at or in connection with, specific sampling points and may not fully represent the conditions that may be encountered across the site at other than these locations. Site conditions at other parts of the site may be different from the site conditions found at the specific sampling points.
- Although reasonable care has been used to assess the extent to which the data collected from site is representative of the overall site condition and its beneficial uses, investigations undertaken in respect of this Report are constrained by the particular site conditions as discussed in this Report. As a result, not all relevant site features and conditions may have been identified in this Report.
- Site conditions (including any the presence of hazardous substances and/or site contamination) may change after the date of this Report. The Auditor and GHD expressly disclaim responsibility:

  1. arising from, or in connection with, any change to the site conditions; and
  2. to update this Report if the site conditions change.

- These Disclaimers should be read in conjunction with the entire Report and no excerpts are taken to be representative of the findings of this Report.

Appendices

Appendix A Figures



General Land Usage:	General/Light Industrial/Commercial
General Soil Type:	Orange/Red Silty Clay to Siltstone
General Topography:	Majority of site flat. Slight steepening in Northern Corner
Closest Water Course:	Jerrabomberra Creek to the NW
Groundwater Flow Direction:	North West
Potential Sensitive Receptors:	Jerrabomberra Creek & Wetlands,
Aquifer Usage:	Unknown (No Bores Within 500m radius)
Registered Bores:	No groundwater bores were located within 500m radius of site.
Potential Offsite Sources of HydroCarbons:	Shell Service Station to the South West and Service Station located West of Site.

CLIENT:
THE SHELL COMPANY OF AUSTRALIA LIMITED

PROJECT:
HEALTH AND ENVIRONMENT RISK ASSESSMENT, SHELL CANBERRA DEPOT, IPSWICH STREET, FYSHWICK, ACT

TITLE:
SITE LOCATION PLAN

A3

0 250 500 750
(1:20,000 metres)

DESIGNED: KM	APPROVED:	PROJECT: 43217584	FIGURE 1
DRAWN: RS	DATE:	CAD FILE: 001.DWG	
DATE: 28/11/06	STATUS: DRAFT	REVISION: A	

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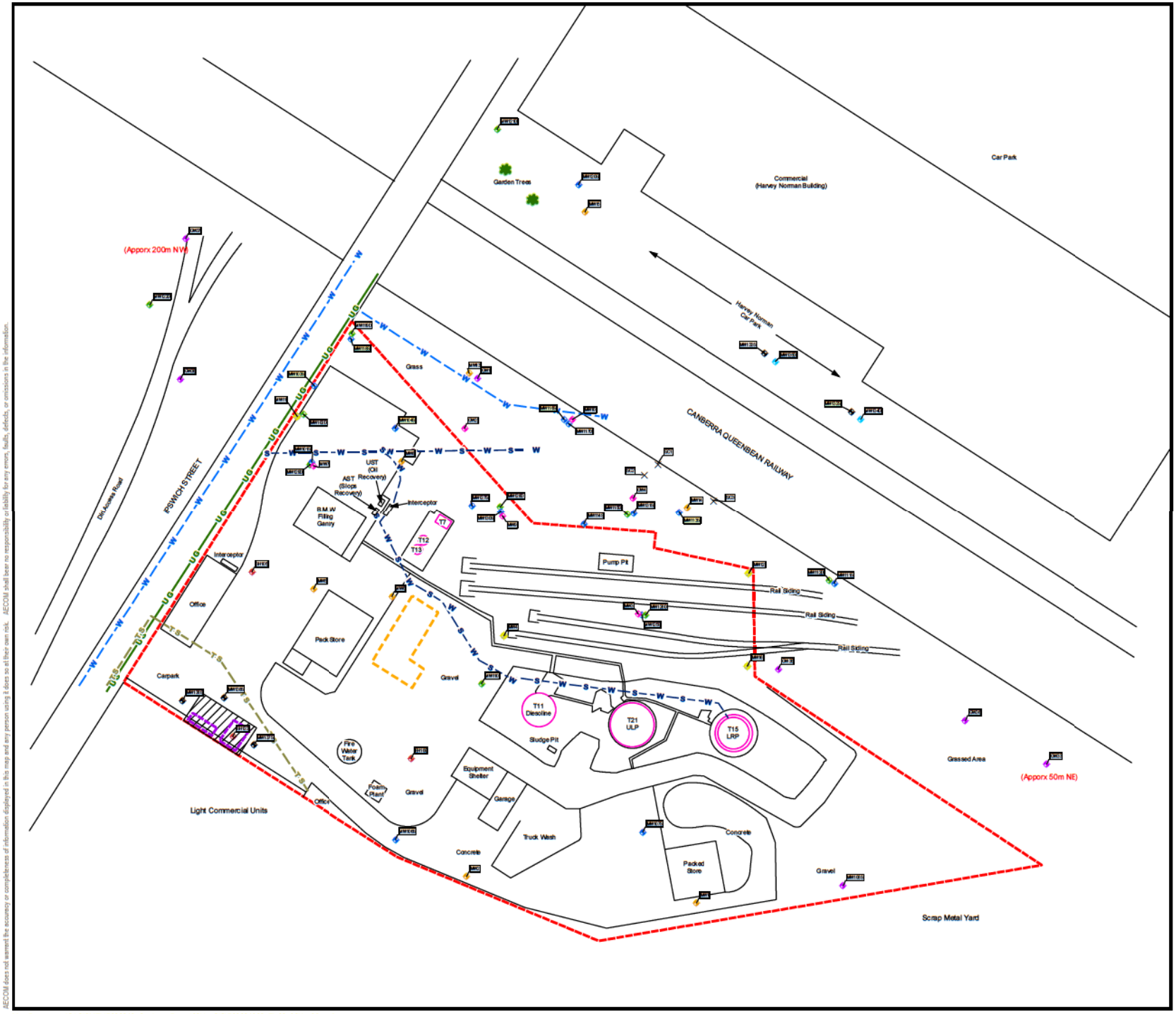

AECOM

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DATUM GDA 1994, PROJECTION MGA ZONE 55

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metres

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LEGEND

- Soil Bore Location
- Decommissioned Wells (ENSR 2007/2008)
- Shallow Wells (ENSR 2007/2008)
- Deep Wells (ENSR 2007/2008)
- Deep Wells (IT Environmental 2005/06)
- Shallow Wells (IT Environmental 2005/06)
- Monitoring Well Lost
- Shallow Wells (AECOM 2009)
- Deep Wells (AECOM 2009)
- Sample Locations (Stormwater Channel)
- MW133S — Monitoring Well Observed Dry (AECOM GME 2009)
- Site Boundary
- Former Location of Semi-buried Tanks
- AST Location
- Underground Water Mains
- Underground Electricity Cables
- Underground Stormwater
- Underground Telstra Cables
- CSM Cross Section Alignment
- Potential USTs
- GPR survey area

SITE LAYOUT PLAN

The Shell Company of Australia

Factual Delineation Environmental Site Assessment

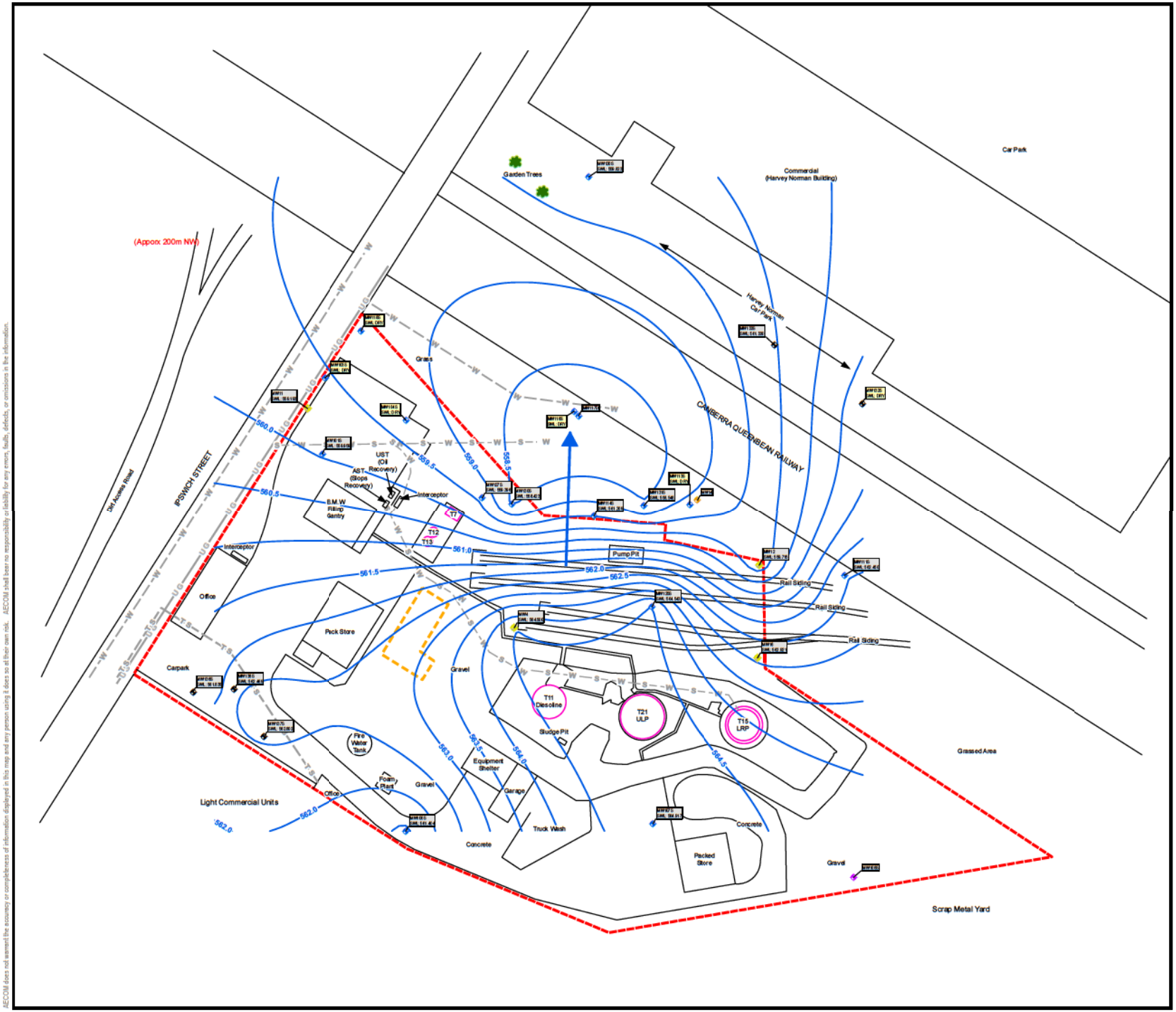
Shell Canberra Depot
16 Ipswich St
Fyshwick, ACT

PROJECT ID	P30021002
CREATED BY	ART
LAST MODIFIED	AJB 12 Jan 2010

Figure **F2**

Map Document: (G:\GISMEL\P300210_Canberra Depot\02\ArcGIS\P30021002_Fig02_02Nov09.mxd)

A3 size



AECOM

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N

DATUM GDA 1994, PROJECTION MGA ZONE 55

0 12.5 25 50

metres

1:1,000 (when printed at A3)

LEGEND

- Shallow Wells (ENSR 2007/2008)
- Deep Wells (IT Environmental 2005/2006)
- Shallow Wells (IT Environmental 2005/2006)
- Monitoring Well Lost
- Shallow Wells (AECOM 2009)
- 558.5 Groundwater Contour m(AHD)
- MW133S Monitoring Well Observed Dry (AECOM GME 2009)
- Site Boundary
- Former Location of Semi-burried Tanks
- AST Location
- Underground Water Mains
- Underground Electricity Cables
- Underground Stormwater
- Underground Telstra Cables
- Inferred Groundwater Flow Direction

HYDROGEOLOGICAL FEATURES - SHALLOW AQUIFER CONTOURS

The Shell Company of Australia

Factual Delineation Environmental Site Assessment

Shell Canberra Depot
16 Ipswich ST
Fyshwick, ACT

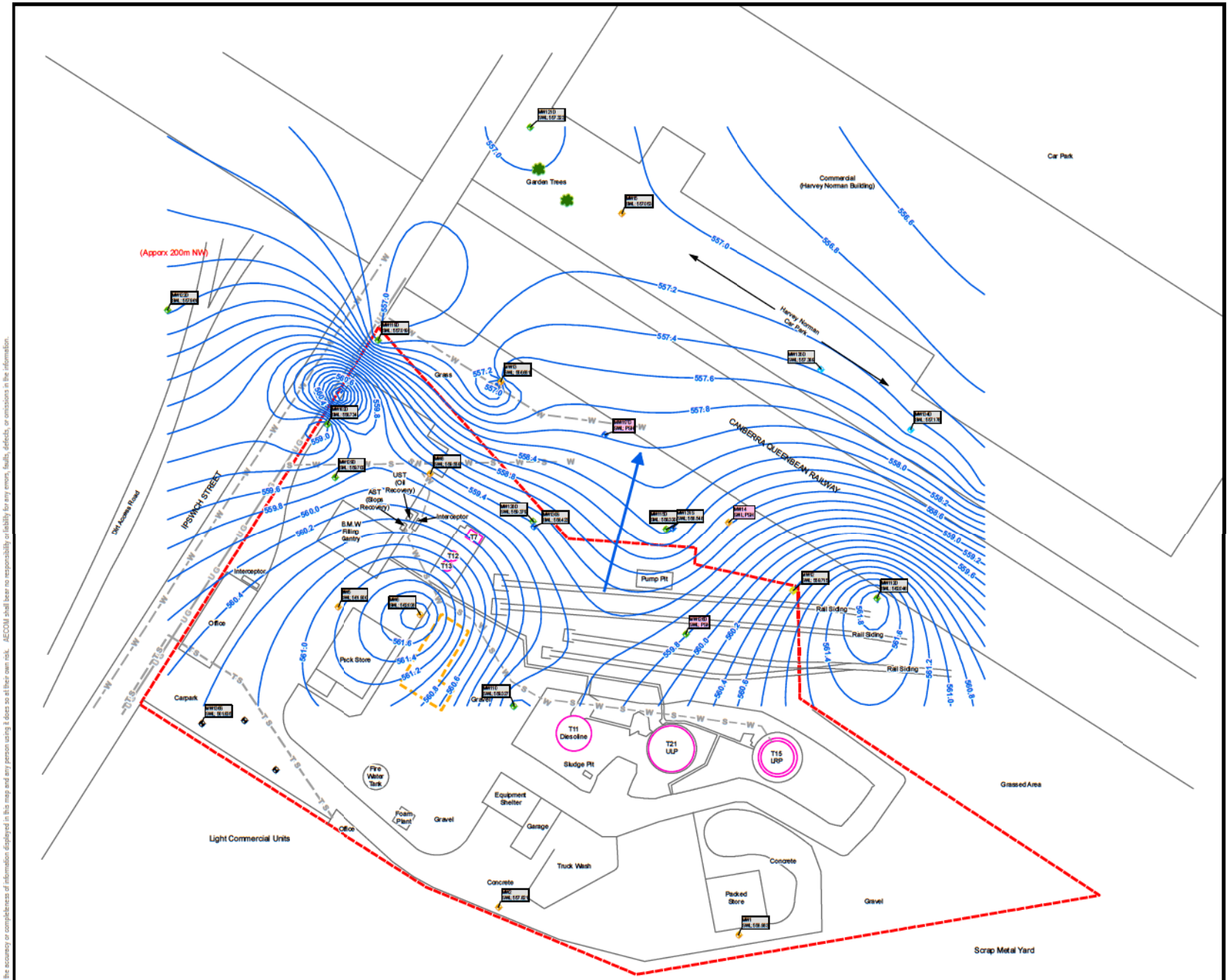
PROJECT ID	P30021002
CREATED BY	ART
LAST MODIFIED	AJB 12 Jan 2010

Figure

F3

Map Document: (G:\GISMEL\P300210_Canberra Depot\02\ArcGIS\P30021002_Fig03_ShallowHydrogeo_04Nov09.mxd)

A3 size



AECOM

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N

DATUM GDA 1994, PROJECTION MGA ZONE 55

0 12.5 25 50

metres

1:1,000 (when printed at A3)

LEGEND

- Shallow Wells (ENSR 2007/2008)
- Deep Wells (IT Environmental 2005/2006)
- Shallow Wells (IT Environmental 2005/2006)
- Shallow Wells (AECOM 2009)
- Deep Wells (ENSR 2007/2008)
- Deep Wells (AECOM 2009)
- MW133S — Phase Separated Hydrocarbon Observed (AECOM GME 2009)
- Site Boundary
- Former Location of Semi-buried Tanks
- AST Location
- Underground Water Mains
- Underground Electricity Cables
- Underground Stormwater
- Underground Telstra Cables
- Inferred Groundwater Flow Direction

Inferred Hydrogeological Information

(i) Hydraulic Gradient: 0.018 m/day

(K) Hydraulic Conductivity: 0.001 - 0.11 m/day

Effective Porosity: 0.2 - 0.06

Seepage Velocity: 0.033m/yr to 12.099 m/yr

HYDROGEOLOGICAL FEATURES - DEEPER AQUIFER CONTOURS

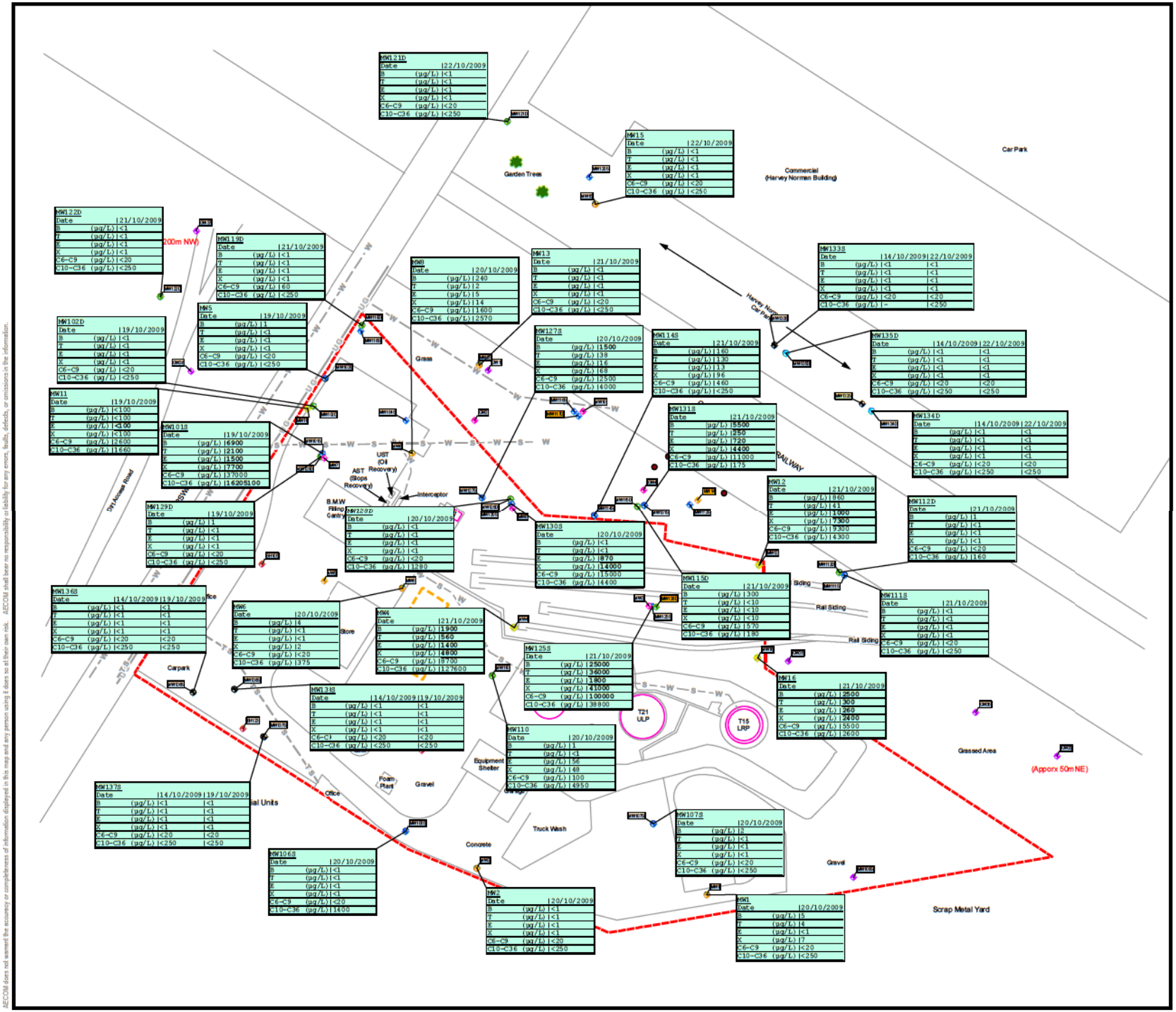
The Shell Company of Australia

Factual Delineation Environmental Site Assessment

Shell Canberra Depot
16 Ipswich St
Fyshwick, ACT

PROJECT ID	P30021002
CREATED BY	ART
LAST MODIFIED	AJB 12 Jan 2010

Figure **F4**



AECOM

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N

DATUM GDA 1994, PROJECTION MGA ZONE XX

0 12.5 25 50

metres

1:1,000 (when printed at A3)

LEGEND

- Soil Bore Location
- Decommissioned Wells (ENSR 2007/2008)
- Shallow Wells (ENSR 2007/2008)
- Deep Wells (ENSR 2007/2008)
- Deep Wells (IT Environmental 2005/06)
- Shallow Wells (IT Environmental 2005/06)
- Monitoring Well Lost
- Shallow Wells (AECOM 2009)
- Deep Wells (AECOM 2009)
- MW133S Monitoring Well Observed Dry (AECOM GME 2009)
- Site Boundary
- Former Location of Semi-buried Tanks
- AST Location
- MW133S PSH impacted wells

MW133S	Bore Identification
Date	Date of Sampling
B (ug/L)	Benzene Concentration
T (ug/L)	Toluene Concentration
E (ug/L)	Ethylbenzene Concentration
X (ug/L)	Xylenes Concentration
C6-C9 (ug/L)	C^6-C^9 Concentration
C10-C36 (ug/L)	C^{10}-C^{36} Concentration

E (ug/L) 57.5	Bold Values Indicate Concentrations Above Nominated Criteria

(ug/L) Micrograms Per Litre

GROUNDWATER ANALYTICAL RESULTS

The Shell Company of Australia

Factual Delineation Environmental Site Assessment

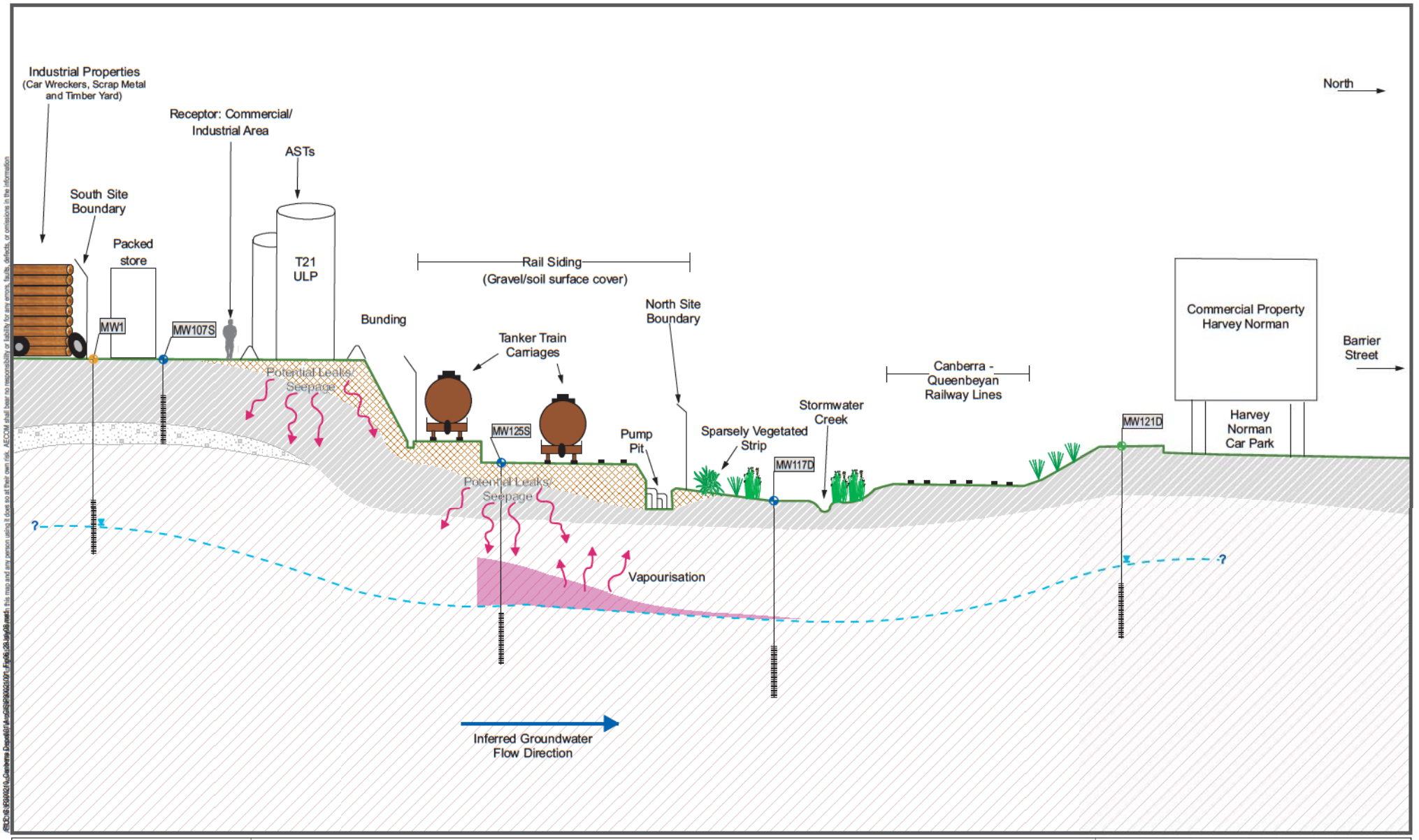
Shell Canberra Depot
16 Ipswich St
Fyshwick, ACT

PROJECT ID	P30021002
CREATED BY	ART
LAST MODIFIED	ALF 04 FEB 2010

Figure **F5**

Map Document: (G:\GIS\MEL\P300210_Canberra Depot\02\ArcGIS\P30021002_Fig07_GWResults_16Nov09.mxd)

A3 size



PROJECT ID: P30021003
CREATED BY: ART
LAST MODIFIED: TO 08 04 2010

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- Fill/ Re-worked Natural
- Low Plasticity Clay
- Clayey Gravel
- Weathered Siltstone
- Phase Separated Hydrocarbon
- Standing Water Level

Conceptual Site Model

The Shell Company of Australia
Human Health and Ecological Risk Assessment
Shell Canberra Depot
16 Ipswich Street
Fyshwick ACT

Figure
F1

Map Document: G:\Projects\PP300200_P300299\P300210\P30021003\P30021003 F1

A3 Size

Appendix B Results Tables

Historic and Current OnSite Soil Results
Fyshwick Fuel Depot
Shell Canberra Depot (ACM107C)
16 Ipswich Street, Fyshwick ACT

					SampleCode	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	
					Field ID	07-De03185	08-JN01073	07-De03181			07-De03969	08-MY10218	07-De03190	08-JN01066			
					Location Code	BH125S_0.1-0.2	BH129D_0.15-0.3	BH127S_0.3-0.4	BH137_0.3-0.4	BH138_0.3-0.4	BH110S_0.3-0.5	BH119D_0.3-0.5	BH123S_0.4-0.5	BH125S_0.4-0.5	BH136_0.4-0.5	Surface Onsite Maximum	
					Sample Depth (m)	BH125S	BH129D	BH127S			BH110S	BH119D	BH123S	BH125S			
					Sampled Date	0.1-0.2	0.15-0.3	0.3-0.4	0.3-0.4	0.3-0.4	0.3-0.5	0.3-0.5	0.4-0.5	0.4-0.5	0.4-0.5		
						5/12/07	23/05/08	7/12/07	13/10/09	13/10/09	3/12/07	14/05/08	6/12/07	21/05/08	12/10/09		
Chem	Name	Units	LOR	NEPM (1999) HIL F	NSW EPA (1994) Sensitive Land Use - Human Health												
TPH	TPH C 6 - C 9 Fraction	mg/kg	20		**65**	<20	<20	<20	<20	300	<20	<20	<20	1300	2700	2700	
	TPH C10 - C14 Fraction	mg/kg	50			140	<50	<50	<50	82	<50	<50	100	1500	<50	1500	
	TPH C15 - C28 Fraction	mg/kg	100			220	<100	<100	<100	350	<100	<100	320	<100	<100	350	
	TPH C29-C36 Fraction	mg/kg	100			<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	0	
	TPH+C10 - C36 (Sum of total)	mg/kg			**1000**	410	<250	<250	<250	432	<250	<250	470	1600	<250	1600	
BTEX	Benzene	mg/kg	0.05		**1**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	7.5	<0.05	7.5	
	Ethylbenzene	mg/kg	0.05		**50**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	41	0.53	41	
	Toluene	mg/kg	0.05		**130**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	78	<0.05	78	
	Xylene Total	mg/kg	0.05		**25**	<0.2	<0.1	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	290	<0.05	290	
Metals	Arsenic	mg/kg	2	**500**		-	-	-	3.7	4.1	-	-	-	-	6.4	6.4	
	Boron	mg/kg	10	**15000**		-	-	-	<10	<10	-	-	-	-	<10	0	
	Cadmium	mg/kg	0.5	**100**		-	-	-	<0.5	<0.5	-	-	-	-	<0.5	0	
	Chromium (hexavalent)	mg/kg	1	**500**		-	-	-	<1	<1	-	-	-	-	<1	0	
	Chromium (III+VI)	mg/kg	5	**600000**		-	-	-	31	31	-	-	-	-	21	31	
	Chromium (Trivalent)	mg/kg	5			-	-	-	31	31	-	-	-	-	21	31	
	Cobalt	mg/kg	5	**500**		-	-	-	<5	11	-	-	-	-	12	12	
	Copper	mg/kg	5	**5000**		-	-	-	20	26	-	-	-	-	21	26	
	Lead	mg/kg	5	1500	**300**	76	16	21	10	15	12	20	14	30	11	76	
	Mercury	mg/kg	0.1	**75**		-	-	-	<0.1	<0.1	-	-	-	-	<0.1	0	
	Molybdenum	mg/kg	10			-	-	-	<10	<10	-	-	-	-	<10	0	
	Nickel	mg/kg	5	**3000**		-	-	-	15	20	-	-	-	-	24	24	
	Selenium	mg/kg	2			-	-	-	<2	<2	-	-	-	-	<2	0	
	Tin	mg/kg	10			-	-	-	<10	<10	-	-	-	-	<10	0	
	Zinc	mg/kg	5	**35000**		-	-	-	64	57	-	-	-	-	47	64	
PAH/Phenols	2,4,6-trichlorophenol	mg/kg	0.1			<0.1	-	<0.1	<0.2	<0.2	<0.1	-	<0.1	-	<0.2	0	
	2,4-dichlorophenol	mg/kg	0.1			<0.1	-	<0.1	<0.2	<0.2	<0.1	-	<0.1	-	<0.2	0	
	2,4-dimethylphenol	mg/kg	0.1			<0.1	-	<0.1	<0.2	<0.2	<0.1	-	<0.1	-	<0.2	0	
	2,6-dichlorophenol	mg/kg	0.1			<0.1	-	<0.1	<0.2	<0.2	<0.1	-	<0.1	-	<0.2	0	
	2-chlorophenol	mg/kg	0.1			<0.1	-	<0.1	<0.2	<0.2	<0.1	-	<0.1	-	<0.2	0	
	2-methylphenol	mg/kg	0.1			<0.1	-	<0.1	<0.2	<0.2	<0.1	-	<0.1	-	<0.2	0	
	2-nitrophenol	mg/kg	0.5			<0.5	-	<0.5	<0.5	<0.5	<0.5	-	<0.5	-	<0.5	0	
	3-&4-methylphenol	mg/kg	0.2			<0.2	-	<0.2	<0.2	<0.2	<0.2	-	<0.2	-	<0.2	0	
	4-chloro-3-methylphenol	mg/kg	0.1			<0.1	-	<0.1	<0.2	<0.2	<0.1	-	<0.1	-	<0.2	0	
	Acenaphthene	mg/kg	0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	
	Acenaphthylene	mg/kg	0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	
	Anthracene	mg/kg	0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	
	Benz(a)anthracene	mg/kg	0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	
	Benzo(a) pyrene	mg/kg	0.1	5	**1**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	
	Benzo(b)fluoranthene	mg/kg	0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	
	Benzo(g,h,i)perylene	mg/kg	0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	
	Benzo(k)fluoranthene	mg/kg	0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	
	Chrysene	mg/kg	0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	
	Dibenz(a,h)anthracene	mg/kg	0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	
	Fluoranthene	mg/kg	0.1			<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	
	Fluorene	mg/kg	0.1			<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	0.2	<0.1	<0.1	0.2	
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	
	Naphthalene	mg/kg	0.1			0.8	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	0.2	18	0.6	18	
	PAHs (Sum of total)	mg/kg	0.1	100	**20**	0.8	<0.1	<0.1	<0.1	1	<0.1	<0.1	0.6	18	0.8	18	
	Pentachlorophenol	mg/kg	0.5			<0.5	-	<0.5	<0.5	<0.5	<0.5	-	<0.5	-	<0.5	0	
	Phenanthrene	mg/kg	0.1			<0.1	<0.1	<0.1	<0.1	0.7	<0.1	<0.1	0.2	<0.1	0.2	0.7	
	Phenol	mg/kg	0.1	**42500**		<0.1	-	<0.1	<0.2	<0.2	<0.1	-	<0.1	-	<0.2	0	
	Pyrene	mg/kg	0.1			<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	

Notes:
mg/kg= milligrams per kilogram
- not analysed
LOR = Limit of Reporting
< = Result less than LOR
BTEX = Monocyclic Aromatic Hydrocarbons
TPH= Total Petroleum Hydrocarbons
PAH= Polycyclic Aromatic Hydrocarbons
Bold cells indicate adopted guideline value
Shaded cells indicate result exceeds adopted guideline value

Historic and Current OnSite Soil Results
Fyshwick Fuel Depot
Shell Canberra Depot (ACM107C)
16 Ipswich Street, Fyshwick ACT

					SampleCode	Subsurface	Subsurface	Subsurface	Subsurface	Subsurface	Subsurface	Subsurface	Subsurface	Subsurface	Subsurface	Subsurface
						07-De00681		07-De00690	07-De00702	07-De00684	07-De00686	07-De00699			08-MY09956	07-De00685
					Field ID	MW102D_0.5-0.6	BH137_0.5-0.6	MW106S_0.8-1.0	MW108_0.8-1.0	MW103S_0.9-1.0	MW104S_0.9-1.0	MW107S_0.9-1.0	BH138_0.9-1.0	BH136_1.0-1.1	BH102D_1-1.45	MW103S_1.5-1.7
					Location Code	MW102		MW106S	MW108	MW103S	MW104S	MW107S			BH102	MW103S
					Sample Depth (m)	0.5-0.6	0.5-0.6	0.8-1	0.8-1	0.9-1	0.9-1	0.9-1	0.9-1.0	1.0-1.1	1.0-1.45	1.5-1.7
					Sampled Date	28/11/07	13/10/09	29/11/07	30/11/07	28/11/07	28/11/07	30/11/07	13/10/09	12/10/09	20/05/08	28/11/07
Chem Name		Units	LOR	NEPM (1999) HIL F	NSW EPA (1994) Sensitive Land Use - Human Health											
TPH	TPH C 6 - C 9 Fraction	mg/kg	20		**65**	<20	160	<20	<20	<20	<20	<20	<20	890	<20	<20
	TPH C10 - C14 Fraction	mg/kg	50			<50	110	<50	<50	<50	<50	<50	200	88	<50	<50
	TPH C15 - C28 Fraction	mg/kg	100			<100	380	<100	<100	<100	<100	<100	630	240	<100	<100
	TPH C29-C36 Fraction	mg/kg	100			<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
	TPH+C10 - C36 (Sum of total)	mg/kg			**1000**	<250	490	<250	<250	<250	<250	<250	830	328	<250	<250
BTEX	Benzene	mg/kg	0.05		**1**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
	Ethylbenzene	mg/kg	0.05		**50**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.39	<0.05	<0.05
	Toluene	mg/kg	0.05		**130**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
	Xylene Total	mg/kg	0.05		**25**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Metals	Arsenic	mg/kg	2	**500**		-	2.7	-	-	-	-	-	2.8	11	-	-
	Boron	mg/kg	10	**15000**		-	<10	-	-	-	-	-	<10	<10	-	-
	Cadmium	mg/kg	0.5	**100**		-	<0.5	-	-	-	-	-	<0.5	<0.5	-	-
	Chromium (hexavalent)	mg/kg	1	**500**		-	<1	-	-	-	-	-	<1	<1	-	-
	Chromium (III+VI)	mg/kg	5	**600000**		-	21	-	-	-	-	-	15	<5	-	-
	Chromium (Trivalent)	mg/kg	5			-	21	-	-	-	-	-	15	<5	-	-
	Cobalt	mg/kg	5	**500**		-	11	-	-	-	-	-	<5	16	-	-
	Copper	mg/kg	5	**5000**		-	19	-	-	-	-	-	14	23	-	-
	Lead	mg/kg	5	1500	**300**	16	14	18	19	17	39	13	6.5	19	7.5	13
	Mercury	mg/kg	0.1	**75**		-	<0.1	-	-	-	-	-	<0.1	<0.1	-	-
	Molybdenum	mg/kg	10			-	<10	-	-	-	-	-	<10	<10	-	-
	Nickel	mg/kg	5	**3000**		-	28	-	-	-	-	-	13	29	-	-
	Selenium	mg/kg	2			-	<2	-	-	-	-	-	<2	<2	-	-
	Tin	mg/kg	10			-	<10	-	-	-	-	-	<10	<10	-	-
	Zinc	mg/kg	5	**35000**		-	74	-	-	-	-	-	40	73	-	-
PAH/Phenols	2,4,6-trichlorophenol	mg/kg	0.1			<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	-	<0.1
	2,4-dichlorophenol	mg/kg	0.1			<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	-	<0.1
	2,4-dimethylphenol	mg/kg	0.1			<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	-	<0.1
	2,6-dichlorophenol	mg/kg	0.1			<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	-	<0.1
	2-chlorophenol	mg/kg	0.1			<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	-	<0.1
	2-methylphenol	mg/kg	0.1			<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	-	<0.1
	2-nitrophenol	mg/kg	0.5			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5
	3-&4-methylphenol	mg/kg	0.2			<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2
	4-chloro-3-methylphenol	mg/kg	0.1			<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	-	<0.1
	Acenaphthene	mg/kg	0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Acenaphthylene	mg/kg	0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Anthracene	mg/kg	0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Benz(a)anthracene	mg/kg	0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Benzo(a) pyrene	mg/kg	0.1	5	**1**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Benzo(b)fluoranthene	mg/kg	0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Benzo(g,h,i)perylene	mg/kg	0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Benzo(k)fluoranthene	mg/kg	0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Chrysene	mg/kg	0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Dibenz(a,h)anthracene	mg/kg	0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Fluoranthene	mg/kg	0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Fluorene	mg/kg	0.1			<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Naphthalene	mg/kg	0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	1.7	<0.1	<0.1
	PAHs (Sum of total)	mg/kg	0.1	100	**20**	<0.1	0.5	<0.1	<0.1	<0.1	<0.1	<0.1	0.5	2.1	<0.1	<0.1
	Pentachlorophenol	mg/kg	0.5			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5
	Phenanthrene	mg/kg	0.1			<0.1	0.5	<0.1	<0.1	<0.1	<0.1	<0.1	0.5	0.4	<0.1	<0.1
	Phenol	mg/kg	0.1	**42500**		<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	-	<0.1
	Pyrene	mg/kg	0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Notes:
mg/kg= milligrams per kilogram
- not analysed
LOR = Limit of Reporting
< = Result less than LOR
BTEX = Monocyclic Aromatic Hydrocarbons
TPH= Total Petroleum Hydrocarbons
PAH= Polycyclic Aromatic Hydrocarbons
Bold cells indicate adopted guideline value
Shaded cells indicate result exceeds adopted guideline value

Historic and Current OnSite Soil Results
Fyshwick Fuel Depot
Shell Canberra Depot (ACM107C)
16 Ipswich Street, Fyshwick ACT

						Subsurface	Subsurface	Subsurface	Subsurface	
					SampleCode	07-De03970			Subsurface Onsite Maximum	Total On Site Maximum
					Field ID	BH110S_1.8-2.0	BH137_1.9-2.0	BH138_1.9-2.0		
					Location Code	BH110S				
					Sample Depth (m)	1.8-2.0	1.9-2.0	1.9-2.0		
					Sampled Date	3/12/07	13/10/09	13/10/09		
ChemName		Units	LOR	NEPM (1999) HIL F	NSW EPA (1994) Sensitive Land Use - Human Health					
TPH	TPH C 6 - C 9 Fraction	mg/kg	20		**65**	<20	<20	<20	890	2700
	TPH C10 - C14 Fraction	mg/kg	50			<50	<50	<50	200	1500
	TPH C15 - C28 Fraction	mg/kg	100			<100	<100	<100	630	630
	TPH C29-C36 Fraction	mg/kg	100			<100	<100	<100	0	0
	TPH+C10 - C36 (Sum of total)	mg/kg			**1000**	<250	<250	<250	830	1600
BTEX	Benzene	mg/kg	0.05		**1**	<0.05	<0.05	<0.05	0	7.5
	Ethylbenzene	mg/kg	0.05		**50**	<0.05	<0.05	<0.05	0.39	41
	Toluene	mg/kg	0.05		**130**	<0.05	<0.05	<0.05	0	78
	Xylene Total	mg/kg	0.05		**25**	<0.05	<0.05	<0.05	0	290
Metals	Arsenic	mg/kg	2	**500**		-	2.6	3.2	11	11
	Boron	mg/kg	10	**15000**		-	<10	<10	0	0
	Cadmium	mg/kg	0.5	**100**		-	<0.5	<0.5	0	0
	Chromium (hexavalent)	mg/kg	1	**500**		-	<1	<1	0	0
	Chromium (III+VI)	mg/kg	5	**600000**		-	27	17	27	31
	Chromium (Trivalent)	mg/kg	5			-	27	17	27	31
	Cobalt	mg/kg	5	**500**		-	<5	12	16	16
	Copper	mg/kg	5	**5000**		-	18	20	23	26
	Lead	mg/kg	5	1500	**300**	5.9	6.1	13	39	76
	Mercury	mg/kg	0.1	**75**		-	<0.1	<0.1	0	0
	Molybdenum	mg/kg	10			-	<10	<10	0	0
	Nickel	mg/kg	5	**3000**		-	17	24	29	29
	Selenium	mg/kg	2			-	<2	<2	0	0
	Tin	mg/kg	10			-	<10	<10	0	0
	Zinc	mg/kg	5	**35000**		-	65	67	74	74
PAH/Phenols	2,4,6-trichlorophenol	mg/kg	0.1			<0.1	<0.2	<0.2	0	0
	2,4-dichlorophenol	mg/kg	0.1			<0.1	<0.2	<0.2	0	0
	2,4-dimethylphenol	mg/kg	0.1			<0.1	<0.2	<0.2	0	0
	2,6-dichlorophenol	mg/kg	0.1			<0.1	<0.2	<0.2	0	0
	2-chlorophenol	mg/kg	0.1			<0.1	<0.2	<0.2	0	0
	2-methylphenol	mg/kg	0.1			<0.1	<0.2	<0.2	0	0
	2-nitrophenol	mg/kg	0.5			<0.5	<0.5	<0.5	0	0
	3-&4-methylphenol	mg/kg	0.2			<0.2	<0.2	<0.2	0	0
	4-chloro-3-methylphenol	mg/kg	0.1			<0.1	<0.2	<0.2	0	0
	Acenaphthene	mg/kg	0.1			<0.1	<0.1	<0.1	0	0
	Acenaphthylene	mg/kg	0.1			<0.1	<0.1	<0.1	0	0
	Anthracene	mg/kg	0.1			<0.1	<0.1	<0.1	0	0
	Benz(a)anthracene	mg/kg	0.1			<0.1	<0.1	<0.1	0	0
	Benzo(a) pyrene	mg/kg	0.1	5	**1**	<0.1	<0.1	<0.1	0	0
	Benzo(b)fluoranthene	mg/kg	0.1			<0.1	<0.1	<0.1	0	0
	Benzo(g,h,i)perylene	mg/kg	0.1			<0.1	<0.1	<0.1	0	0
	Benzo(k)fluoranthene	mg/kg	0.1			<0.1	<0.1	<0.1	0	0
	Chrysene	mg/kg	0.1			<0.1	<0.1	<0.1	0	0
	Dibenz(a,h)anthracene	mg/kg	0.1			<0.1	<0.1	<0.1	0	0
	Fluoranthene	mg/kg	0.1			<0.1	<0.1	<0.1	0	0.1
	Fluorene	mg/kg	0.1			<0.1	<0.1	<0.1	0	0.2
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.1			<0.1	<0.1	<0.1	0	0
	Naphthalene	mg/kg	0.1			<0.1	<0.1	<0.1	1.7	18
	PAHs (Sum of total)	mg/kg	0.1	100	**20**	<0.1	<0.1	<0.1	2.1	18
	Pentachlorophenol	mg/kg	0.5			<0.5	<0.5	<0.5	0	0
	Phenanthrene	mg/kg	0.1			<0.1	<0.1	<0.1	0.5	0.7
	Phenol	mg/kg	0.1	**42500**		<0.1	<0.2	<0.2	0	0
	Pyrene	mg/kg	0.1			<0.1	<0.1	<0.1	0	0.2

Notes:
mg/kg= milligrams per kilogram
- not analysed
LOR = Limit of Reporting
< = Result less than LOR
BTEX = Monocyclic Aromatic Hydrocarbons
TPH= Total Petroleum Hydrocarbons
PAH= Polycyclic Aromatic Hydrocarbons
Bold cells indicate adopted guideline value
Shaded cells indicate result exceeds adopted guideline value

Historic and Current OffSite Soil Results
Fyshwick Fuel Depot
Shell Canberra Depot (ACM107C)
16 Ipswich Street, Fyshwick ACT

					SampleCode	Surface	Surface	Surface	Surface Maximum	Subsurface	Subsurface	Subsurface	Subsurface	Subsurface	Subsurface Maximum	Total Off Site Maximum
					Field ID	07-De03977	07-De03171	08-JN01068		08-JN00514		07-De03991		07-De03177		
					Location Code	BH111S_0.35-0.45	BH120S_0.35-	BH117D_0.4-0.5		BH131S_0.5-0.6	BH135_0.5-0.6	BH116S_0.7-0.8	BH134_0.8-1.0	BH122D_1.3-1.5		
					Sample Depth (m)	BH111S	BH120S	BH117D		BH131S_0.5-0.6		BH116S		BH122D		
					Sampled Date	0.35-0.45	0.35-0.45	0.4-0.5		0.5-0.6	0.5-0.6	0.7-0.8	0.8-1.0	1.3-1.5		
ChemName		Units	LOR	NEPM (1999) HIL F	NSW EPA (1994) Sensitive Land Use - Human Health	4/12/07	6/12/07	22/05/08		28/05/08	14/10/09	5/12/07	13/10/09	6/12/07		
TPH	TPH C 6 - C 9 Fraction	mg/kg	20		**65**	<20	<20	<20	0	<20	<20	<20	<20	<20	0	0
	TPH C10 - C14 Fraction	mg/kg	50			<50	<50	<50	0	<50	<50	<50	<50	<50	0	0
	TPH C15 - C28 Fraction	mg/kg	100			<100	<100	<100	0	<100	<100	<100	<100	<100	0	0
	TPH C29-C36 Fraction	mg/kg	100			<100	<100	<100	0	<100	<100	<100	<100	<100	0	0
	TPH+C10 - C36 (Sum of total)	mg/kg			**1000**	<250	<250	<250	0	<250	<250	<250	<250	<250	0	0
BTEX	Benzene	mg/kg	0.05		**1**	<0.05	<0.05	<0.05	0	<0.05	<0.05	<0.05	<0.05	<0.05	0	0
	Ethylbenzene	mg/kg	0.05		**50**	<0.05	<0.05	<0.05	0	<0.05	<0.05	<0.05	<0.05	<0.05	0	0
	Toluene	mg/kg	0.05		**130**	<0.05	<0.05	<0.05	0	<0.05	<0.05	<0.05	<0.05	<0.05	0	0
	Xylene Total	mg/kg	0.05		**25**	<0.05	<0.05	<0.2	0	<0.05	<0.05	<0.05	<0.05	<0.05	0	0
Metals	Arsenic	mg/kg	2	**500**		-	-	-	0	-	2.5	-	<2	-	2.5	2.5
	Boron	mg/kg	10	**15000**		-	-	-	0	-	<10	-	<10	-	0	0
	Cadmium	mg/kg	0.5	**100**		-	-	-	0	-	<0.5	-	<0.5	-	0	0
	Chromium (hexavalent)	mg/kg	1	**500**		-	-	-	0	-	<1	-	<1	-	0	0
	Chromium (III+VI)	mg/kg	5	**600000**		-	-	-	0	-	13	-	29	-	29	29
	Chromium (Trivalent)	mg/kg	5			-	-	-	0	-	13	-	29	-	29	29
	Cobalt	mg/kg	5	**500**		-	-	-	0	-	5.4	-	13	-	13	13
	Copper	mg/kg	5	**5000**		-	-	-	0	-	7.5	-	13	-	13	13
	Lead	mg/kg	5	1500	**300**	14	19	25	25	13	20	15	16	16	20	25
	Mercury	mg/kg	0.1	**75**		-	-	-	0	-	<0.1	-	<0.1	-	0	0
	Molybdenum	mg/kg	10			-	-	-	0	-	<10	-	<10	-	0	0
	Nickel	mg/kg	5	**3000**		-	-	-	0	-	8.3	-	14	-	14	14
	Selenium	mg/kg	2			-	-	-	0	-	<2	-	<2	-	0	0
	Tin	mg/kg	10			-	-	-	0	-	<10	-	<10	-	0	0
	Zinc	mg/kg	5	**35000**		-	-	-	0	-	31	-	50	-	50	50
PAH/Phenols	2,4,6-trichlorophenol	mg/kg	0.1			<0.1	<0.1	-	0	-	<0.2	<0.1	<0.2	<0.1	0	0
	2,4-dichlorophenol	mg/kg	0.1			<0.1	<0.1	-	0	-	<0.2	<0.1	<0.2	<0.1	0	0
	2,4-dimethylphenol	mg/kg	0.1			<0.1	<0.1	-	0	-	<0.2	<0.1	<0.2	<0.1	0	0
	2,6-dichlorophenol	mg/kg	0.1			<0.1	<0.1	-	0	-	<0.2	<0.1	<0.2	<0.1	0	0
	2-chlorophenol	mg/kg	0.1			<0.1	<0.1	-	0	-	<0.2	<0.1	<0.2	<0.1	0	0
	2-methylphenol	mg/kg	0.1			<0.1	<0.1	-	0	-	<0.2	<0.1	<0.2	<0.1	0	0
	2-nitrophenol	mg/kg	0.5			<0.5	<0.5	-	0	-	<0.5	<0.5	<0.5	<0.5	0	0
	3-84-methylphenol	mg/kg	0.2			<0.2	<0.2	-	0	-	<0.2	<0.2	<0.2	<0.2	0	0
	4-chloro-3-methylphenol	mg/kg	0.1			<0.1	<0.1	-	0	-	<0.2	<0.1	<0.2	<0.1	0	0
	Acenaphthene	mg/kg	0.1			<0.1	<0.1	<0.1	0	<0.1	<0.1	<0.1	<0.1	<0.1	0	0
	Acenaphthylene	mg/kg	0.1			<0.1	<0.1	<0.1	0	<0.1	<0.1	<0.1	<0.1	<0.1	0	0
	Anthracene	mg/kg	0.1			<0.1	<0.1	<0.1	0	<0.1	<0.1	<0.1	<0.1	<0.1	0	0
	Benz(a)anthracene	mg/kg	0.1			<0.1	0.2	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0	0.2
	Benzo(a) pyrene	mg/kg	0.1	5	**1**	<0.1	0.2	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0	0.2
	Benzo(b)fluoranthene	mg/kg	0.1			<0.1	0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	0.1
	Benzo(g,h,i)perylene	mg/kg	0.1			<0.1	0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	0.1
	Benzo(k)fluoranthene	mg/kg	0.1			<0.1	0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	0.1
	Chrysene	mg/kg	0.1			<0.1	0.2	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0	0.2
	Dibenz(a,h)anthracene	mg/kg	0.1			<0.1	<0.1	<0.1	0	<0.1	<0.1	<0.1	<0.1	<0.1	0	0
	Fluoranthene	mg/kg	0.1			<0.1	0.3	<0.1	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	0	0.3
	Fluorene	mg/kg	0.1			<0.1	<0.1	<0.1	0	<0.1	<0.1	<0.1	<0.1	<0.1	0	0
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.1			<0.1	0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	0.1
	Naphthalene	mg/kg	0.1			<0.1	<0.1	<0.1	0	<0.1	<0.1	<0.1	<0.1	<0.1	0	0
	PAHs (Sum of total)	mg/kg	0.1	100	**20**	<0.1	2.1	<0.1	2.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	2.1
	Pentachlorophenol	mg/kg	0.5			<0.5	<0.5	-	0	-	<0.5	<0.5	<0.5	<0.5	0	0
	Phenanthrene	mg/kg	0.1			<0.1	0.3	<0.1	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	0	0.3
	Phenol	mg/kg	0.1	**42500**		<0.1	<0.1	-	0	-	<0.2	<0.1	<0.2	<0.1	0	0
	Pyrene	mg/kg	0.1			<0.1	0.5	<0.1	0.5	<0.1	<0.1	<0.1	<0.1	<0.1	0	0.5

Notes:
mg/kg= milligrams per kilogram
- not analysed
LOR = Limit of Reporting
< = Result less than LOR
BTEX = Monocyclic Aromatic Hydrocarbons
TPH= Total Petroleum Hydrocarbons
PAH= Polycyclic Aromatic Hydrocarbons
Bold cells indicate adopted guideline value
Shaded cells indicate result exceeds adopted guideline value

Historic and Current OnSite Groundwater Results
Fyshwick Fuel Depot
Shell Canberra Depot (ACM107C)
16 Ipswich Street, Fyshwick ACT

	Chem Name	Units	LOR	NHMRC (2004) Drinking	ANZECC (2000) Ecosystems Fresh Water (95%)	SampleCode			08-JN08788	08-JN08800	08-JN08802	08-JN08803	08-JN08795	08-MY09954	08-JN08809	08-JN08796	08-JN08790	08-JN10413	08-JN08797	08-JN08793	Shallow Wells Maximum
						Field ID	MW136S	MW137S	MW138S	MW101S	MW106S	MW107S	MW108S	MW11	MW110	MW12	MW125S	MW127S	MW130S	MW16	MW4	
						Location Code				MW101S	MW106S	MW107S	MW108S	MW11	MW110	MW12	MW125S	MW127S	MW130S	MW16	MW4	
						Sample Depth (m)	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	
						Sampled Date	14/10/09	14/10/09	14/10/09	17/6/08	17/6/08	17/6/08	17/6/08	17/6/08	19/5/08	17/6/08	17/6/08	17/6/08	20/6/08	17/6/08	17/6/08	
TPH	TPH C 6 - C 9 Fraction	µg/L	20			<20	<20	<20	13000	30	50	<20	1400	2000	4100	82000	26000	4300	4400	16000	82000
	TPH C10 - C14 Fraction	µg/L	50			<50	<50	<50	36000	13000	<50*	<50	780	5200	530	7600	-	-	2000	3200	36000
	TPH C15 - C28 Fraction	µg/L	100			<100	<100	<100	38000	3200	<100*	<100	300	4300	100	1500	-	-	200	3300	38000
	TPH C29-C36 Fraction	µg/L	100			<100	<100	<100	800	<100	<100*	<100	<100	<100	<100	100	-	-	<100	<100	800
	TPH+C10 - C36 (Sum of total)	µg/L				<250	<250	<250	74800	16250	<250*	<250	1130	11550	680	9200	-	-	2200	6550	74800
BTEX	Benzene	µg/L	1	**1**	950	<1	<1	<1	7700	1	2	<1	83	<1	5	25000	16000	22000	2100	1900	25000
	Toluene	µg/L	1	**800**		<1	<1	<1	2100	4	1	<1	3	<1	5	40000	2900	8400	40	250	40000
	Ethylbenzene	µg/L	1	**300**		<1	<1	<1	620	<1	<1	<1	64	5200	1	1200	780	43	10	950	5200
	Xylene Total	µg/L	1	**600**		<1	<1	<1	2900	5	2	<1	11	14000	40	16000	6600	12000	1100	2600	16000
Metals	Arsenic	mg/L	0.001	**0.007**	0.024	0.003	0.002	0.002	-	-	-	-	-	-	-	-	-	-	-	-	0.003
	Boron	mg/L	0.05	4	**0.37**	<0.05	<0.05	0.05	-	-	-	-	-	-	-	-	-	-	-	-	0.05
	Cadmium	mg/L	0.0002	0.002	**0.0002**	<0.0002	<0.0002	<0.0002	-	-	-	-	-	-	-	-	-	-	-	-	0
	Chromium (hexavalent)	mg/L	0.001	0.05	**0.001**	<0.001	<0.001	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	0
	Chromium (III+VI)	mg/L	0.001		**0.001**	0.044	0.002	0.003	-	-	-	-	-	-	-	-	-	-	-	-	0.044
	Chromium (Trivalent)	mg/L	0.001			0.044	0.002	0.003	-	-	-	-	-	-	-	-	-	-	-	-	0.044
	Cobalt	mg/L	0.001			<0.001	<0.001	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	0
	Copper	mg/L	0.001	2	**0.0014**	0.001	<0.001	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	0.001
	Lead	mg/L	0.001	0.01	**0.0034**	0.001	<0.001	0.001	0.005	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	0.11	0.001	0.016	0.002	<0.001	0.11
	Mercury	mg/L	0.0001	0.001	**0.0006**	<0.0001	<0.0001	<0.0001	-	-	-	-	-	-	-	-	-	-	-	-	0
	Molybdenum	mg/L	0.005	**0.05**		0.038	<0.005	<0.005	-	-	-	-	-	-	-	-	-	-	-	-	0.038
	Nickel	mg/L	0.001	0.02	**0.011**	<0.001	<0.001	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	0
	Selenium	mg/L	0.001	**0.01**	0.011	0.002	<0.001	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	0.002
	Tin	mg/L	0.005			<0.005	<0.005	<0.005	-	-	-	-	-	-	-	-	-	-	-	-	0
	Zinc	mg/L	0.001		**0.008**	0.006	0.012	0.021	-	-	-	-	-	-	-	-	-	-	-	-	0.021
PAH/Phenols	2,4,6-trichlorophenol	µg/L	1, 2		**20**	<2	<2	<2	<5	<5	-	<1	<1	<1	<1	<1	-	-	<1	<1	0
	2,4-dichlorophenol	µg/L	1			<2	<2	<2	<5	<1	-	<1	<1	<1	<1	<1	-	-	<1	<1	0
	2,4-dimethylphenol	µg/L	1		**160**	<2	<2	<2	<5	<1	-	<1	<1	<1	5	<5	-	-	43	<5	43
	2,6-dichlorophenol	µg/L	1			<2	<2	<2	<5	<1	-	<1	<1	<1	<1	<1	-	-	<1	<1	0
	2-chlorophenol	µg/L	1		**490**	<2	<2	<2	<5	<1	-	<1	<1	<1	<1	<1	-	-	<1	<1	0
	2-methylphenol	µg/L	1			<2	<2	<2	<10	<1	-	<1	<1	<1	<1	<10	-	-	11	<1	11
	2-nitrophenol	µg/L	5			<5	<5	<5	<10	<5	-	<5	<5	<5	<5	<5	-	-	<5	<5	0
	3-&4-methylphenol	µg/L	2			<2	<2	<2	<10	<2	-	<2	<2	<2	<2	<2	-	-	8	<2	8
	4-chloro-3-methylphenol	µg/L	1			<2	<2	<2	<10	<1	-	<1	<1	<1	<1	<1	-	-	<1	<1	0
	Acenaphthene	µg/L	1			<1	<1	<1	<5	<2	-	<1	1	<1	<1	<1	-	-	<1	<5	1
	Acenaphthylene	µg/L	1			<1	<1	<1	<10	<1	-	<1	<1	<1	<1	<1	-	-	<1	<1	0
	Anthracene	µg/L	1			<1	<1	<1	<50	<1	-	<1	<1	<1	<1	<1	-	-	<1	<1	0
	Benz(a)anthracene	µg/L	1			<1	<1	<1	<2	<1	-	<1	<1	<1	<1	<1	-	-	<1	<1	0
	Benzo(a) pyrene	µg/L	1	**0.01**		<1	<1	<1	<2	<1	-	<1	<1	<1	<1	<1	-	-	<1	<1	0
	Benzo(b)fluoranthene	µg/L	1			<1	<1	<1	<2	<1	-	<1	<1	<1	<1	<1	-	-	<1	<1	0
	Benzo(g,h,i)perylene	µg/L	1			<1	<1	<1	<2	<1	-	<1	<1	<1	<1	<1	-	-	<1	<1	0
	Benzo(k)fluoranthene	µg/L	1			<1	<1	<1	<2	<1	-	<1	<1	<1	<1	<1	-	-	<1	<1	0
	Chrysene	µg/L	1			<1	<1	<1	<2	<1	-	<1	<1	<1	<1	<1	-	-	<1	<1	0
	Dibenz(a,h)anthracene	µg/L	1			<1	<1	<1	<2	<1	-	<1	<1	<1	<1	<1	-	-	<1	<1	0
	Fluoranthene	µg/L	1			<1	<1	<1	<2	<1	-	<1	1	<1	<1	<1	-	-	<1	<1	1
	Fluorene	µg/L	1			<1	<1	<1	<10	<5	-	5	2	<1	<1	<1	-	-	<1	6	6
	Indeno(1,2,3-c,d)pyrene	µg/L	1			<1	<1	<1	<2	<1	-	<1	<1	<1	<1	<1	-	-	<1	<1	0
	Naphthalene	µg/L	1		**16**	<1	<1	3	760	<5	-	<1	41	0.14	3	290	-	-	9	220	760
	PAHs (Sum of total)	µg/L	1			<1	<1	3	920	<5	-	<1	45	150	3	290	-	-	9	230	920
	Pentachlorophenol	µg/L	5		**22**	<5	<5	<5	<10	<5	-	<5	<5	<5	<5	<5	-	-	<5	<5	0
	Phenanthrene	µg/L	1			<1	<1	<1	160	<1	-	<1	<1	5	<1	<1	-	-	<1	6	160
	Phenol	µg/L	1		**320**	<2	<2	<2	<10	<1	-	<1	<1	<1	<1	<1	-	-	41	<5	41
	Pyrene	µg/L	1			<1	<1	<1	<2	<1	-	<1	<1	<1	<1	<1	-	-	<1	<1	0

Notes:
ug/L = micrograms per litre
mg/L= milligrams per litre
- = not analysed
LOR = Limit of Reporting
< = Result less than LOR
BTEX = Monocyclic Aromatic Hydrocarbons
TPH= Total Petroleum Hydrocarbons
PAH= Polycyclic Aromatic Hydrocarbons
* Note only 1/3 bottle was filled for MW107S therefore results may be unreliable due to large headspace.
S = Shallow Well
D= Deep Well
S/D = shallow and deep well in sample location
Bold cells indicate adopted guideline value
Shaded cells indicate result exceeds adopted guideline value

Historic and Current OnSite Groundwater Results
Fyshwick Fuel Depot
Shell Canberra Depot (ACM107C)
16 Ipswich Street, Fyshwick ACT

	SampleCode	08-JN08805	08-JN08801	08-JN08794	08-JN08789	08-JN08791	08-JN08787	08-JN08799	08-JN08786	08-JN08804	08-JN08792	Deep Wells Maximum	Shallow and Deep Wells Maximum
	Field ID	MW6	MW1	MW102D	MW119D	MW128D	MW129D	MW13	MW2	MW5	MW8		
	Location Code	MW06	MW1	MW102D	MW119D	MW128D	MW129D	MW13	MW2	MW5	MW8		
	Sample Depth (m)	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep		
	Sampled Date	17/06/08	17/06/08	17/06/08	17/06/08	17/06/08	17/06/08	17/06/08	17/06/08	17/06/08	17/06/08		

	Chem Name	Units	LOR	NHMRC (2004) Drinking	ANZECC (2000) Ecosystems Fresh Water (95%)												
TPH	TPH C 6 - C 9 Fraction	µg/L	20			<20	<20	90	<20	4500	90	<20	<20	<20	930	4500	82000
	TPH C10 - C14 Fraction	µg/L	50			<50	<50	<50	<50	1600	<50	<50	<50	<50	450	1600	36000
	TPH C15 - C28 Fraction	µg/L	100			<100	<100	<100	<100	400	100	<100	<100	<100	1100	1100	38000
	TPH C29-C36 Fraction	µg/L	100			<100	<100	<100	<100	<100	100	<100	<100	<100	<100	100	800
	TPH+C10 - C36 (Sum of total)	µg/L				<250	<250	<250	<250	2050	225	<250	<250	<250	1600	2050	74800
BTEX	Benzene	µg/L	1	**1**	950	6	<1	<1	<1	51	14	<1	<1	<1	130	130	25000
	Toluene	µg/L	1	**800**		<1	<2	<1	<1	110	2	<1	<1	<1	2	110	40000
	Ethylbenzene	µg/L	1	**300**		<1	<1	<1	<1	360	10	<1	<1	<1	3	360	5200
	Xylene Total	µg/L	1	**600**		2	<2	<2	<1	2000	52	<1	<1	<1	8	2000	16000
Metals	Arsenic	mg/L	0.001	**0.007**	0.024	-	-	-	-	-	-	-	-	-	-	0	0.003
	Boron	mg/L	0.05	4	**0.37**	-	-	-	-	-	-	-	-	-	-	0	0.05
	Cadmium	mg/L	0.0002	0.002	**0.0002**	-	-	-	-	-	-	-	-	-	-	0	0
	Chromium (hexavalent)	mg/L	0.001	0.05	**0.001**	-	-	-	-	-	-	-	-	-	-	0	0
	Chromium (III+VI)	mg/L	0.001		**0.001**	-	-	-	-	-	-	-	-	-	-	0	0.044
	Chromium (Trivalent)	mg/L	0.001			-	-	-	-	-	-	-	-	-	-	0	0.044
	Cobalt	mg/L	0.001			-	-	-	-	-	-	-	-	-	-	0	0
	Copper	mg/L	0.001	2	**0.0014**	-	-	-	-	-	-	-	-	-	-	0	0.001
	Lead	mg/L	0.001	0.01	**0.0034**	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.11
	Mercury	mg/L	0.0001	0.001	**0.0006**	-	-	-	-	-	-	-	-	-	-	0	0
	Molybdenum	mg/L	0.005	**0.05**		-	-	-	-	-	-	-	-	-	-	0	0.038
	Nickel	mg/L	0.001	0.02	**0.011**	-	-	-	-	-	-	-	-	-	-	0	0
	Selenium	mg/L	0.001	**0.01**	0.011	-	-	-	-	-	-	-	-	-	-	0	0.002
	Tin	mg/L	0.005			-	-	-	-	-	-	-	-	-	-	0	0
	Zinc	mg/L	0.001		**0.008**	-	-	-	-	-	-	-	-	-	-	0	0.021
PAH/Phenols	2,4,6-trichlorophenol	µg/L	1, 2		**20**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	0
	2,4-dichlorophenol	µg/L	1			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	0
	2,4-dimethylphenol	µg/L	1		**160**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	43
	2,6-dichlorophenol	µg/L	1			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	0
	2-chlorophenol	µg/L	1		**490**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	0
	2-methylphenol	µg/L	1			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	11
	2-nitrophenol	µg/L	5			<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	0	0
	3-&4-methylphenol	µg/L	2			<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	0	8
	4-chloro-3-methylphenol	µg/L	1			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	0
	Acenaphthene	µg/L	1			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	1
	Acenaphthylene	µg/L	1			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	0
	Anthracene	µg/L	1			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	0
	Benz(a)anthracene	µg/L	1			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	0
	Benzo(a) pyrene	µg/L	1	**0.01**		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	0
	Benzo(b)fluoranthene	µg/L	1			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	0
	Benzo(g,h,i)perylene	µg/L	1			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	0
	Benzo(k)fluoranthene	µg/L	1			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	0
	Chrysene	µg/L	1			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	0
	Dibenz(a,h)anthracene	µg/L	1			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	0
	Fluoranthene	µg/L	1			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	1
	Fluorene	µg/L	1			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	6
	Indeno(1,2,3-c,d)pyrene	µg/L	1			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	0
	Naphthalene	µg/L	1		**16**	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	0	760
	PAHs (Sum of total)	µg/L	1			<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	0	920
	Pentachlorophenol	µg/L	5		**22**	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	0	0
	Phenanthrene	µg/L	1			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	160
	Phenol	µg/L	1		**320**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	41
	Pyrene	µg/L	1			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	0

Notes:
ug/L = micrograms per litre
mg/L= milligrams per litre
- = not analysed
LOR = Limit of Reporting
< = Result less than LOR
BTEX = Monocyclic Aromatic Hydrocarbons
TPH= Total Petroleum Hydrocarbons
PAH= Polycyclic Aromatic Hydrocarbons
* Note only 1/3 bottle was filled for MW107S therefore results may be unreliable due to large headspace.
S = Shallow Well
D= Deep Well
S/D = shallow and deep well in sample location
Bold cells indicate adopted guideline value
Shaded cells indicate result exceeds adopted guideline value

Historic and Current OffSite Groundwater and Surface Water(drain) Results
Fyshwick Fuel Depot
Shell Canberra Depot (ACM107C)
16 Ipswich Street, Fyshwick ACT

	SampleCode				08-JN10414		08-JN08810	08-JN08798	08-JN08807	08-JN08806			08-JN08808			SC1	SC2	SC3
	Field ID	MW133S	MW111S	Shallow Wells Maximum	MW112D	MW115D	MW121D	MW122D			MW15	Deep Well Maximum	Shallow and Deep Well Maximum	10/21/2009	10/21/2009	10/21/2009
	Location Code		MW111S		MW112D	MW115D	MW121D	MW122D	MW134D	MW135D	MW15			Surface Water Samples Stormwater drain		
	Sample Depth (m)	Shallow	Shallow		Deep	Deep	Deep	Deep	Deep	Deep	Deep					
	Sampled Date	14/10/09	20/6/08		17/06/08	17/06/08	17/06/08	17/06/08	14/10/09	14/10/09	17/06/08					

Chem	Name	Units	LOR	NHMRC (2004) Drinking	ANZECC (2000) Ecosystems Fresh Water (95%)														
TPH	TPH C 6 - C 9 Fraction	µg/L	20			<20	<20	0	<20	340	<20	<20	<20	<20	<20	340	340	**100**	<20	<20
	TPH C10 - C14 Fraction	µg/L	50			-	-	0	<50	70	<50	<50	<50	<50	<50	70	70	<50	**110**	<50
	TPH C15 - C28 Fraction	µg/L	100			-	-	0	<100	<100	<100	<100	<100	<100	<100	0	0	<100	**200**	<100
	TPH C29-C36 Fraction	µg/L	100			-	-	0	<100	<100	<100	<100	<100	<100	<100	0	0	<100	<100	<100
	TPH+C10 - C36 (Sum of total)	µg/L				-	-	0	<250	170	<250	<250	<250	<250	<250	170	170	<250	310	<250
BTEX	Benzene	µg/L	1	**1**	950	<1	1	1	<1	<1	<1	<1	<1	<1	<1	0	1	<1	<1	<1
	Toluene	µg/L	1	**800**		<1	3	3	<2	<1	<1	<1	<1	<1	<1	0	3	<1	<1	<1
	Ethylbenzene	µg/L	1	**300**		<1	<1	0	<1	<1	<1	<1	<1	<1	<1	0	0	<1	<1	<1
	Xylene Total	µg/L	1	**600**		<1	4	4	<2	<1	<1	<1	<1	<1	<2	0	4	<1	<1	<1
Metals	Arsenic	mg/L	0.001	**0.007**	0.024	-	-	0	-	-	-	-	<0.001	0.001	-	0.001	0.001	0.001	0.001	0.001
	Boron	mg/L	0.05	4	**0.37**	-	-	0	-	-	-	-	<0.05	<0.05	-	0	0	0.06	0.07	<0.05
	Cadmium	mg/L	0.0002	0.002	**0.0002**	-	-	0	-	-	-	-	<0.0002	<0.0002	-	0	0	0.0002	<0.0002	<0.0002
	Chromium (hexavalent)	mg/L	0.001	0.05	**0.001**	-	-	0	-	-	-	-	<0.001	<0.001	-	0	0	<0.001	<0.001	<0.001
	Chromium (III+VI)	mg/L	0.001		**0.001**	-	-	0	-	-	-	-	<0.001	<0.001	-	0	0	<0.001	<0.001	<0.001
	Chromium (Trivalent)	mg/L	0.001			-	-	0	-	-	-	-	<0.001	<0.001	-	0	0	<0.001	<0.001	<0.001
	Cobalt	mg/L	0.001			-	-	0	-	-	-	-	<0.001	<0.001	-	0	0	<0.001	<0.001	<0.001
	Copper	mg/L	0.001	2	**0.0014**	-	-	0	-	-	-	-	<0.001	<0.001	-	0	0	0.022	0.019	0.008
	Lead	mg/L	0.001	0.01	**0.0034**	-	<0.001	0	<0.001	0.003	<0.001	<0.001	0.002	0.004	<0.001	0.004	0.004	0.003	0.003	0.003
	Mercury	mg/L	0.0001	0.001	**0.0006**	-	-	0	-	-	-	-	<0.0001	<0.0001	-	0	0	<0.0001	<0.0001	<0.0001
	Molybdenum	mg/L	0.005	**0.05**		-	-	0	-	-	-	-	<0.005	<0.005	-	0	0	0.028	0.032	<0.005
	Nickel	mg/L	0.001	0.02	**0.011**	-	-	0	-	-	-	-	0.001	<0.001	-	0.001	0.001	0.002	0.002	0.001
	Selenium	mg/L	0.001	**0.01**	0.011	-	-	0	-	-	-	-	<0.001	<0.001	-	0	0	<0.001	<0.001	<0.001
	Tin	mg/L	0.005			-	-	0	-	-	-	-	<0.005	0.006	-	0.006	0.006	<0.005	<0.005	<0.005
	Zinc	mg/L	0.001		**0.008**	-	-	0	-	-	-	-	0.007	0.011	-	0.011	0.011	0.5	0.39	0.25
PAH/Phenols	2,4,6-trichlorophenol	µg/L	2		**20**	-		0	<1	<1	<1	<1	<2	<2	<1	0	0	<2	<2	<2
	2,4-dichlorophenol	µg/L	1, 2			-	-	0	<1	<1	<1	<1	<2	<2	<1	0	0	<2	<2	<2
	2,4-dimethylphenol	µg/L	1		**160**	-	-	0	<1	<1	<1	<1	<2	<2	<1	0	0	<2	<2	<2
	2,6-dichlorophenol	µg/L	1, 2				-	0	<1	<1	<1	<1	<2	<2	<1	0	0	<2	<2	<2
	2-chlorophenol	µg/L	1		**490**	-	-	0	<5	<5	<5	<5	<5	<5	<5	0	0	<2	<2	<2
	2-methylphenol	µg/L	1			-	-	0	<2	<2	<2	<2	<2	<2	<2	0	0	<2	<2	<2
	2-nitrophenol	µg/L	5				-	0	<1	<1	<1	<1	<2	<2	<1	0	0	<5	<5	<5
	3-&4-methylphenol	µg/L	1, 2			-	-	0	<1	<1	<1	<1	<1	<1	<1	0	0	<2	<2	<2
	4-chloro-3-methylphenol	µg/L	1				-	0	<1	<1	<1	<1	<1	<1	<1	0	0	<2	<2	<2
	Acenaphthene	µg/L	1			-	-	0	<1	<1	<1	<1	<1	<1	<1	0	0	<1	<1	<1
	Acenaphthylene	µg/L	1			-	-	0	<1	<1	<1	<1	<1	<1	<1	0	0	<1	<1	<1
	Anthracene	µg/L	1			-	-	0	<1	<1	<1	<1	<1	<1	<1	0	0	<1	<1	<1
	Benz(a)anthracene	µg/L	1			-	-	0	<1	<1	<1	<1	<1	<1	<1	0	0	<1	<1	<1
	Benzo(a) pyrene	µg/L	1	**0.01**		-	-	0	<1	<1	<1	<1	<1	<1	<1	0	0	<1	<1	<1
	Benzo(b)fluoranthene	µg/L	1			-	-	0	<1	<1	<1	<1	<1	<1	<1	0	0	<1	<1	<1
	Benzo(g,h,i)perylene	µg/L	1			-	-	0	<1	<1	<1	<1	<1	<1	<1	0	0	<1	<1	<1
	Benzo(k)fluoranthene	µg/L	1			-	-	0	<1	<1	<1	<1	<1	<1	<1	0	0	<1	<1	<1
	Chrysene	µg/L	1			-	-	0	<1	<1	<1	<1	<1	<1	<1	0	0	<1	<1	<1
	Dibenz(a,h)anthracene	µg/L	1			-	-	0	<1	<1	<1	<1	<1	<1	<1	0	0	<1	<1	<1
	Fluoranthene	µg/L	1			-	-	0	<1	<1	<1	<1	<1	<1	<1	0	0	<1	<1	<1
	Fluorene	µg/L	1			-	-	0	<1	<1	<1	<1	<1	<1	<1	0	0	<1	<1	<1
	Indeno(1,2,3-c,d)pyrene	µg/L	1			-	-	0	<1	<1	<1	<1	<1	<1	<1	0	0	<1	<1	<1
	Naphthalene	µg/L	1		**16**	-	-	0	<1	<1	<1	<1	<1	<1	<1	0	0	<1	<1	<1
	PAHs (Sum of total)	µg/L	1			-	-	0	<1	<1	<1	<1	<1	<1	<1	0	0	<1	<1	<1
	Pentachlorophenol	µg/L	5		**22**	-	-	0	<5	<5	<5	<5	<5	<5	<5	0	0	<5	<5	<5
	Phenanthrene	µg/L	1			-	-	0	<1	<1	<1	<1	<1	<1	<1	0	0	<1	<1	<1
	Phenol	µg/L	1		**320**	-	-	0	<1	<1	<1	<1	<2	<2	<1	0	0	<2	<2	<2
	Pyrene	µg/L	1			-	-	0	<1	<1	<1	<1	<1	<1	<1	0	0	<1	<1	<1

Notes:
- = not analysed
LOR = Limit of Reporting
< = Result less than LOR
BTEX = Monocyclic Aromatic Hydrocarbons
TPH= Total Petroleum Hydrocarbons
PAH= Polycyclic Aromatic Hydrocarbons
S = Shallow Well
D= Deep Well
S/D = shallow and deep well in sample location
Bold cells indicate adopted guideline value
Shaded cells indicate result exceeds adopted guideline value

Table 19 – Historical and Recent sampling Data

Sample Location	Sampling Date	Total Petroleum Hydrocarbons (TPH)					Monocyclic Aromatic Hydrocarbons (BTEX)			
		C6-C9	C10-C14	C15-C28	C29-C39	C10-C36	Benzene	Toluene	Ethylbenzene	Xylene
MW1	22/02/06	<20	<20	<100	<100	<250	<1	<1	<1	<1
	20/09/06	<20	<20	<100	<100	<250	<1	<1	<1	<1
	19/12/06	<20	<20	<100	<100	<250	<0.5	<1	<1	<3
	17/06/08	<20	<50	<100	<100	<250	<1	<1	<1	<1
	22/10/09	<20	<50	<100	<100	<250	5	4	<1	7
MW2	22/02/06	<20	<20	<100	<100	<250	<1	<1	<1	<1
	20/09/06	<20	<20	300	204	504	<1	<1	<1	<1
	20/12/06	<20	<20	<100	<100	<250	<0.5	<1	<1	<3
	17/06/08	<20	<20	<100	<100	<250	<1	<1	<1	<1
	20/10/09	<20	<20	<100	<100	<250	<1	<1	<1	<1
	22/06/16	<20	<50	<100	<100	<100	<1	<1	<1	<3
MW3	22/02/06	PSH - Not Sampled								
	20/09/06									
	19/12/06									
MW4	22/02/06	11000	4800	352	100	5252	2700	650	1900	5650
	20/09/06	10000	6700	2600	142	9442	2400	480	1700	4040
	19/12/06	14000	10495	5200	<100	15696	2400	2000	550	4860
	17/06/08	16000	3200	3300	<100	6550	1900	950	250	2600
	21/10/09	8700	7300	120000	300	127600	1900	560	1400	4800
MW5	05/08/05	<20	280	134	<100	414	1.2	<1	<1	<1
	22/02/06	<20	<100	<100	<100	<300	<1	<1	<1	<1
	20/08/06	<20	100	<100	100	<300	<1	<1	<1	<1
	20/12/06	<20	87	184	<100	271	<0.5	<1	<1	<3
	17/06/08	<20	<50	<100	<100	<250	<1	<1	<1	<1
	19/10/09	<20	<50	<100	<100	<250	1	<1	<1	<1
	21/06/16	<20	<50	<100	<100	<100	<1	<1	<1	<3
MW6	05/08/05	<20	200	114	<100	314	2.8	<1	<1	2
	22/02/06	<20	100	<100	<100	100	4	<1	<1	<1
	20/09/06	<20	<50	<100	<100	<100	8	<1	<1	<1
	20/12/06	<20	130	316	<100	446	<0.5	<1	<1	<3

	17/06/08	<20	<50	<100	<100	<250	6	<1	<1	2
	20/10/09	<20	<50	300	<100	300	4	<1	<1	2
	21/06/16	<20	490	800	<100	1280	<1	<1	<1	<3
MW7	05/08/05	26000	42460	31750	356	74565	7100	3500	1200	5700
	22/02/06	60000	80429	63016	509	143954	17000	2700	2600	12000
	20/08/06	PSH - Not Sampled								
	19/12/06									
MW8	05/08/05	1200	1900	1590	120	3619	250	22	70	710
	22/02/06	780	110	993	100	2093	130	6	71	304
	20/09/06	680	2000	3930	205	6135	230	5	21	117
	20/12/06	530	1900	2900	<100	4800	220	<5	6	20
	17/06/08	930	450	1100	<100	1600	130	3	2	8
	20/10/09	1600	770	1700	100	2570	240	2	5	14
	21/06/16	80	400	1200	<100	1600	<1	<1	<1	<3
MW9	05/08/05	101000	14674	3010	<100	17684	23000	14000	4400	212000
	22/02/06	42000	13401	4360	100	17761	19000	8400	2000	107000
	20/09/06	PSH - Not Sampled								
	19/12/06[1]	220000	154000	52361	<1000	206361	23000	14000	7600	30000
MW10	05/08/05	120000	34780	6610	<100	41390	26000	45000	4700	30600
	22/02/06	67000	9400	1400	100	10800	21000	32000	1800	13000
	20/09/06	PSH - Not Sampled								
MW11	22/02/06	400	1900	201	100	2101	110	3	83	23
	20/09/06	760	2400	1080	262	3740	150	3	79	14
	20/12/06	5900	3700	1700	<100	5400	240	120	220	650
	17/06/08	1400	780	300	<100	1130	83	64	3	11
	21/10/09	2600	810	800	<100	1660	1	<1	<1	<1
	21/06/16	360	1000	1400	<100	2400	4	<1	<1	<3
MW12	20/12/06	880	750	388	<100	1138	40	2	6	25
	22/02/06	11000	5900	100	100	5900	1500	130	1300	7900
	20/08/06	6400	4000	432	100	4432	1300	42	1200	1889
	17/06/08	4100	530	100	<100	680	5	1	5	40
	19/10/09	9300	4200	<100	<100	4300	860	41	1000	7300
MW13	05/08/05	<20	<20	<100	<100	<250	<0.5	<1	<1	<3
	20/12/06	<20	180	392	<100	572	<0.5	<1	<1	10

	22/02/06	<20	<50	<100	<100	<250	1	<1	<1	<1
	20/08/06	<20	20	528	169	697	<1	<1	<1	<1
	17/06/08	<20	<50	<100	<100	<250	1	<1	<1	<1
	21/10/09	<20	<50	<100	<100	<250	<1	<1	<1	<1
MW14	22/02/06	31000	16727	12180	100	28452	12000	6700	1200	10300
	20/09/06	PSH - Not Sampled								
	19/12/06									
	17/06/08									
	19/10/09									
	22/06/16									
MW15	22/02/06	<20	100	278	100	378	<1	<1	<1	<1
	20/09/06	<20	<20	<100	<100	<250	<1	<1	<1	<1
	19/12/06	<20	<20	<100	<100	<250	<0.5	<1	<1	<3
	17/06/08	<20	<50	<100	<100	<250	<1	<1	<1	<1
	22/10/09	<20	<50	<100	<100	<250	<1	<1	<1	<1
MW16	22/02/06	9800	3700	580	100	4280	3300	2500	100	2800
	20/09/06	5400	2500	849	100	3349	2000	880	84	1680
	19/12/06	380	-	-	-	-	5.4	<1	<1	99
	17/06/08	4400	2000	200	<100	2200	2100	10	40	1100
	21/10/09	5500	2100	500	<100	2600	2500	300	260	2400
MW101S	17/06/08	13000	36000	38000	800	74800	7700	620	2100	2900
	22/10/09	37000	7400000	8800000	5100	8805100	6900	2100	1500	7700
	22/06/16[2]	PSH - Not Sampled								
MW102D	17/06/08	90	<50	100	100	225	<1	<1	<1	<2
	19/10/09	<20	<50	<100	<100	<250	<1	<1	<1	<2
	21/06/16	<20	<50	<100	<100	<100	<1	<1	<1	<3
MW103S	22/06/16	<20	<50	<100	<100	<100	<1	<1	<1	<3
MW106S	17/06/08	30	13000	3200	<100	16250	1	<1	4	5
	22/10/09	<20	600	800	<100	1400	<1	<1	<1	<1
	22/06/16	<20	<50	<100	<100	<100	<1	<1	<1	<3
MW107S	17/06/08	50	<50	<100	<100	<250	2	<1	1	2
	20/10/09	<20	<50	<100	<100	<250	2	<1	<1	<1
	22/06/16	<20	<50	<100	<100	<100	<1	<1	<1	<3
MW108S	17/06/08	<20	<50	<100	<100	<250	<1	<1	<1	<1

	20/10/09	Not Located								
MW110	17/06/08	2000	5200	4300	<100	11550	<1	5200	<1	14000
	22/10/09	100	2100	2800	<100	4950	1	<1	56	48
	21/06/16	<20	<50	<100	<100	<100	<1	<1	<1	<3
MW111S	17/06/08	<20	-	-	-	-	1	<1	3	4
	21/10/09	<20	<50	<100	<100	<250	<1	<1	<1	<1
MW112D	17/06/08	<20	<50	<100	<100	<250	<1	<1	<1	<1
	22/10/09	<20	60	<100	<100	60	<1	<1	<1	<1
MW113S	21/06/16	610	1100	4900	<100	6000	300	<1	<1	<3
MW114S	22/06/16	650	70	<100	<100	<100	390	16	29	<30
MW115D	17/06/08	340	70	<100	<100	170	<1	<1	<1	<1
	22/10/09	570	80	<100	<100	80	300	<1	<1	<1
	22/06/16	620	770	500	<100	1300	360	<10	<10	<30
MW117D	17/06/08	PSH - Not Sampled								
	19/10/09									
MW119D	17/06/08	<20	<50	<100	<100	<250	<1	<1	<1	<1
	21/10/09	60	<50	<100	<100	<250	<1	<1	<1	<1
MW121D	17/06/08	<20	<50	<100	<100	<250	<1	<1	<1	<1
	22/10/09	<20	<50	<100	<100	<250	<1	<1	<1	<1
	17/01/17	<20	<50	<100	<100	<100	<1	<1	<1	<3
MW122D	17/06/08	<20	<50	<100	<100	<250	<1	<1	<1	<1
	22/10/09	<20	<50	<100	<100	<250	<1	<1	<1	<1
MW125S	17/06/08	82000	7600	1500	100	9200	25000	1200	40000	16000
	21/10/09	100000	24000	12000	2800	38800	25000	36000	1800	41000
MW126D	17/06/08	PSH - Not Sampled								
	19/10/09									
	22/06/16									
MW127S	17/06/08	26000	-	-	-	-	16000	780	2900	6600
	20/10/09	2500	2100	1600	300	4000	1500	38	16	68
MW128D	17/06/08	4300	1600	400	<100	2050	51	360	110	2000
	20/10/09	<20	180	1000	100	1280	<1	<1	<1	<1
	21/06/16	<20	90	700	<100	780	3	<1	<1	<3
MW129D	17/06/08	90	<50	100	100	225	14	10	2	52
	20/10/09	<20	<50	<100	<100	<250	<1	<1	<1	<1

MW130S	20/06/08	4300	-	-	-	-	2200	43	8400	12000
	20/10/09	15000	3600	800	<100	4400	<1	<1	870	14000
	21/06/16	440	6000	200	200	6440	21000	890	<200	7600
MW131S	21/10/09	11000	<50	100	<100	100	5500	250	720	4400
	22/06/16	11000	3000	400	<100	3370	4900	100	660	1100
MW133S	22/10/09	<20	<50	<100	<100	<250	<1	<1	<1	<1
MW134D	22/10/09	<20	<50	<100	<100	<250	<1	<1	<1	<1
	17/01/17	<20	<50	<100	<100	<100	<1	<1	<1	<3
MW135D	22/10/09	<20	<50	<100	<100	<250	<1	<1	<1	<1
	17/01/17	<20	<50	<100	<100	<100	<1	<1	<1	<3
MW136S	19/10/09	<20	<50	<100	<100	<250	<1	<1	<1	<1
MW137S	19/10/09	<20	<50	<100	<100	<250	<1	<1	<1	<1
	22/06/16	<20	<50	<100	<100	<100	<1	<1	<1	<3
MW138S	19/10/09	<20	<50	<100	<100	<250	<1	<1	<1	<1
	22/06/16	<20	<50	<100	<100	<100	<1	<1	<1	<3

Note: All results in µg/l
Shading represents the presence of PSH

1. Sample recovered from MW9 even though the well was reported as decommissioned
2. Sample recorded on the chain of custody and laboratory report as MW7

Appendix C EMP

ENVIRONMENTAL CONSULTING SERVICES
PTY LTD ABN 75 073 668 425

ENVIRONMENTAL MANAGEMENT PLAN

16 Ipswich Road
Fyshwick, ACT

Environmental Consulting Services Pty Ltd
June 2017

Simon Caples

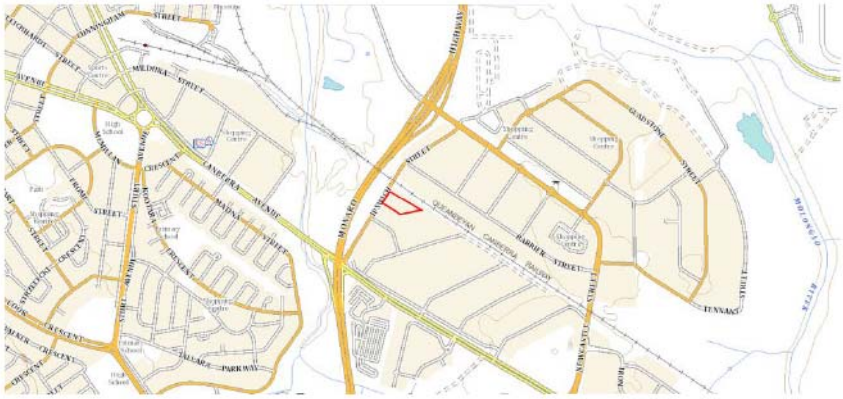
PO Box 1046 Leichhardt NSW 2040 simon@ecsgroup.com.au 0415 225 474

1.0 OVERVIEW

The purpose of this Environmental Management Plan (EMP) is to allow the Environment Protection Authority to enter into an environmental protection agreement with Access Trading Company Pty Ltd (the Site Owner) for ongoing commercial use of 16 Ipswich Road in Fyshwick (the Site).

The Site is described as Block 9, Section 8 – Division of Fyshwick in DP 5469 Vol: 832 Folio: 21 and the location is presented on Figure 1 - Location Plan.

Figure 1 - Site Location Plan

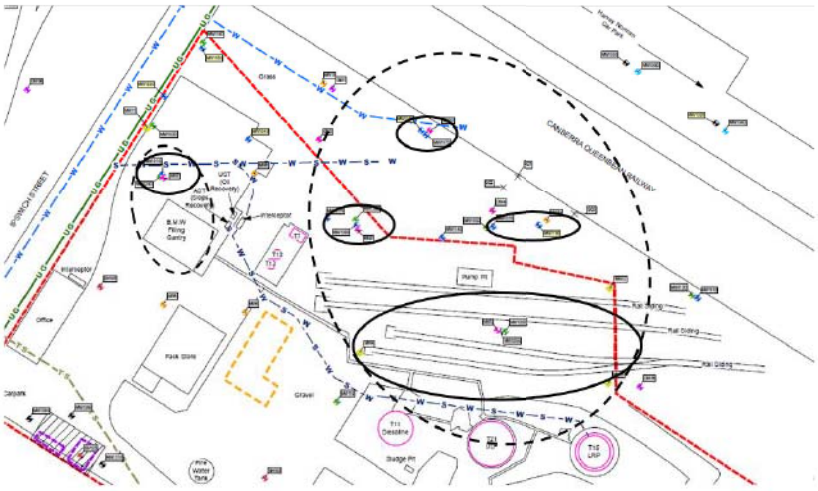


The Site has been the subject of environmental assessments that have indicated the presence of petroleum hydrocarbon contamination in soil and groundwater at the Site resulting from the previous use of the land as a fuel storage depot.

The soil and groundwater contamination at the Site consists of diesel and gasoline fuel including benzene. The nature of the contamination includes absorbed hydrocarbon contaminants within soil, dissolved hydrocarbon contaminants in groundwater and Phase Separate Hydrocarbon ('free product) floating on the groundwater.

The distribution of contamination at the Site is presented on Figure 2 with Phase Separate Hydrocarbon ('free product) outline in solid black and contaminations 'zones' with a dotted outline.

Figure 2 –Contamination Distribution



The depth to PSH varies across the Site but may be encountered at depth of 3m or below. Soil contamination may be present at some locations from the ground surface down.

The EMP presents management measures to mitigate potential risks associated with the existing contamination at the Site. An overview of the environmental risks at the Site is presented in Table 1.

Table 1 – Site Overview

Consideration	Comment
Proposed activity	Commercial use of the land. Ancillary storage of metal.
Receiving environment	Indoor air, site construction environment and surface water.
Environmental risks	Vapour intrusion into buildings, exposure to contamination during construction activities and off-site impact.
Management strategies	Restrict construction of buildings over areas of contamination and implement management measures for excavation activities.
Environmental acceptability	The existing contamination is only considered to represent a risk related to excavation activities or construction. The contamination is not considered to represent a risk to human health or the environment if undisturbed with the current Site improvements.

This EMP has been prepared based on the report entitled *Site Validation Report, Former Shell Canberra Depot, 16 Ipswich Street, Fyshwick ACT* (Environmental Consulting Services Pty Ltd, March 2017)

2.0 BACKGROUND

The investigations completed at the Site have resulted in the development of a Conceptual Site Model (CSM). The CSM is presented on Table 2.

Table 2 – Conceptual Site Model

Sources	
Primary Contamination Sources – On Site	Historical product storage • UST(s) in car park area; • former semi buried tanks in the centre of the Site; Historical operations • filling gantry and associated fuel lines; • truck wash and garage; and • rail siding and associated pumping infrastructure.
Secondary Contamination Sources	• impacted surface soils; • impacted subsurface soils; • dissolved groundwater plume; • free-phase liquid plume; and • impacted surface water
Impacts	
Extent of Soil Impacts	The rail siding and the carpark area
Extent of Groundwater Impacts	The rail siding and open space to the north of the Site including the rail lines. The contaminants of concern are benzene and the TRH F1 fraction.
Phase Separated Hydrocarbons Impact	• MW126D encountered 1.0-1.2m of PSH in 2008 and 8m in 2009; • MW14 encountered 0.4m of PSH in 2008 and 1.4m in 2009; and • MW117D encountered 0.035m of PSH in 2008 and 0.067m in 2009.
Receptors	
Potential Human Receptors	• Future commercial workers; • Future intrusive workers;
Ecological Receptors	Nil. Ecological receptors were not considered to be at significant risk from Site based impacts
Pathways	
Potential Human Exposure Pathways	• Direct contact exposure to chemicals in soil; • Direct contact exposure to chemicals in groundwater within an excavation; • Inhalation of chemicals in windblown dust; • Inhalation of vapours in indoor air; and • Inhalation of vapours in outdoor air.

Fate and transport modelling has been undertaken as part of a Human Health and Ecological Risk Assessment.

The potential fate and transportation of petroleum hydrocarbons via groundwater, towards a downgradient receptor indicated that after 100 years of steady state groundwater migration (i.e. with no degradation of benzene) benzene would not travel further than approximately 50 m of the site.

The modelling indicated that organic groundwater impacts are expected to be at concentrations below limits of detection within 50 m of the Site boundary after 100 years, suggesting that adverse off-Site impacts associated with these chemicals are unlikely.

Validation of the model was completed by comparison of the modelled concentrations to the reported concentrations at a monitoring well more than 50m down gradient of the Site. Concentrations of petroleum hydrocarbon contaminants were not detected at this well indicating that the modelling results described above are valid.

Contaminant transport through groundwater appears best evaluated through observation down gradient to the form loading gantry. Impact in this area appear to have migrated less than 20m during the life of the facility and to present day. This distribution of impact indicates a rate of migration of less than 1m per year.

2.0 JUSTIFICATION

The Site has been contaminated from historic use of the land as a fuel storage depot. It is proposed to use the Site for alternate commercial/industrial use, associated with the storage of metal for recycling. The proposed Site use is not related to the impacts at this Site.

Management of the contamination at the Site is proposed rather than active remediation. Active remediation is not considered feasible or necessary on the following basis:

- Remediation of the contamination is not needed to allow the proposed use of the land. Management controls including limiting construction of new buildings and minimising and controlling excavation activities can mitigate the potential risk associated with the contamination.
- The product recovery trial indicated that active extraction of PSH was not viable.
- The permeability of the soils at the Site would preclude effective vapour extraction or air sparging to reduce impact at the Site.
- Excavation and on-Site, ex-situ remediation of soil and groundwater would result in significant disturbance to the Site and also significant energy expenditure with associated emissions.

On Site ex-situ remediation of contamination is considered a potential method to reduce the impacts on the Site. Remediation of the contamination will mitigate the potential human health risks but will result in further environmental impacts. The environmental impacts associated with remediation are considered more significant than managing the existing, potential human health risks.

3.0 CHARACTERISTIC OF THE PROPOSED ACTIVITY

The proposed activity is the commercial use of the Site with the implementation of administrative controls to manage human health risk associated with contamination. The key characteristics of the proposed activity are summarised in Table 3.

Table 3 - Key characteristics

Element	Description
Administrative controls to allow use of the Site	Management of human health risks associated with Site contamination that are ongoing until land use changes or redevelopment
Total Site area	Approximately 2 hectares (20,500m^2)
Contaminated media	Soil and groundwater including PSH
Primary contaminants of concern	Benzene and TRH F1 fraction
Potential human health risks	• Exposure to contamination through excavation; • Indoor vapour inhalation if there is development over the contamination
Administrative controls to manage potential human health risk	• Prohibition of the construction of building/enclosed spaces; • Management of disturbance or exposure of the soil or exposure to groundwater.

The proposed land use is limited to storage of material. The land use will not generate impacts on neighbouring properties other than minor noise associated with material movement. The use of the land however, triggers the need for management of potential human health risks associated with Site contamination. This EMP is intended to address the human health risks by the establishment of controls which themselves are seen as the Proposed activities.

The proposed administrative controls are intended to replace the controls that were in place during the operation of the fuel depot.

It is proposed that the construction of buildings or enclosed spaces be prohibited at the Site to mitigate the potential for vapour intrusion into buildings constructed over contamination which could result in a vapour inhalation risk to Site occupants.

In addition it is proposed to restrict excavation activities by requiring the production of a safe work method statement that considered to contamination at the Site. For any excavation of greater than 0.3m depth a safe work method statement should be prepared. The safe work method statement must be prepared by a competent person. A competent person is a person who has acquired through training, qualification or experience, the knowledge and skills to identify, investigate and assess the risks associated with the proposed work at this Site and is able to develop appropriate risk management strategies for the work.

The safe work method statement must considered, but is not limited to:

- Potential human health risk resulting from exposure to contaminated material;
- Waste management; and
- Site reinstatement.

The safe work method statement should also include contingency measures in the event that unexpected conditions or circumstances arise.

This EMP has been prepared based on information presented in the report entitled *Site Validation Report, Former Shell Canberra Depot, 16 Ipswich Street, Fyshwick ACT* (Environmental Consulting Services Pty Ltd March 2017).

The Site Validation Report must be referred to during the preparation of any safe work method statements prepared prior to commencing activities that involve construction, disturbance or exposure of the soil beneath the Site or exposure to groundwater.

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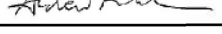
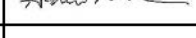
Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
Final	H. Luo	A. Kohlrusch		A. Kohlrusch		3/7/2017

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Blocks 9 & 11 Section 8, Fyshwick

APPENDIX D

CARDNO SITE INVESTIGATION

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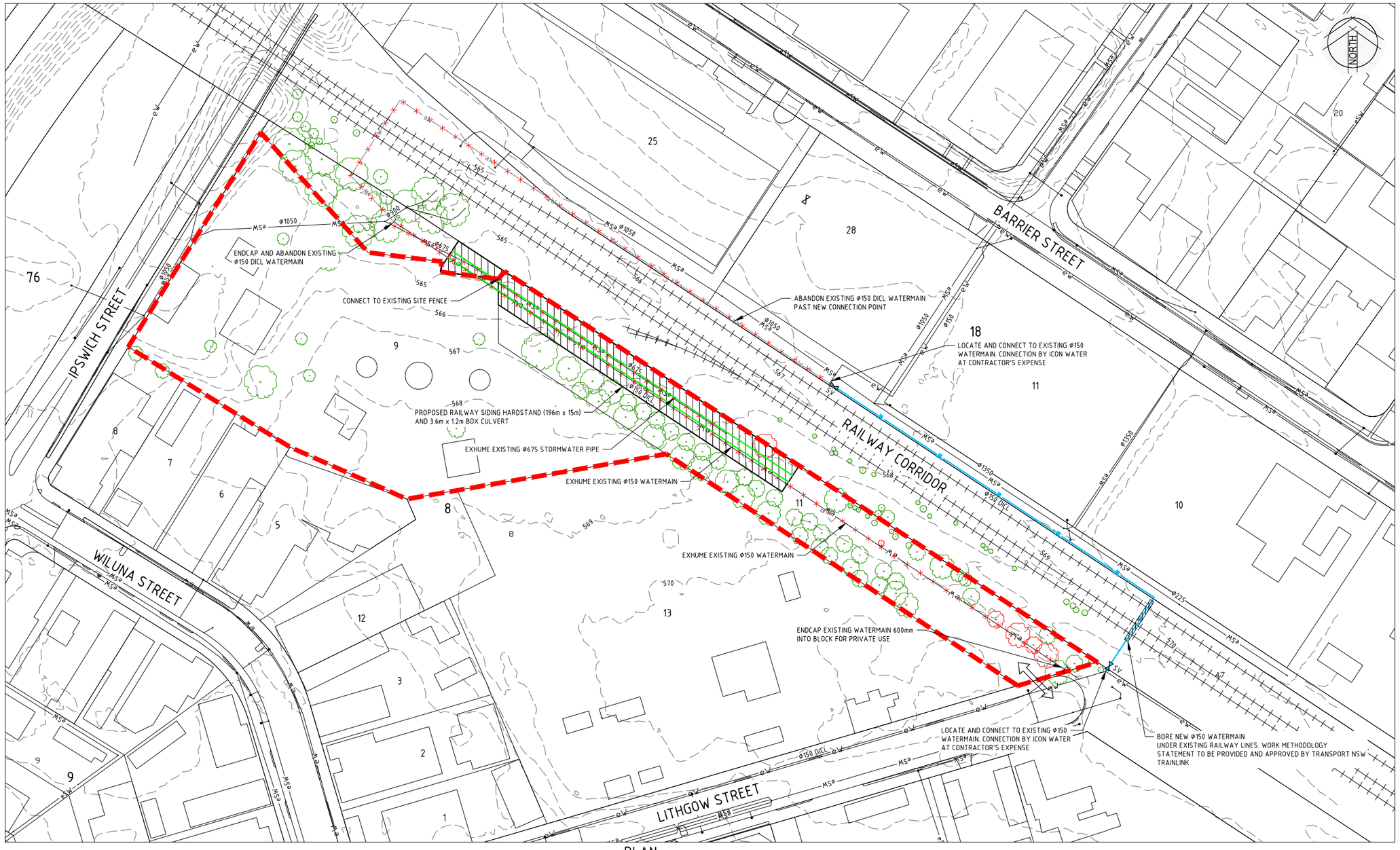


LEGEND

- SITE BOUNDARY
- EXISTING RAILWAY LINES
- TREES TO BE RETAINED
- TREES TO BE REMOVED
- SITE INGRESS AND EGRESS

PROPOSED SERVICE

- W — WATER
- STORMWATER BOX CULVERT

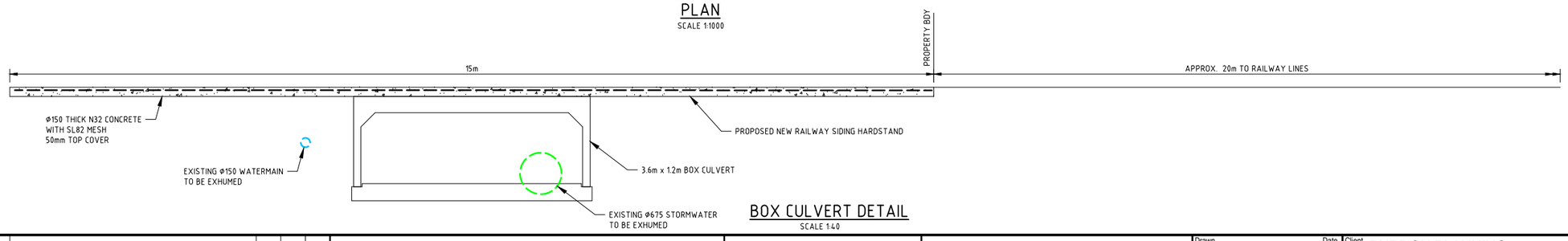
EXISTING SERVICES

- eSW — STORMWATER
- eW — WATER

EXHUMED/ABANDONED SERVICES

- eSW — EXHUMED STORMWATER
- eW — EXHUMED WATER
- aW — ABANDONED WATER

PLAN
SCALE 1:1000



BOX CULVERT DETAIL
SCALE 1:40

UTILITY INFORMATION SHOWN ON PLANS DOES NOT DEPICT ANY MORE THAN THE PRESENCE OF A SERVICE, BASED ON AVAILABLE DOCUMENTARY EVIDENCE. THE PRESENCE OF A UTILITY SERVICE, ITS SIZE AND LOCATION SHOULD BE CONFIRMED BY FIELD INSPECTION, PRIOR TO THE COMMENCEMENT OF WORKS AND THE RELEVANT UTILITY PLANS OBTAINED FROM DIAL BEFORE YOU DIG. CAUTION SHOULD BE EXERCISED WHEN WORKING WITHIN THE VICINITY OF ALL UTILITY SERVICES.

0 1 2 3 4m
SCALE 1:40 @A1

0 20 40 60 80 100m
SCALE 1:1000 @A1

Rev.	Date	Description	Des.	Verif.	Appd.
B	20/01/2017	REVISED DA SUBMISSION - TREES TO BE RETAINED	PDJ	MN	JPS
A	18/01/2017	DA SUBMISSION	PDJ	MN	JPS

PURDON PLANNING

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Web: www.cardno.com.au

Drawn	PDJ	Date 18/01/2017
Checked	MN	Date 18/01/2017
Designed	PDJ	Date 18/01/2017
Verified	GZ	Date 18/01/2017
Approved	JPS	18/01/2017

Client: PURDON PLANNING
Project: BLOCK 8, SECTION 11 FYSHWICK
PROPOSED RAILWAY SIDING
Title: PROPOSED WORKS

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSE

Datum		Scale	Size
AHD		AS SHOWN	A1

Drawing Number: 50517058-1005
Revision: B

Blocks 9 & 11 Section 8, Fyshwick

APPENDIX

E

FYSHWICK SOUTH STORMWATER AUGMENTATION

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TO JERRABOMBERRA CREEK
GPT
HIGHWAY
MONARO
IPSWICH STREET
BARRIER STREET
NEWCASTLE STREET
CLARENCE STREET
KEMBLA STREET
WOLLONGONG STREET
MARYBOROUGH STREET
ISA STREET
PIRIE STREET
COLLIE STREET
ALBANY STREET
TENNANT STREET
LYELL STREET
WILUNA STREET
LITHGOW STREET
GEELONG STREET
CANBERRA AVENUE
YALLOURN STREET
WHYALLA STREET
1500 WILUNA STREET 1200
1200
1050
750
600
525
450
375
LEGEND
EXISTING PIPE
UPGRADED CHANNEL
750 DUPLICATED PIPE AND SIZE (10 Yr ARI)
750 UPGRADED PIPE AND SIZE (10 Yr ARI)
750 NEW PIPE AND SIZE (10 Yr ARI)
ABANDONED PIPE
750 NEW PIPE AND SIZE (100 Yr ARI)
750 DUPLICATED PIPE AND SIZE (100 Yr ARI)
750 UPGRADED PIPE AND SIZE (100 Yr ARI)
NEW CHANNEL
0 50 100 150 200 250m
FIGURE 6.4
AUGMENTATION - OPTION B2
40038-08.DWG 09/08/96

Blocks 9 & 11 Section 8, Fyshwick

APPENDIX F

HAZMAT REPORT

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L&D CONSULTING
LANCASTER & DICKENSON

HAZARDOUS MATERIALS SURVEY REPORT

16 Ipswich St,
FYSHWICK ACT 2609

Prepared For: Arcadis

Survey Completion Date: 12 September 2017

Job reference: LD0660AA

16 Ipswich St
FYSHWICK
ACT 2609

PREPARED FOR:
Arcadis

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Document Control

File Reference	Revision	Date	Prepared by	Authorised by
LD0660AA_HAZMAT_16 Ipswich St, Fyshwick_20170925	0	26/09/2017	J. Smith	K. Lancaster

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Appendices

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Glossary

ACM	Asbestos Containing Material. Any material, object, product or debris that contains asbestos.
Amosite	Grey or brown asbestos.
ARCP	Asbestos Removal Control Plan. A document detailing the control measures for undertaking particular asbestos removal works.
Chrysotile	White asbestos.
Crocidolite	Blue asbestos.
Friable asbestos	Friable asbestos material can be crumbled or reduced to a dust by hand pressure when dry. It can represent a significant exposure hazard as a consequence of minor disturbance. Pipe lagging, loose-fill asbestos, millboard and severely damaged non-friable asbestos are examples of friable asbestos.
Non-friable asbestos	Non-friable asbestos is material that contains asbestos firmly bound into a matrix. It may consist of cement or various resins/binders and cannot be reduced to a dust by hand pressure. As such it does not present an exposure hazard unless cut, abraded, sanded or otherwise disturbed. Therefore, the exposure risk from non-friable ACM is negligible during normal building occupation.
ODS	Ozone Depleting Substances
PCBs	Polychlorinated Biphenyls
Safe Work Method Statement (SMWS)	Details the methodology and requirement for carrying out particular high risk construction work, including asbestos works.
SMF	Synthetic Mineral Fibres
WHS	Work Health and Safety

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1 Introduction

The *ACT Work Health and Safety Regulation 2011* states that a person or persons with management or control of the workplace must ensure that an asbestos register and an asbestos management plan be developed for the workplace. These documents are essential to aiding those with management or control of the workplace (management) to effectively manage ACM during normal building use. Management should also ensure that other hazardous materials on site are effectively managed.

1.1 Purpose

This Hazardous Materials Survey Report includes a register of all ACM, SMF, PCBs, lead containing paint, ODS and fuel storage tanks identified during the survey of 16 Ipswich St, Fyshwick completed on 12 September 2017. The register includes the location, condition and extent of these materials.

This document should be made available to all persons involved in the planned demolition of the site as well as any personnel which have a responsibility to ensure the effective management of any hazardous materials on site.

1.2 Objectives

This document is created to provide persons with control of the site during its planned refurbishment and/or demolition with a system by which they can ensure that all practicable steps are taken to minimise as far as practicable the risk of exposure to hazardous materials to those visiting, occupying or working at the premises located at 16 Ipswich St, Fyshwick. Its objectives are to:

- Detail all identified hazardous materials on site including locations, condition and extent
- Advise persons with control of the site on the potential risk associated with identified hazardous materials and recommended control actions
- Describe the process for advising to those visiting, occupying or working on site of the hazardous materials which may affect them

2 Legislation

Whilst the focus of this document is to assist management to fulfil its duties with regard to the health and safety, the document has also been written to ensure that the legislative requirements associated with asbestos management can be met. This document has been written in accordance with the requirements outlined in:

- AS4361.2-1998 *Guide to Lead Paint Management - Part 2: Residential and Commercial Buildings*
- ACT Work Health and Safety (WHS) Act 2011
- ACT WHS Regulation 2011
- ACT WHS (How to Manage and Control Asbestos in the Workplace Code of Practice) approval 2014
- ACT WHS (How to Safely Remove Asbestos in the Workplace Code of Practice) approval 2014
- *Code of Practice for the Safe Use of Synthetic Mineral Fibres* [NOHSC: 2006 (1990)]

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3 Assessment Methodology

3.1 Asbestos Survey

Asbestos management surveys are conducted to identify, as far as practicable, all accessible ACM. In accordance with L & D procedures, the assessor(s) conducted a systematic inspection of the site.

Following visual assessment of the site, bulk samples are taken of suspected ACM for analysis with the purpose of confirming whether the material contains asbestos. The site sampling regime is dependent on such things as the nature of the building and the building history. Sufficient samples were taken at each location and representative bulk sampling procedures are adopted where there are repetitive materials. Materials similar to those positively identified to contain asbestos are also presumed to contain asbestos and should be treated as such. Samples are taken using fibre suppression techniques and sample locations are sealed following sampling to prevent any subsequent fibre release.

Samples collected during the assessment for asbestos analysis are delivered to a National Association of Testing Authorities (NATA) accredited laboratory with a chain of custody form. Samples are analysed using polarised light microscopy and dispersion staining techniques.

Risk Assessment

Identified ACM is risk assessed based on the following criteria:

- the condition of the material at the time of the assessment;
- the accessibility of the material;
- the likelihood of the material being disturbed resulting in a release of asbestos fibre.

Each ACM is categorised into one of four (4) risk categories:

Very Low Risk:	Material is very unlikely to pose an exposure risk in its current condition during standard building use.
Low Risk:	Material is unlikely to pose an exposure risk in its current condition during standard building use.
Medium Risk:	Material is likely to pose an exposure risk in its current condition during standard building use.
High Risk:	Material poses an exposure risk in its current condition.

Risk assessments are relevant to the specific time of the assessment and are made by the assessor using their professional judgement.

3.1.1 Assessing Risk

There are a number of factors that are considered during an asbestos material risk assessment:

- **Type of product or binding matrix**: Asbestos fibres were used in the manufacture of many different building products. These materials typically utilised an agent to bind the asbestos fibres within the matrix of the building material. Fibres which are bound within a matrix cannot be inhaled and therefore do not pose an exposure risk until the fibres are released from the matrix.

- **Condition of ACM:** The condition of an ACM is important for assessing risk. An example of this would be asbestos cement sheet in poor condition. Although the asbestos fibres were manufactured to be bound within the cement matrix, damage has resulted in the release of airborne fibre as well as making further disturbance of the material more likely to generate airborne asbestos fibres.
- **Location:** The location of an ACM is typically a great indicator on the likelihood that an ACM will become disturbed. The more accessible and ACM or if an ACM is present in an "Active" work area, the more likely it is that an ACM will become disturbed. Direct disturbance of ACM can result in an asbestos exposure and also increases the likelihood of the further fibre release if disturbed again.

Risk assessments are relevant to the specific time of the assessment and are made by the licenced asbestos assessor using their professional judgement.

Where a risk assessment indicates there is an elevated risk of exposure to airborne asbestos fibre, suitable control measures must be implemented to eliminate or reduce the risk as far as practicable.

3.1.2 Determining Suitable Control Measures

Recommended control measures are made by the LAA based on the results of the risk assessment. These recommendations are presented within the site asbestos register (Section 6.1). However, should the condition of identified ACM change or should site conditions increase the likelihood that ACM may be disturbed, this risk assessment may need to be revised.

The *ACT WHS (How to Manage and Control Asbestos in the Workplace Code of Practice) Approval 2014* requires that when choosing the most appropriate control measure for managing ACM or asbestos, the hierarchy of controls must be considered. It is important that Management refers to the hierarchy of controls (Section 11) to make determinations on whether further/alternative action is required.

3.2 SMF

The survey for SMF is carried out in general accordance with the guidelines documented in the *Code of Practice for the Safe Use of Synthetic Mineral Fibres* [NOHSC: 2006 (1990)]. This includes documenting any materials visually assessed on site as being consistent with SMF.

3.3 Fuel Storage Tanks

A visual inspection of the site was undertaken to assess for signs of infrastructure of both above ground and below ground fuel storage tanks.

3.4 PCBs

Detailed information found on capacitors of light fittings and other electrical equipment was recorded for cross-referencing with the Australian and New Zealand Environmental and Conservation Council (ANZECC) *Identification of PCB containing capacitors information booklet (1997)*.

Due to the inherent hazard in accessing electrical components, such as live electricity, working at heights and confined spaces, some components may not be safely accessed. In these instances, comment is made on the likelihood of PCB containing materials based upon age and appearance.

3.5 Lead Containing Paint

All surface paints on site were assessed for their likelihood to contain lead. The assessment concentrated on areas where lead based paints may have been used (e.g. Building exterior, window frames, skirting boards etc.). Determination of which areas are most likely to have lead based paint is made by the assessor based on factors such as the age and construction of the building(s). The sampling program typically included taking three (3) sub samples for each paint identified to ensure representative analysis. Samples size is typically 25mm^2. Painted surfaces samples were delivered to a NATA accredited facility for lead analysis.

AS4361.2 – 1998 *Guide to Lead Paint Management – Part 2: Residential and Commercial Buildings,* defines lead paint as that containing in excess of 1% lead by weight.

3.6 ODS

An inspection of air conditioning and refrigeration units was undertaken to assess for ODS.

4 Survey Details

On 12 September 2017, Lancaster & Dickenson Consulting completed a hazardous materials survey of 16 Ipswich St, Fyshwick. This document details the findings of this survey. The lead surveyor was ACT licensed Asbestos Assessor Kyle Lancaster (Licence No. AA00004).

4.1 Site Description

Site Address:	16 Ipswich St, Fyshwick
Block & Section:	Block 9, Section 8 - FYSHWICK

4.2 Site Location

The location of the site is shown blow in Figure 1.

Figure 1: Site location

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5 Survey Findings

Lead Surveyor	Kyle Lancaster - LAA (AA00004)	**Survey Completion Date**	12 September 2017
Site Address	16 Ipswich St, Fyshwick		

This tables presented in the following sections detail the findings of the intrusive hazardous materials survey.

5.1 Asbestos

Table 1a includes details of asbestos items that were identified or assumed to be present during the survey of 16 Ipswich St, Fyshwick. Table 1b includes information on the samples taken during the survey which were found to be non-asbestos. Asbestos sample analysis was undertaken at L&D's, National Association of Testing Authorities (NATA) accredited laboratory. The samples were analysed by Polarised Light Microscopy using dispersion staining techniques. The results of the asbestos sample analysis can be found on the Certificates of Analysis (Appendix E to this report).

Key Codes for Asbestos Register

Asbestos Content: CHR = Chrysotile, AMO = Amosite, CROC = Crocidolite, NAD = No asbestos detected

ACM Form: F = Friable, NF = Non-friable

Material Condition: G = Good, F = Fair, P = Poor

Likelihood of Disturbance: VL = Very low, L = Low, M = Medium, H = High

Risk Ranking: 1 = Very low, 2= Low, 3 = Medium, 4 = High

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Table 1a – Asbestos Materials Register

ITEM NO.	BUILDING	LOCATION DESCRIPTION	MATERIAL DESCRIPTION	PHOTO NO	SAMPLE NO.	ASBESTOS CONTENT	ASBESTOS TYPE	MATERIAL CONDITION	LIKELIHOOD OF DISTURBANCE	RISK RATING	RECOMMENDATIONS & COMMENTS
LD0660AA-001	Store Office	Wall sheet to SE end of building (internal)	Fibre Cement	A1	LD-KL2113	CHR	Non-friable	G	VL	1	Remove prior to the commencement of demolition works
LD0660AA-002	Store Office	External sheet debris around store office	Fibre Cement	A2	LD-KL2115b	CHR & AMO	Non-friable	P	L	2	Remove as soon as practicable
LD0660AA-003	Fire Pump Shed	External sheet debris around fire pump shed	Fibre Cement	-	Refer to sample LD-KL2115b		Non-friable	P	L	2	
LD0660AA-004	Fire Pump Shed	Pipe flange joints	Gasket	A3	LD-KL2117	CHR	Non-friable	G	VL	1	Remove prior to the commencement of demolition works
LD0660AA-005	Throughout	Pipe flange joints throughout site	Gasket	A3	Refer to sample LD-KL2117		Non-friable	G	VL	1	
LD0660AA-006	Fire Pump Shed	Eave sheet	Fibre Cement	A4	LD-KL2118	CHR	Non-friable	G	VL	1	
LD0660AA-007	Store Shed	Layer beneath tin screws	Bitumen	A5	LD-KL2119	CHR	Non-friable	G	VL	1	

ITEM NO.	BUILDING	LOCATION DESCRIPTION	MATERIAL DESCRIPTION	PHOTO NO	SAMPLE NO.	ASBESTOS CONTENT	ASBESTOS TYPE	MATERIAL CONDITION	LIKELIHOOD OF DISTURBANCE	RISK RATING	RECOMMENDATIONS & COMMENTS
LD0660AA-008	Store Shed	Corrugated sheet roof	Fibre Cement	A6	Visually Assessed	Assumed	Non-friable	F	L	**2**	Remove prior to the commencement of demolition works
LD0660AA-009	Store Shed	Guttering to roof	Fibre Cement	A7	Visually Assessed	Assumed	Non-friable	F	L	**2**	
LD0660AA-010	Main Office	Lining and debris to ceiling void	Fibre Cement	A8/A9	LD-JS1323	CHR	Non-friable	G	VL	**1**	
LD0660AA-011	Main Office	Switchboard backing panel	Tar board	A10	Visually Assessed	Assumed	Non-friable	G	VL	**1**	
LD0660AA-012	Throughout	Post master general pits	Fibre Cement	A11	Visually Assessed	Assumed	Non-friable	F	VL	**1**	

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Table 1b: Non-asbestos Sample Register

SAMPLE NO.	BUILDING	LOCATION DESCRIPTION	MATERIAL DESCRIPTION	PHOTO NO	COMMENTS
LD-KL2114	Store Office	Wall sheet around doorway to storeroom	Fibre Cement	NA1	-
LD-KL2115a	Store Office	External sheet debris around store office	Fibre Cement	-	-
LD-KL2116	Store Office	External infill panels	Fibre Cement	NA2	-
LD-KL2120	Store Shed	Pipe flange joints adjacent road bridge	Gasket	NA3	Green gaskets
LD-KL2121	-	Expansion joints to tank concrete pads	Mastic	NA4	-
LD-KL2122	-	Wrap to pipes at northern end of site	Fibrous Plaster	NA5	-
LD-KL2123	-	Expansion joint mastic to walls adjacent driveway	Mastic	NA6	-
LD-JS1321	Main Office	Vinyl flooring to entryway	Vinyl	NA7	Refer to kitchen & male toilets
LD-JS1322	Main Office	Wall sheet to storeroom adjacent entry	Fibre Cement	NA8	Refer ceiling sheet to storeroom & external sheeting to northern end of building

5.2 Discussions

Throughout site there are a large quantity of pipe flange joints. Any joints that are not consistent with sample LD-KL2120 or made from a non-suspect asbestos material (e.g. rubber) should be considered to contain asbestos. All ACM should be removed prior to the commencement of demolition works or any other works which are likely to disturb the materials. The sheet debris around the store office and fire pump shed should be removed as soon as practicable.

5.3 Asbestos Removal

Where it has been assessed (by LAA or site management) that asbestos removal is required, safe work process should be followed to ensure that the act of removal does not pose a risk in itself. There are also regulatory requirements relating to the removal of asbestos which have also been written to mitigate risks posed by the removal of asbestos.

5.3.1 Prior to Licensed Asbestos Removal Work Commencing

Prior to the commencement of any works associated with asbestos, an asbestos removal contractor must notify the regulator of the plan to undertake asbestos removal works. This notification process typically includes completing a notification form and supplying the regulator with an Asbestos Removal Control Plan (ARCP). The ARCP should include as a minimum:

- Proposed method for removal of asbestos;
- Approximate quantity and kind of asbestos to be removed;
- Equipment proposed to be used to remove the asbestos, including PPE and RPE equipment;
- Details of air monitoring programme (as required)

Removal works may only commence five (5) days following submission of this documentation unless provision is given by the regulator for the work to be undertaken sooner, as emergency asbestos removal works.

A Safe Work Method Statement must also be developed and delivered to the head contractor for the site. The SWMS is developed to outline the safe work methods and hazard controls necessary for managing the risk of asbestos exposure.

Prior to asbestos removal being undertaken, the Site Controller should:

- Provide a copy of the asbestos register to the asbestos removal contractor;

- Inform all occupants and workers employees in the areas adjacent the proposed asbestos removal work areas of plan for asbestos to be removed
- Ensure arrangements have been made for air monitoring to be conducted (where required);

5.3.2 Asbestos Removal Works

Removal of friable asbestos must be undertaken by an ACT licensed Class A Asbestos Removalist as per the *Work Health and Safety: How to Safely Remove Asbestos Code of Practice (2014)* and in accordance with *EPA (2011) Contaminated Sites Information Sheet No. 5 'Requirements for the Transport and Disposal of Asbestos Contaminated Wastes'* and *Information Sheet No.6 'Management of Small Scale, Low Risk Soil Asbestos Contamination'*. Removal of non- friable asbestos can be undertaken by either an ACT licensed Class A or Class B Asbestos Removalist.

The asbestos removal licence holder must appoint a licensed asbestos removal supervisor to oversee the removal work.

5.3.3 Air Monitoring for Asbestos Removal Works

Air monitoring, is mandatory during the removal (or remediation) of friable asbestos, and must be undertaken in accordance with the *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres, 2nd Edition [NOHSC: 3003(2005)]*. It is sometimes required, but is typically not mandatory for the removal of non-friable asbestos.

Asbestos fibre air monitoring is a tool used by LAA to assess the suitability of controls utilised during asbestos removal works.

Air monitoring can also be used to help assess the asbestos exposure risk posed following the disturbance of a known or suspect ACM (further details regarding undertaking air monitoring following unexpected uncovering or disturbance of known or suspect ACM is detailed in Sections 15.1 and 15.2).

It is a requirement that any air monitoring undertaken during asbestos removal works is to be undertaken by an independent LAA. Lab analysis of air monitoring filters should be undertaken at a NATA (National Association of Testing Authorities, Australia) accredited laboratory.

5.3.4 Following Completion of Asbestos Removal Works

On completion of asbestos removal works an independent ACT licensed Asbestos Assessor must be employed to undertake a Clearance Inspection. A satisfactory clearance certificate for the remediated areas must include no visible suspect material and where applicable,

clearance monitoring (required for friable removal enclosures and some non-friable removal works) must also indicate that airborne fibre levels are satisfactory (<0.01 fibres per mL).

6 Summary of Identified SMF

Two (2) SMF items were identified during the survey of 16 Ipswich St, Fyshwick. Table 2 below summarises these items.

Table 2: Details of Identified SMF

Location	Material Description	Extent	Type	Photo	Recommended action
Ceiling space above timber cladding to Main Office	Insulation	Throughout	Bonded	-	Manage during demolition works
Lining to tiles within ceiling space	Sisalation	Throughout	Bonded	SMF1	Manage during demolition works

6.1.1 Removal of SMF Products

Procedures to be applied for removal depend on the form of the original SMF insulation installed.

The two basic forms of SMF insulation are bonded and unbonded. The bonded form is where adhesives or cements have been applied to the SMF before delivery and the SMF product has a specific shape. The unbonded form has no adhesives or cements and the SMF is loose material packed into a package. The unbonded form can be packed loose or mixed with adhesives or cements before, or during, installation.

Removal of bonded material is easier and less hazardous. Any physical abrasion, including cutting, should be kept to a minimum during removal. Such removal can be performed in a dry condition if there is minimal physical abrasion. Only in circumstances where heat or other causes have made the bonded SMF attach itself to the substrate should physical abrasion take place. If this occurs, removal should be performed as for unbonded SMF removal.

Removal of unbonded material is difficult and more hazardous. The unbonded material should be thoroughly wetted before removal takes place. Dry removal may be necessary when there are electrical and heat considerations. Increased respiratory protection may be necessary when working in enclosed or poorly ventilated spaces or where the SMF insulation has undergone physical change.

7 Summary of Identified PCB and Non-PCB Containing Capacitors

The capacitors of a selection of each type of light fitting throughout the site were inspected. The details of all capacitors were noted and checked against the ANZECC Identification Of PCB-Containing Capacitors (1997).

One (1) type of PCB containing capacitor was identified to fluorescent light fittings during the survey.

Table 3: Details of Identified PCB and Non-PBC Containing Capacitors

Locations	Capacitor Type	PCB?	Photo no.	Extent	Recommended action
Various ceiling light fittings	Ducon APM 235 3.5µ ± 10%	**Yes**	PCB1	Throughout site	No action required
Various ceiling light fittings	ATCO CP-8.0	No	NPCB1	Throughout site	No action required

As there is no clear extent of light fittings that contain PCB containing capacitors, all light fittings should be inspected and any metal capacitors treated as containing PCB.

7.1.1 Handling of PCB Containing Capacitors

PCB-containing capacitors are unlikely to pose a health risk, unless they become damaged and leak. Care must be taken when handling a damaged capacitor to ensure that spillage does not occur. The person handling the damaged capacitor should take the following precautions:

- put on personal protective equipment and clothing before removing damaged or leaking components;
- wear gloves that are made of materials that are resistant to PCBs, such as Viton, polyethylene, polyvinyl alcohol (PVA), polytetrafluoroethylene (PTFE), butyl rubber, nitrile rubber, or neoprene. Mid-arm length gauntlets may be required;
- do not use gloves made of polyvinyl chloride (PVC) or natural rubber (latex);
- use disposable gloves;

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• wear disposable overalls made of Tyvek or made of materials with similar chemical resistant properties;

• when working with overhead equipment (e.g. Fluorescent light fixtures), wear a full-face shield and appropriate hair protection;

• wash any non-disposable contaminated equipment with kerosene and collect the kerosene for disposal as a PCB-contaminated solvent;

• if PCB vapours are suspected (e.g. PCB leaks onto a hot surface in a confined space), wear a suitable respirator. Use a twin cartridge type respirator suitable for chlorinated vapours. It is always prudent to ensure adequate ventilation. NOTE: PCBs do not vaporise readily at room temperature;

• do not smoke; and

• after handling PCBs, even if gloves were worn, wash hands well in warm, soapy water before eating, drinking, smoking, handling food or drink, or using toilet facilities.

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8 Summary of Identified Lead Containing Paint

Table 4: Details of Lead Paint Sampling & Analysis

Sample No	Locations	Colour	Photo no.	Lead content (%)	Comments
Lead Paint ≥ 1.0 % Pb	First Schedule Lead Paint 0.25% Pb ≤ 1.0 % Pb				Lead-free Paint < 0.25 % Pb
LD0660AA-P1abc	Poles, handrails and steps throughout site	Yellow		0.09	No action required
LD0660AA-P2abc	Besser blocks, tanks and poles throughout site	White		<0.05	
LD0660AA-P3abc	Main office façade, doors and pipes	Brown		0.05	
LD0660AA-P4	Fire pump station walls	Cream		0.2	
LD0660AA-P5abc	Pipework throughout site	Red	LP1	1.2	Manage during demolition works
LD0660AA-P6abc	Foam pipework throughout site	Blue		<0.05	No action required
LD0660AA-P7	Store shed (front) - walls	Grey	LP2	0.3	Manage during demolition works
LD0660AA-P8abc	Besser block walls, water tank and fire pump house facade	Green		<0.05	No action required

Analysis of paint samples taken during the survey of 16 Ipswich St, Fyshwick identified red lead paint to pipe work throughout the site and grey first schedule lead paint to the store shed walls. Lead paint sample analysis was undertaken by Envirolab Services Pty Ltd, a NATA accredited laboratory. The results of the lead paint sample analysis can be found on the Certificates of Analysis (Appendix F to this report).

Lead and first-schedule lead paints should be managed during demolition. In the ACT materials containing lead paint may be disposed of as construction waste but should not be recycled.

9 Summary of Identified Ozone Depleting Substances (ODS)

All air-conditioning and refrigeration units were inspected during the survey of 16 Ipswich St, Fyshwick.. The presence of ODS in inspected units was determined using refrigerant information where available. Units which did not have information regarding the refrigerant type used, were assumed to contain ODS.

Table 5: Details of units inspected for Ozone Depleting Substances (ODS)

Unit Location	Unit Description	Refrigerant	ODS? (Y/N)	Recommended action
Store room	Air-conditioning units	R22	**Yes**	De-gas unit prior to removal
Main Office building	Air-conditioning units	R22	**Yes**	De-gas unit prior to removal

10 Summary of Identified Fuel Tank Storage

Multiple above ground storage tanks were identified during the survey of 16 Ipswich St, Fyshwick. These tanks were labelled as containing diesel and heating oil. Due to the presence of above ground tanks and taking into consideration the historical use of the site, it should be assumed that underground storage tanks may also be present.

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11 Limitations

11.1 Hazardous Materials Survey

The survey was undertaken in accordance with relevant legislation and best practice and is specific to the time it was conducted.

The purpose of this hazardous materials survey was to identify all hazardous materials present on a site. However, due to the rooms still being utilised limitations of these surveys and the sometime random nature of hazardous materials in buildings materials, no guarantee can be made that all hazardous materials were identified during the site survey. Further hazardous materials may be concealed behind other building materials.

In general, inaccessible areas may include, but are not limited to:

- Areas of buildings only accessible through demolition;
- Confined spaces;
- Electrical equipment;
- Internal sections of electrical equipment and plant;
- Shafts, voids and service risers;
- Roof tops;
- Beneath concrete slabs and structures.

11.2 Site Specific Restrictions

The following areas could not be safely accessed for full inspection:

- Within fuel tanks
- Railway area
- Store office subfloor

11.3 Report

This document may need to be reviewed periodically to ensure it remains current. All conclusions and recommendations are written by the assessor using information available at the time of writing the report and their professional judgement. The report was designed to be read as a whole document and therefore should only be reproduced in full.

L & D Consulting take no responsibility for the accuracy of analysis results provided by third-party laboratories.

The client should advise any third parties to whom this report is delivered of the specific scope and limitations of the report.

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APPENDIX A

Asbestos Photographs

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ASBESTOS SAMPLE PHOTOGRAPHS

Photograph A1
Store Office
Wall sheet to SE end of building

Photograph A2
Around store office
External sheet debris (mixed with non-asbestos material)

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ASBESTOS SAMPLE PHOTOGRAPHS

Photograph A3
Fire pump shed
Pipe flange joints

Photograph A4
Fire pump shed
Eave sheets

ASBESTOS SAMPLE PHOTOGRAPHS

Photograph A5
Store shed (rear)
Bitumen layer beneath tin screws

Photograph A6
Store shed (front)
Corrugated sheet roof

ASBESTOS SAMPLE PHOTOGRAPHS

Photograph A7
Store shed (front)
Guttering to roof

Photograph A8
Main Office
Sheet lining to ceiling void

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ASBESTOS SAMPLE PHOTOGRAPHS

Photograph A9
Main Office
Sheet debris to ceiling void

Photograph A10
Main Office
Switchboard backing panel

ASBESTOS SAMPLE PHOTOGRAPHS

Photograph A11
Various
PMG pits

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APPENDIX B

Non-Asbestos Photographs

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NON-ASBESTOS SAMPLE PHOTOGRAPHS

Photograph NA1
Store office
Wall sheet around doorway to storeroom

Photograph NA2
Store office
External infill panels

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NON-ASBESTOS SAMPLE PHOTOGRAPHS

Photograph NA3
Pipe flange joints adjacent road bridge

Photograph NA4
Expansion joints to fuel tank concrete pads

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NON-ASBESTOS SAMPLE PHOTOGRAPHS

Photograph NA5
Wrap to pipes at northern end of site

Photograph NA6
Expansion joint mastic to walls adjacent driveway

NON-ASBESTOS SAMPLE PHOTOGRAPHS

Photograph NA7
Main Office
Vinyl flooring to Main Office building

Photograph NA8
Main Office
Wall sheet to store room adjacent entry

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APPENDIX C

ODS Photographs

ODS ITEM PHOTOGRAPHS

Photograph ODS1
Store office: Air conditioner units

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APPENDIX D

Lead Paint Photographs

LEAD PAINT PHOTOGRAPHS

Photograph LP1
Pies throughout - red paint (Lead paint)

Photograph LP2
Store shed walls – grey paint (First-schedule lead paint)

APPENDIX E

Certificates of Analysis - Asbestos

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ASBESTOS FIBRE IDENTIFICATION TEST REPORT

CLIENT DETAILS		LABORATORY DETAILS	
Client Name:	Arcadis	**Address:**	1/6 Dacre Street Mitchell ACT 2911
Client Contact:	Chris Gunton		
Email:	Chris.gunton@arcadis.com.au	**Lab Manager:**	Kyle Lancaster
Site Name/Reference:	16 Ipswich St, Fyshwick	**Email:**	laboratory@landd.com.au

REPORT DETAILS			
L&D Report Reference:	LD0660ID15092017	**Samples Received:**	12/09/2017
No. of Samples:	15	**Report Issue Date:**	15/09/2017

Test Specifications: Qualitative identification of Chrysotile, Amosite and Crocidolite asbestos fibre in bulk samples using Polarised Light Microscopy (PLM) and Dispersion Staining Techniques including Synthetic Mineral Fibre (SMF) and Organic Fibre as per Australian Standard 4964-2004 and methods identified in Section C of the Lancaster & Dickenson Consulting (L & D) Laboratory Manual.

L&D ID Reference	Sample Reference	Sample Analysis Date	Sample Description	Sample Mass	Non-Asbestos Fibres Detected	Asbestos Fibres Detected
LD0660ID15092017-1	LD-KL2113	14/09/2017	Fibre Cement	0.9 g	Organic Fibres Detected	**Chrysotile Asbestos Detected**
LD0660ID15092017-2	LD-KL2114	14/09/2017	Fibre Cement	0.9 g	Organic Fibres Detected	**No Asbestos Detected**
LD0660ID15092017-3	LD-KL2115a	14/09/2017	Fibre Cement	8.1 g	Organic Fibres Detected	**No Asbestos Detected**
LD0660ID15092017-4	LD-KL2115b	14/09/2017	Fibre Cement	8.8 g	None	**Chrysotile & Amosite Asbestos Detected**
LD0660ID15092017-5	LD-KL2116	14/09/2017	Fibre Cement	0.9 g	Organic Fibres Detected	**No Asbestos Detected**
LD0660ID15092017-6	LD-KL2117	14/09/2017	Gasket	0.9 g	None	**Chrysotile Asbestos Detected**
LD0660ID15092017-7	LD-KL2118	14/09/2017	Fibre Cement	0.9 g	Organic Fibres Detected	**Chrysotile Asbestos Detected**

L&D APPROVED IDENTIFIER		L&D APPROVED SIGNATORY
K. Lancaster	NATA WORLD RECOGNISED ACCREDITATION **Accreditation no: 19512** **Accredited for compliance with ISO/IEC 17025.**	K. Lancaster
Kyle Lancaster		**Kyle Lancaster**

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Mitchell ACT 2911
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L&D ID Reference	Sample Reference	Sample Analysis Date	Sample Description	Sample Mass	Non-Asbestos Fibres Detected	Asbestos Fibres Detected
LD0660ID15092017-8	LD-KL2119	14/09/2017	Bitumen	1.0 g	None	**Chrysotile Asbestos Detected**
LD0660ID15092017-9	LD-KL2120	14/09/2017	Gasket	1.2 g	Organic Fibres Detected	**No Asbestos Detected**
LD0660ID15092017-10	LD-KL2121	14/09/2017	Mastic	4.2 g	None	**No Asbestos Detected**
LD0660ID15092017-11	LD-KL2122	14/09/2017	Fibrous Plaster	1.6 g	Organic Fibres Detected	**No Asbestos Detected**
LD0660ID15092017-12	LD-KL2123	14/09/2017	Mastic	6.1 g	None	**No Asbestos Detected**
LD0660ID15092017-13	LD-JS1321	14/09/2017	Vinyl (pink)	3.0 g	None	**No Asbestos Detected**
LD0660ID15092017-14	LD-JS1322	14/09/2017	Fibre Cement	0.9 g	Organic Fibres Detected	**No Asbestos Detected**
LD0660ID15092017-15	LD-JS1323	14/09/2017	Fibre Cement	0.9 g	None	**Chrysotile Asbestos Detected**

Notes:

1. Asbestos in bulk materials requiring disintegration such as vinyl, resins, mastic and caulking can be difficult to detect using PLM and dispersion staining due to the low grade or small length or diameter of the asbestos fibres present in the material, or due to the fact that very fine fibres have been distributed intimately throughout the materials. Where no asbestos is detected in such a sample, another, independent analytical technique should be considered.
2. Where a sample is delivered to the laboratory by a third party, L & D accepts no responsibility for the quality of sample submitted, including whether the sample is representative of the source material.
3. All L & D reports must not be reproduced except in full.
4. The practical detection limit for identification of asbestos fibre using PLM and dispersion staining techniques is 0.01-0.1%, equivalent to 0.1-1g/kg.
5. The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

L&D APPROVED IDENTIFIER		L&D APPROVED SIGNATORY
Kyle Lancaster	NATA WORLD RECOGNISED ACCREDITATION Accreditation no: 19512 Accredited for compliance with ISO/IEC 17025.	Kyle Lancaster

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APPENDIX F

Certificates of Analysis – Lead Paint

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 175695

Client Details

Client	Lancaster & Dickenson Consulting Pty Ltd
Attention	Ewan Dickenson
Address	Unit 8, 285 Canberra Ave, Fyshwick, ACT, 2609

Sample Details

Your Reference	**LD0660AA**
Number of Samples	20 Paints
Date samples received	15/09/2017
Date completed instructions received	15/09/2017

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	22/09/2017
Date of Issue	19/09/2017

NATA Accreditation Number 2901. This document shall not be reproduced except in full.

Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Long Pham, Team Leader, Metals

Authorised By

David Springer, General Manager

Lead in Paint						
Our Reference		175695-1	175695-2	175695-3	175695-4	175695-5
Your Reference	UNITS	LD0660AA-P1a	LD0660AA-P1b	LD0660AA-P1c	LD0660AA-P2a	LD0660AA-P2b
Date Sampled		12/09/2017	12/09/2017	12/09/2017	12/09/2017	12/09/2017
Type of sample		Paint	Paint	Paint	Paint	Paint
Date prepared	-	18/09/2017	18/09/2017	18/09/2017	18/09/2017	18/09/2017
Date analysed	-	18/09/2017	18/09/2017	18/09/2017	18/09/2017	18/09/2017
Lead in paint	%w/w	<0.05	0.09	0.06	<0.05	<0.05

Lead in Paint						
Our Reference		175695-6	175695-7	175695-8	175695-9	175695-10
Your Reference	UNITS	LD0660AA-P2c	LD0660AA-P3a	LD0660AA-P3b	LD0660AA-P3c	LD0660AA-P4
Date Sampled		12/09/2017	12/09/2017	12/09/2017	12/09/2017	12/09/2017
Type of sample		Paint	Paint	Paint	Paint	Paint
Date prepared	-	18/09/2017	18/09/2017	18/09/2017	18/09/2017	18/09/2017
Date analysed	-	18/09/2017	18/09/2017	18/09/2017	18/09/2017	18/09/2017
Lead in paint	%w/w	<0.05	<0.05	<0.05	0.05	0.2

Lead in Paint						
Our Reference		175695-11	175695-12	175695-13	175695-14	175695-15
Your Reference	UNITS	LD0660AA-P5a	LD0660AA-P5b	LD0660AA-P5c	LD0660AA-P6a	LD0660AA-P6b
Date Sampled		12/09/2017	12/09/2017	12/09/2017	12/09/2017	12/09/2017
Type of sample		Paint	Paint	Paint	Paint	Paint
Date prepared	-	18/09/2017	18/09/2017	18/09/2017	18/09/2017	18/09/2017
Date analysed	-	18/09/2017	18/09/2017	18/09/2017	18/09/2017	18/09/2017
Lead in paint	%w/w	1.1	1.2	1.0	<0.05	<0.05

Lead in Paint						
Our Reference		175695-16	175695-17	175695-18	175695-19	175695-20
Your Reference	UNITS	LD0660AA-P6c	LD0660AA-P7	LD0660AA-P8a	LD0660AA-P8b	LD0660AA-P8c
Date Sampled		12/09/2017	12/09/2017	12/09/2017	12/09/2017	12/09/2017
Type of sample		Paint	Paint	Paint	Paint	Paint
Date prepared	-	18/09/2017	18/09/2017	18/09/2017	18/09/2017	18/09/2017
Date analysed	-	18/09/2017	18/09/2017	18/09/2017	18/09/2017	18/09/2017
Lead in paint	%w/w	<0.05	0.3	<0.05	<0.05	<0.05

Method ID	Methodology Summary
Metals-004	Digestion of Paint chips/scrapings/liquids for Metals determination by ICP-AES/MS and or CV/AAS.

QUALITY CONTROL: Lead in Paint						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			18/09/2017	4	18/09/2017	18/09/2017		18/09/2017	[NT]
Date analysed	-			18/09/2017	4	18/09/2017	18/09/2017		18/09/2017	[NT]
Lead in paint	%w/w	0.05	Metals-004	<0.05	4	<0.05	<0.05	0	96	[NT]

QUALITY CONTROL: Lead in Paint						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	17	18/09/2017	18/09/2017		[NT]	[NT]
Date analysed	-			[NT]	17	18/09/2017	18/09/2017		[NT]	[NT]
Lead in paint	%w/w	0.05	Metals-004	[NT]	17	0.3	0.3	0	[NT]	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

Laboratory Acceptance Criteria

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

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

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

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

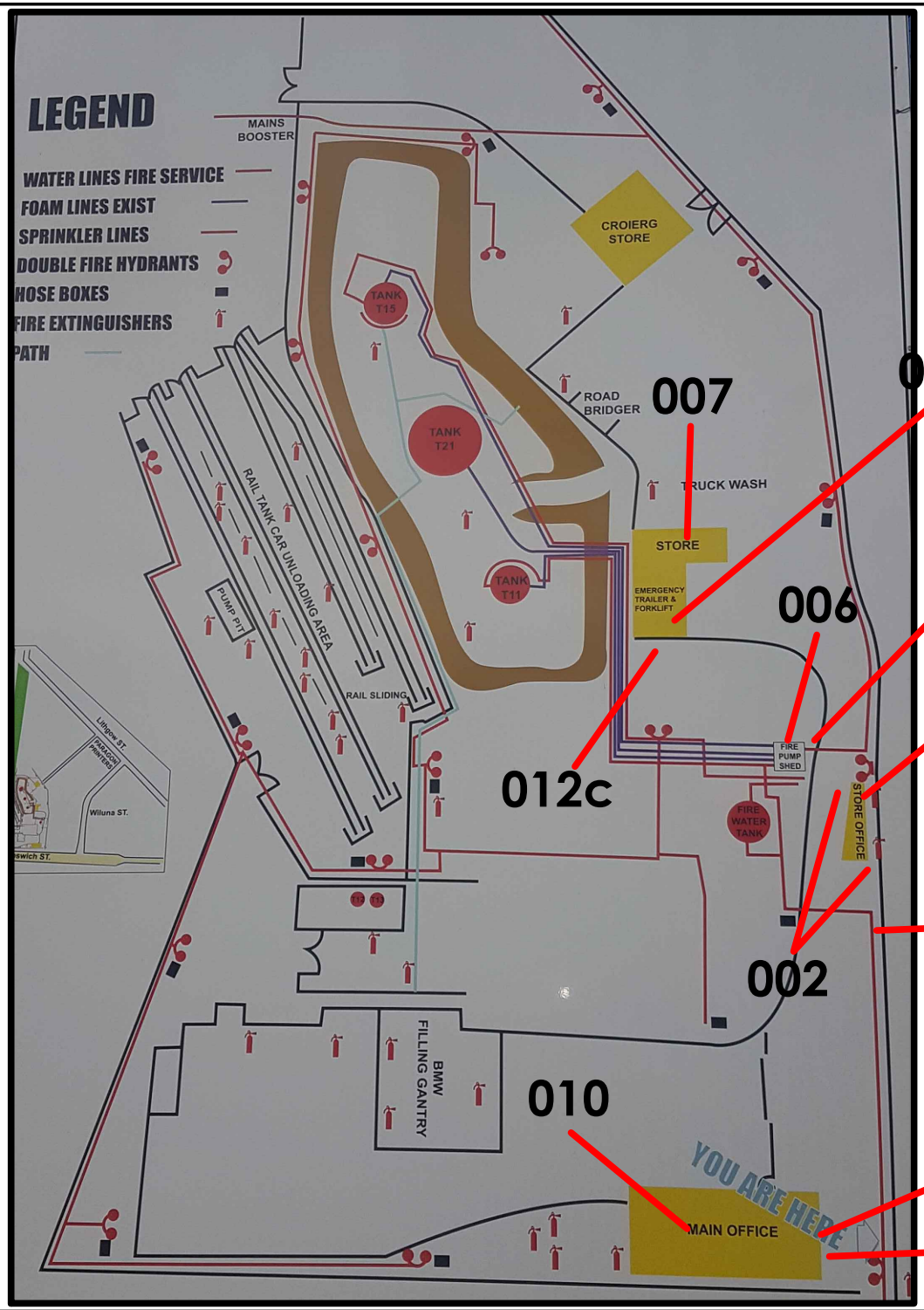
When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

APPENDIX G

Site Plan



L&D CONSULTING
LANCASTER & DICKENSON

LANCASTER & DICKENSON CONSULTING
UNIT 1, 6 DACRE STREET
MITCHELL ACT 2911

PHONE: 0477 477 757
EMAIL: ADMIN@LANDD.COM.AU

SITE DETAILS

16 Ipswich St
FYSHWICK ACT 2609

DRAWING TITLE

Site Plan

CLIENT

Arcadis

THIS PLAN IS NOT TO SCALE

N

THIS SITE PLAN IS PROVIDED FOR THE IDENTIFICATION OF AREAS ONLY IN RELATION TO THE ASBESTOS SURVEY

THIS DRAWING SHOULD BE READ IN COLOUR & IN CONJUNCTION WITH THE L&D SURVEY REPORT LD2621AA

REVISION: 0

DRAWN BY: K. LANCASTER

DATE CREATED: 25 SEPTEMBER 2017

REVIEWED BY: E. DICKENSON

KEY

001 ASBESTOS ITEM NUMBER

Blocks 9 & 11 Section 8, Fyshwick

APPENDIX G

WASTE REPORT

Cardno
Shaping the Future

MEMO

ARCADIS Design & Consultancy for natural and built assets

Date	15/02/2018
To	Cardno NSW/ACT Pty Ltd
From	Duncan Lummis
Copy to	Chris Gunton
Subject	**Solid Waste Management – MRF Facility, Capital Recycling Solutions**

Context

Capital Recycling Solutions' proposes a Materials Recovery Facility (MRF) and Rail Freight Terminal (RFT). The MRF and RFT will be located at Fyshwick in the Australian Capital Territory (ACT).

This memo provides advisory text designed to shape and inform potential inclusions within an EIS document for solid wastes that will be managed during the operation of the MRF facility (i.e. post construction and commissioning), as follows:

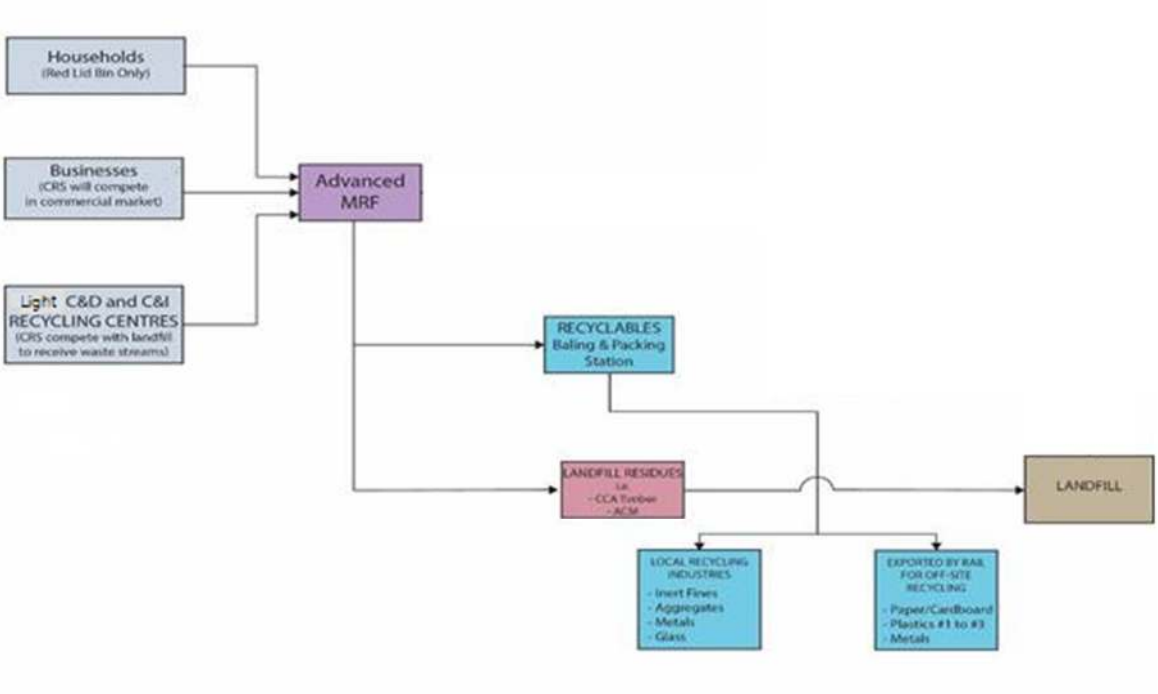
- *Description of the nature, sources, locations, quantities of all materials to be handled*
- *Advice on waste management including the storage, stockpiling and disposal of materials and waste*
- *Description of mitigation measures to reduce the potential of waste spreading to the surrounding area*
- *Outline management procedures in case of oversupply of waste and any consideration to the measures in place when/if the facility ceases operation*

Summary of Proposed MRF Facility

It is assumed that the proposed facility will include the following key components:

- Waste reception and weighing
- Waste storage (pre and post-processing)
- MRF separation processes
- Management of process outputs, including:
  - Segregated recyclables
  - Other wastes requiring disposal (including hazardous, non-compliant and non-targeted materials)
  - Railing of recyclables
- Bulking and containerisation of process residues for disposal at appropriate licenced facilities

A summary of the assumed process flow at the facility is shown in the following diagram.



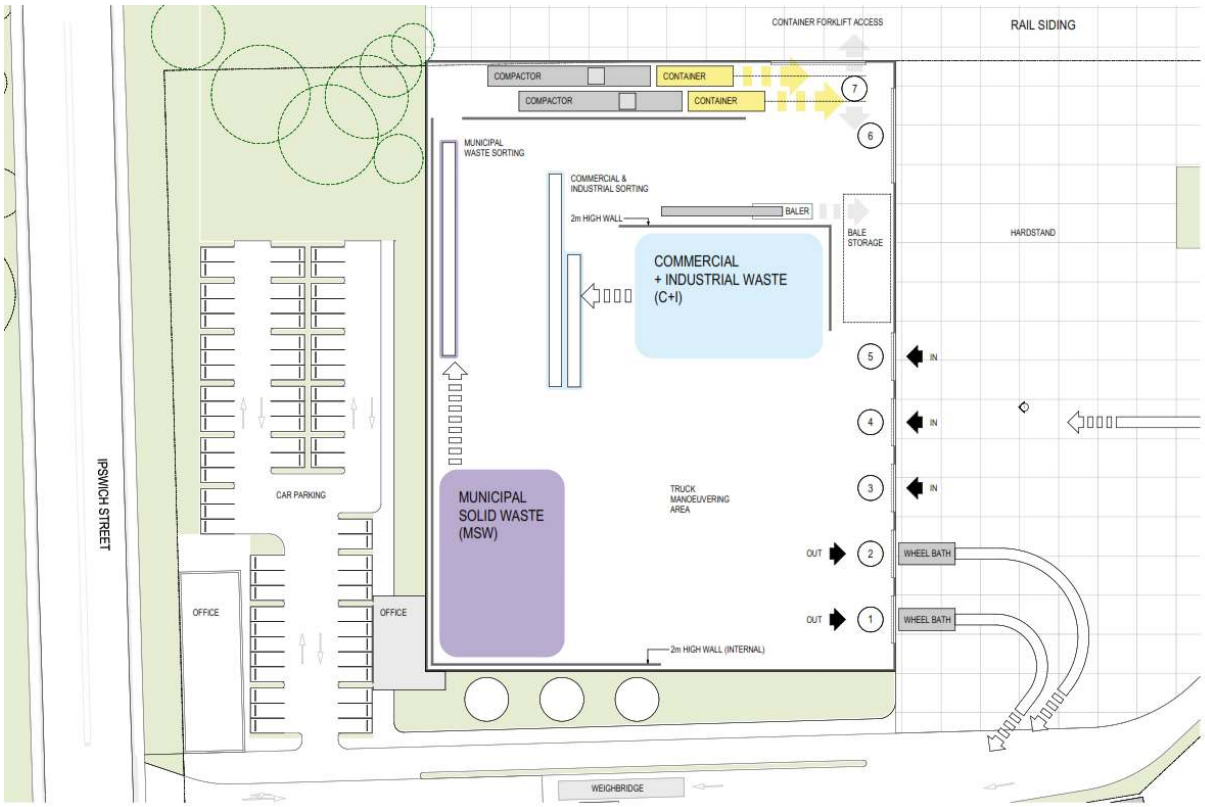
Source: CAPITAL RECYCLING SOLUTIONS P/L, SCOPING APPLICATION, MAY 2017

Sources, locations and quantities of wastes

Wastes will be delivered to the site by compactor and non-compaction waste collection vehicles.

Information on the potential quantities, locations and sources of wastes have not been included in detail in this memo. These details will be provided separately and will reflect the facility's targeted input quantities and sources and will be updated as required during the proposal's development.

It has also been assumed that the location of waste reception, storage and transfer areas within the site will be appropriately identified, potentially within site design documents and associated drawings. Adequate contingency storage capacity will be included to cater for periods of unexpected high waste inputs and periods of facility downtime due to planned or unplanned maintenance or emergency events. A diagram of the preliminary facility layout design is provided overleaf.



Source: Preliminary Canberra Facilities Resource Diagram 2017

External Sources

In summary the key sources of waste inputs to the site, as identified within the composition and input data:

- Commercial and industrial
- Construction and demolition (light)
- Kerbside collected MSW and bulky waste
- Private sector direct deliveries (not general public)
- Stormwater waste (solid)
- Street sweepings and litter bin wastes
- Road maintenance wastes
- Source segregated materials, for example timber and glass for bulking/processing

On-site Process Outputs

In addition to wastes delivered to the site, materials and waste produced as a result of on-site processes will be include:

- Segregated recyclables
- MRF process residues

Nature of wastes to be accepted and excluded

Incoming wastes will be weighed, tipped and pre-sorted, processed and/or stored as appropriate according to their composition, weight and volume and whether they are to be used as input materials to the MRF or contained prior off-site transfer. Excluded wastes and recyclables will be bulked prior to onward transfer for reprocessing.

It is assumed that each waste type and stream will either be categorised as Acceptable Wastes or Excluded Wastes as follows:

Acceptable Wastes

The following wastes are also assumed to be acceptable and will be targeted for recycling via the MRF process, to assist compliance with and performance against the waste hierarchy. Key waste types to be targeted as feedstock to the MRF are likely to include:

- Glass
- Plastics
- Metals
- Paper and cardboard
- Bricks and rubble (inert)
- Wood
- Plasterboard

Excluded wastes

The following wastes are assumed to be unacceptable and will not be targeted nor be accepted as inputs to the facility:

- E waste
- Liquid wastes
- Radioactive wastes
- Asbestos
- Any explosive or flammable material including material derived from grease, oil, tar, shale or coal
- Any sludge or refuse material (unless it can be shown to be harmless)
- Any material containing arsenic, cadmium, cyanide, lead, mercury, selenium and sulphide
- Any toxic inorganic material, including soluble salt of barium, boron, chromium manganese, silver or zinc
- Any toxic organic material, including pesticides or herbicides
- Clinical wastes
- Contaminated wastes
- Cytotoxic wastes
- Hazardous wastes
- Contaminated soil

- Batteries

Waste Management Activities and Procedures

The text and table provided below address the brief's requirements to provide:

- Advice on waste management including the storage, stockpiling and disposal of materials and waste
- Description of mitigation measures to reduce the potential of waste spreading to the surrounding area (containment)

No detailed regulations nor planning guidelines have been identified for the ACT area that cover considerations such as minimum design requirements or operations for such facilities. Therefore, it is advised that site activities are guided by and follow industry best practice.

A management process for safely identifying, containing and managing each waste type will be developed and applied at the site. This will include safe systems of operation for the reception, storage, internal site transfer and off-site transport of wastes and materials.

The site operator will provide Waste Reception and Site Management protocols that will:

- Define waste reception, storage and processing activities and requirements for all wastes
- Enable the management and operation of the site in an efficient and sustainable manner which complies with relevant environmental and health and safety requirements
- Comply with agreed quality, environmental and health and safety management systems

Appropriately sized and covered storage facilities will be provided for both input and output wastes and materials in order to optimise the overall operation, including transfers within, to and from the facility, and will include adequate capacity for periods of unexpectedly high waste inputs and periods of facility downtime.

A summary table of key waste management and mitigation measures recommended for application at the site is provided below.

Component	Description	Management measures (including mitigation measures to ensure waste containment)
Site access	Control of entry to the site	A registered vehicles list will be maintained by the operator to prevent the entry of unauthorised waste vehicles. Separate and appropriate monitoring and registration systems for rail container handling will also be applied, linked to container identification numbers and sources
Delivery of waste	Control and recording of wastes received at the site	Detail key information such as: • Date • Arrival time • Delivery details • Source • Waste type • Volume/weight To ensure acceptable waste is received, enquiries as to the content of customer loads will be made at the vehicle weighbridge supported by visual inspections, as appropriate. Unacceptable vehicle loads will be turned around at the gate and either returned to the generator/hauler or sent to landfill as appropriate. Vehicles will be reloaded if required. Deliveries will be directed to different tipping areas depending on waste type or need for further inspection.

Component	Description	Management measures (including mitigation measures to ensure waste containment)
Waste reception and storage – residual and non-acceptable wastes	Tipping and storage of residual and similar wastes	Loads will be tipped onto tipping floors to allow visual inspection during unloading. Some loads may be tipped in a designated area(s) where it can be subject to preliminary sorting or for sent directly for processing. The design of all tipping and storage areas will consider and address the following: • Input requirements • Ventilation requirements (including odour generation and dispersal) • Fire risk mitigation • Protection from vermin Video monitoring of tipping areas will be provided as an additional safeguard against processing non-acceptable wastes and fire hazards. The waste tipping floors will be concrete lined, and enclosed within the buildings and potentially will operate under a negative pressure to manage fugitive odour emissions. Fast acting roller doors at the entrances and exits to reception buildings will be used where appropriate to minimise odour and litter emissions. No wastes will be stockpiled externally. Non-recyclable wastes will be loaded into appropriate containers, including shipping containers, prior to being sent for landfill disposal.
Waste reception and storage recyclable, recovered and rejected materials	Tipping and storage of recyclable, recovered and rejected materials	Adequate storage and containment will be provided for: • Reject materials separated on the tipping floor • Recycled materials separated on the tipping floor (e.g. metals, timber and other bulky items) • Recycled materials separated by the MRF (e.g. paper/cardboard, plastic, metals). Storage in bays or skip bins for smaller volume items (such as e-waste) will be sized according to expected throughput, composition and collection service frequency.

Component	Description	Management measures (including mitigation measures to ensure waste containment)
		Contingency capacity can be managed through additional collection servicing or overflow storage.
Leachate and run-off management	Containment of leachate	Some leachate will be generated due to liquid being present within the waste and from wash-down water used to clean the building. Leachate management measures will apply to areas within the shed where waste would be transferred to and from trucks and compactors. The compactors at the CRS facility would be enclosed, reducing the amount of leachate run off. The base of the waste storage areas will slope to a 20,000 Litre leachate collection tank. All leachate collected and will be managed within the shed area or within an appropriate run-off management system. Leachate and run-off will be contained within the shed, either above or below ground, to prevent contamination of water courses, ground water or sewage systems and will be pumped into compacted waste bales onsite prior to disposal.
Off-site reprocessing	Recyclables	Recyclables recovered through the MRF facility will be loaded and/or transported to appropriately licensed markets/reprocessors, via road or rail.
Fire management	All areas	Waste will be contained within concrete lined, bunded and enclosed building areas with fixed fire suppression equipment and early warning alarm systems provided where appropriate.
Reporting	Maintain records and reporting	The amount and type of waste received, processed and sent for off-site processing and for disposal will be recorded and reported as required under the contract(s) and by regulatory authorities. Records will be maintained for the period(s) defined by the regulatory authorities and contract(s).

Outline management procedures in case of oversupply of waste and any consideration to the measures in place when/if the facility ceases operation

The operator will provide a Contingency Plan that will detail the arrangements for managing wastes in cases of:

- Planned and Unplanned Maintenance
- Plant breakdown
- Exhaustion of storage capacity, in cases of oversupply of inputs
- Emergency situations.

The Contingency Plan will also include details of:

- The maintenance of the plan, including the periodic checking of the continued validity of the contingency arrangements
- Contingency services, including alternative facilities
- Contingency arrangements for instances of both planned/unplanned unavailability of key plant including weighbridge(s);
- Market contingencies

Contingency Events

Any planned short duration events will be scheduled to occur at times that do not affect the delivery of the services and are unlikely to require contingency arrangements. Planned maintenance will occur outside processing hours.

For all short-term events, waste reception and storage will generally continue regardless of whether the facility is processing or not. Where possible, contracted deliveries will continue to be tipped up to the licenced storage capacity.

Weekday operations at the facility will process waste at a rate that ensureswaste is cleared daily. Accordingly, the services will be cushioned from any short-duration processing issues by the storage capacity built into the facility and processing design.

Oversupply of Incoming Waste Materials

There are 4.5 hours allowed everyday for contingencies and there are also contingency bypass arrangements through the processing lines. It is also noted that the containerisation of waste will allow storage (in a worst case scenario). Further it is noted that alternative arrangements for the management of waste would also be available through the network of licenced facilities within the ACT.

Blocks 9 & 11 Section 8, Fyshwick

APPENDIX H

WATER QUALITY AND HYDROLOGY REVIEW

Cardno
Shaping the Future

Mr Gerard Zafico
Senior Design Engineer
Cardno (ACT/NSW) Pty Ltd
Level 2, 14 Wormald Street
Symonston ACT 2609

Arcadis Australia Pacific Pty Ltd
Level 16, 580 George Street
Sydney NSW 2000
Tel No: +61 2 8907 9000
www.arcadis.com/au

15/02/2018

Review of Water Quality and Hydrology Information, Blocks 9 and 11, Section 8, Fyshwick

Dear Gerard,

1 INTRODUCTION

Arcadis Australia Pacific Pty Ltd (Arcadis) incorporating Environmental Strategies Pty Ltd (ES) is was engaged by Cardno NSW/ACT Pty Ltd (Cardno) to review water quality and hydrology information for Blocks 9 and 11, Section 8, Fyshwick.

Information regarding water quality was presented in the Site Audit Report by Mr Andrew Kolrusch of GHD titled 'Access Trading Company Limited, 16 Ipswich Street, Fyshwick, Site Audit Report'. The report was provided to Arcadis for review and the summaries and discussions provided in this letter have relied upon the contents of this report, except where otherwise stated.

It is understood that the outcomes of this review are to be integrated into the Environmental Impact Statement (EIS) that is required as a part of the planning process for the Materials Recovery Facility (MRF) and Rail Freight Terminal (RFT) proposed by Capital Recycling Solutions Facility on Blocks 9 and 11, Section 8, Fyshwick which is located at 16 Ipswich Street Fyshwick (herein referred to as the Site).

2 CURRENT GROUNDWATER QUALITY AND PROTECTIVE MEASURES

Groundwater was found to occur in two aquifer systems at the site. The upper system is within 6m of the ground surface within shallow clay and weathered siltstone, low yielding (typically less than 0.5 litres per second) and is fresh to brackish (total dissolved solids 500 – 1,000 mg/L).

Arcadis' review of the Canberra 1:100,000 geological sheet indicates that the site is mapped as being underlain by the Canberra Formation (Mudstone, siltstone, minor sandstone, limestone, hornfels, dacitic ignimbrite, and volcaniclastic sediments) but is also close to the mapped boundary with the Narrabundah Ashstone (Tuffaceous sandstone, tuff, and ashstone) and also to the boundary with the Mount Ainslie Volcanics (Dacitic ignimbrite, minor ashstone agglomerate and shale). The geology as decribed in the reports is consistent with the Canberra Formation and the Narrabundah Ashstone.

The deeper groundwater occurs below 7m depth in the Canberra Formation and is regarded as a regional aquifer.

Groundwater quality was measured through field assessment of water quality parameters including salinity. Salinity measurements are used to drive beneficial use assessments for waters.

Salinity is measured in the field as electrical conductivity in micro-seimens per centimetre (μS/cm) which can be used to estimate the total dissolved solids component (TDS) by multiplying the electrical conductivity by a factor of 0.7. A more accurate conversion factor can be calculated for particular waters by correlating laboratory measurements of TDS to electrical conductivity measurements as the conductivity is dependent on the specific ionic composition of the dissolved components in groundwater.

Beyond the salinity measurements, contaminants from historical use of the site were also identified in groundwater at the site. Separate phase hydrocarbon product is present at the site and will directly affect groundwater quality as the hydrocarbons dissolve into groundwater. In the reported results, contaminants exceeding investigation levels were:

- Total recoverable hydrocarbons (TRH) (present up to 40,000 μg/L but no criteria available);
- Monoaromatic fuel compounds (BTEX: benzene, toluene, ethylbenzene and xylenes);
- Naphthalene;
- Metals: Zinc and lead.

3 PRESENT AND POTENTIAL WATER USES AND USERS

The use of affected water as a potable water supply is ruled out due to the fuel impacts in water and the salinity levels exceeding the Australian drinking water guideline recommendation of 500 mg/L TDS for potable water.

Beyond the aesthetic issues around the TRH impact, BTEX concentrations exceed the Australian drinking water criteria. In particular, the criteria for benzene (1 μg/L) is significantly exceeded with the 2016 maximum benzene concentration in water being 4,900 μg/L in MW131S. The water should not be used for potable supply without specific testing for suitability.

ANZECC (2000) provides guidance for irrigation and stock water suitability based on salinity of groundwater. Table 9.2.5 of ANZECC (2000) is reproduced below:

Table 9.2.5 Irrigation water salinity ratings based on electrical conductivity[a]

EC (dS/m)[b]	Water salinity rating	Plant suitability
<0.65	Very low	Sensitive crops
0.65–1.3	Low	Moderately sensitive crops
1.3–2.9	Medium	Moderately tolerant crops
2.9–5.2	High	Tolerant crops
5.2–8.1	Very high	Very tolerant crops
>8.1	Extreme	Generally too saline

a Adapted from DNR (1997); b 1dS/m = 1000 μS/cm

Groundwater investigation levels for ecological protection are exceeded for BTEX compounds and for metals. However, the metals impacts are likely due to the local geology and the criteria are presented in ANZECC (2000) as point of use criteria. Where these criteria are exceeded in groundwater, the impacts are not considered to adversely affect ecological receptors until such time as the water containing those concentrations discharges at the receiving body. Thus, the exceedance of those criteria at the site indicates the potential for an adverse ecological impact but is not conclusive without further consideration.

The reported groundwater salinity (TDS 500 - 1,000 mg/L) corresponds to 0.7 – 1.4 dS/m indicating suitability for irrigation of moderately salt tolerant crops.

Table 9.3.3 of ANZECC (2000), reproduced below, indicates stock watering suitability by salinity.

Table 9.3.3 Tolerances of livestock to total dissolved solids (salinity) in drinking water[a]

Livestock	Total Dissolved Solids (mg/L)		
	No adverse effects on animals expected	Animals may have initial reluctance to drink or there may be some scouring, but stock should adapt without loss of production	Loss of production and a decline in animal condition and health would be expected. Stock may tolerate these levels for short periods if introduced gradually
Beef cattle	0–4000	4000–5000	5000–10000
Dairy cattle	0–2400	2400–4000	4000–7000
Sheep	0–4000	4000–10000	10000–13000[b]
Horses	0–4000	4000–6000	6000–7000
Pigs	0–4000	4000–6000	6000–8000
Poultry	0–2000	2000–3000	3000–4000

a Adapted from ANZECC (1992); b Sheep on lush green feed may tolerate up to 13000 mg/L TDS without loss of condition or production.

The groundwater at the site has a salinity suitable for stock watering of all listed species with no adverse effects.

4 POTENTIAL IMPACTS ON JERRABOMBERRA CREEK AND WETLANDS

The site audit report notes that the impact from historical site activities was determined to be constrained to the vicinity of the site (less than 100m from the site boundary).

The site is some 400m from Jerrabomberra Creek and therefore is beyond the range identified for contaminant migration from the site to be able to reach the creek or affect the wetlands. From the closest point on Jerrabomberra Creek to the site, it is a further 1.2km to the wetlands, providing further distance for attenuation processes to occur.

Arcadis has not reviewed the fate and transport modelling in detail as part of this report. However, it is our experience that the predicted maximum transport distance of 100m from the site is typical of hydrocarbon impact in clay and weathered shale and that plumes of greater length are rare. Longer plumes tend to be associated with larger infrastructure (e.g. refineries and bulk storage depots) which have a much wider footprint and larger losses of product.

Therefore, even in the event of inaccuracies being present in the modelling and predictions leading to the consultants estimates under-predicting the potential transport distance there remains a “safety factor” of four in the assessment. Arcadis is satisfied

that there is negligible risk that the site impacts can affect Jerrabomberra Creek or the associated wetlands.

5 STORMWATER MANAGEMENT

There are hydrocarbon impacts in the upper metre of soil at the site. Accordingly, it will be important to ensure that any exposed or stockpiled soils are managed to prevent dust generation. Similarly, stormwater collected in excavations or in bunds around stockpiles is likely to be impacted with TRH and BTEX compounds and should not be discharged to stormwater without testing prior to disposal.

All stormwater collected from exposed soils should be retained on site for assessment prior to disposal.

Options for impacted water include disposal as liquid waste or retention and treatment on site prior to disposal. The scale of disposal required and degree of contamination of the water will affect the costs for these activities and it is not possible to predict which will be more cost effective. For small, irregular stormwater disposal requirements it is anticipated that liquid waste disposal on demand will be the most efficient.

6 CLOSING

We trust that the contents of this letter meet your immediate requirements. Should you have any questions regarding this letter, then please do not hesitate to contact myself on 0478 186 378.

Yours sincerely

Chris Gunton
Senior Hydrogeochemist
0478 186 378

Tim Chambers
Principal Hydrogeologist
0458 888 033

Blocks 9 & 11 Section 8, Fyshwick

APPENDIX

I

TEAM QUALIFICATIONS

Cardno
Shaping the Future

John Samoty

Current Position
Senior Civil Engineer
Canberra

Principal

Profession
Civil Engineer

Years' Experience
16 Years

Joined Cardno
August 2006

Education
Bachelor of Engineering (Civil) (Hons)

Affiliations
MIEAust, CPEng, NPER, RPEQ

Summary of Experience

John is a Chartered Professional Engineer and 2IC of Cardno's Canberra office with over 16 years' experience as a Senior Project and Design Manager specialising in pavement and hydraulic design.

Since joining Cardno, John has successfully led multi-disciplinary teams as Project Manager on numerous commissions with a strong and consistently proven ability to manage time and budget constraints.

In his time with Cardno, John has been responsible for managing and peer reviewing the masterplanning, detailed design and documentation of hydraulic services, pavement design for numerous residential, commercial and industrial subdivision projects and general civil engineering infrastructure projects associated with water sensitive urban design. This includes managing sub-consultants and dealing directly with the Client and service authorities from concept and masterplanning through to construction.

John's extensive dealings with approval authorities in the ACT have resulted in expedited approvals and robust designs that exceed client expectations.

He has recently peer reviewed the hydraulic and civil design packages for Lawson South Stages 1A, 1B and 1C.

John has also been responsible for the project management and contract administration on a number of high profile civil infrastructure projects, including the Constitution Avenue Upgrade, the staged rehabilitation of Anzac Parade, and numerous other National Capital Authority Asset Management Projects.

Significant Projects

> Lawson South Estate
> Coombs and Wright Residential Estates
> Casey 1 Estate
> Casey 3 Estate
> Hume West Industrial Estate
> Section 48 Fyshwick Industrial Estate
> Section 84 City

Gerard Zafico

Current Position
Senior Design Engineer
Canberra

Profession
Civil Engineer

Years' Experience
15 Years

Education
BSc Civil Eng.

Affiliations
Member Institution of Engineers Ireland (MIEI)

Summary of Experience

Gerard has over 15 years experience in infrastructure design from urban development and subdivision design. His experience in design is varied and wide, with working experience in three different continents. He has worked with international engineering consultancies in the Philippines, Ireland and now in Australia.

The design of roads, stormwater and sewer drainage, utilities and urban planning has been a few of Gerard's responsibilities over the years having been involved in the planning of major development projects both locally and overseas. These projects include the design of the first suburbs of Molonglo Valley in the ACT, a planned 10,000 unit development in Adamstown in Dublin, Ireland and the Military Installation in Gizan and Farasan, Saudi Arabia. All of which included major infrastructure elements like bridges, a railway station and sewerage treatment plants.

His experience also includes design and contract management of projects as well as client and local authority liaison.

Significant Projects

> Gungahlin Town Centre East Roads - 3km of road in a town centre environment
> Coombs (EDP/Detailed Design/Construction) - 643 Residential Blocks & 27 multi-unit sites (120Ha). This also consists of a Local Centre and a Primary School
> Wright (Detailed Design) - 520 Residential Blocks & 10 multi-unit sites
> Casey 3 Residential Estate, Gungahlin - 180 dwellings
> Hume West (Detailed Design) - Industrial Estate (33 Blocks, 59.2 Ha)
> Anzac Parade (Stage 3) Rehabilitation
> Ngunnawal Retirement Village - 164 units plus a clubhouse
> Molonglo River Park Trunk Cycle Path (2.5 km)
> John Gorton Drive Trunk Watermain
> National Archives Rehabilitation
> Adamstown Strategic Development Zone, Dublin, Ireland (Design, Planning, Construction). The Adamstown SDZ comprises of a gross developable area of 213.9 Ha. It is planned to have approximately 10,000 residential units subdivided into eleven development areas and four amenity areas. This includes the construction of a new railway station, four primary schools, a post primary school, a district centre with up to 37,500 sqm of commercial development and three local commercial centres.
> Adamstown Square 2: The development is composed of 224 residential dwellings consisting of 2-4 bedroom units in a mixture of houses, apartments and duplexes with underground car parking.
> Adamstown Square 3: The development is comprised of 319 dwellings ranging from 3-5 storey houses and duplexes

Current Position
Project Co-ordinator

Profession
Project Manager

Years' Experience
6 Years

Joined Cardno
January 2017

Education
Bachelor Degree in Project Management (Eng)

Diploma of Project Management

Diploma of Building & Construction

Mana Naghsghgar

Summary of Experience

Mana is a professional project manager with 6 years of experience. This has included providing project control and program management for a range of industry's including oil and gas, utility, construction and educational institutions.

Mana is proficient in integrating and controlling complex schedules for procurement, construction, installation, developments and maintenance programs. Her logical and efficient style of project management sees Mana effectively delivering timely, high quality projects.

Significant Projects

> Narrabundah B45 S100 Due Diligence Report (Project Manager)
> Narrabundah Ballpark Upgrade (Project Engineer)
> Kirkham Sportsfield Design (Project Engineer)
> North Wright and North Coombs Residential Estate (Project Engineer)
> Fyshwick Block 11 Section 8 Stormwater (Project Manager)
> Numerous residential and commercial developments (Project Coordinator)

Craig Allen

Current Position
Project Officer (Design / Construction)

Years' Experience
5 Years

Joined Cardno
March 2014

Education
Advanced Diploma of Engineering (Design)

Summary of Experience

Craig is a Project Officer with Cardno with over 5 years' experience.

Craig graduated from CIT in 2009 and has since been working as a Project Administrator / Coordinator in the Canberra Region. Craig has been involved in all aspects of this role from prequalification and system management, through to project tendering, administration and management.

Craig is able to use his civil construction knowledge to assist with a wide range of project responsibilities including construction inspections and contract administration, and to contribute in the delivery of design projects.

Significant Projects

> Taylor Primary School, Civil Works - $1M (Client: Binutti Constructions).
Civil works, sewer and stormwater reticulation and associated works including improvement to car parking facilities and extensive underground services.

> O'Brien Place Extension Gungahlin - $0.7M (Client: Land Development Agency).
Works involved the demolition of an existing cul-de-sac and extension of the existing roadway / services to suit new blocks to be sold by the LDA.

> Anzac Parade & Constitution Avenue Intersection Stage 1 - $1.9M (Client: National Capital Authority).
Works involved the reconstruction of existing pavement and incorporated the removal and reconstruction of new kerbs and stormwater pumps.

> Antill Street Stormwater Augmentation $2.05M (Shared Services Procurement).
The works comprised the construction of 1.65m and 1.35m stormwater pipes and associated infrastructure approximately 250m along the eastern verge of Antill Street and the extension of the current sewer line 130m along Aspinall Street.

> Efkarpidis & Hinder Street Extensions $1.1M (Shared Services Procurement)
Works involved the extension of Hinder Street and Efkarpdis Street and site services for Block 1 Section 227 Gungahlin, including earthworks, roads, hydraulic services, concrete works, traffic control devices and landscaping.

> Belconnen Police Station - Civil $1.05M (Shared Services Procurement)
The works involved the construction of two new carparks, the extension of an existing carpark, including stormwater services and bulk/detail earthworks.

Tara Lu

Current Position
Engineer

Profession
Engineer

Years' Experience
4+ Years

Joined Cardno
May 2017

Education
Bachelor Engineering (Hons)

Member of Engineers Australia

Additional Training
Construction Industry White Card

Asbestos Awareness Training

Select and Modify (Red Card)

ACTEW AGL Electrical Safety Rules (Blue Book)

First Aid

Summary of Experience

Tara is a project engineer commenced with Cardno in May 2017. Tara brings 4 years' worth of design and construction project engineering experience along with knowledge in utility coordination, technical compliance and quality assurance.

As a project engineer, Tara works closely with senior engineers to perform various design, analyse and review tasks across all civil disciplines, with a focus on the interconnections and constraints amongst complex systems and technical requirements. Tara was qualified as a Systems Engineer and had been working in the utility industry for the over three years on various Design and Construction projects prior to joining Cardno.

Significant Projects

> West Cowra Sewerage Reticulation Network Design
> North Wright Box Gum Woodland Stormwater Design
> Shannon Drive, Run-O-Waters Goulburn DA Documentation
> Shannon Drive, Run-O-Waters Goulburn WSUD Design
> Bowral Station Street Upgrade Utilities Coordination
> Radford Master Plan Design Documentation
> Radford Master Plan Stormwater Design
> Greenway S33 B3, 4 & 5 Site Servicing
> Tharwa Section 6 Site Investigation Reports (Stage 1A)
> Mawson S57 B6 Site Investigation Reports (Stage 2)
> Lawson 132kV Power Line Relocation DA amendment
> Fyshwick B9 and B11 S8 Environmental Impact Statement

Phillip Jewell

Current Position
Design Drafter - Civil

Profession
Draftsperson

Years' Experience
13

Joined Cardno
July 2002

Professional Qualifications
RMS Select/Modify Control Plans (Red Card)

RMS Design & Inspect Traffic Control Plans (Orange Card)

Summary of Experience

Phillip is a civil design draftsman in the Cardno (NSW/ACT) Canberra office with practical experience across a wide array of civil design infrastructure and urban components. Phillip's particular speciality is the design of traffic control devices, temporary traffic management, underground services, shared trenches, and handover of projects to the relevant authorities.

Phillip is able to combine his technical knowledge with practical experience in construction site surveillance and design support to Superintendents in the field during construction. Further to this, Phillip also holds both orange and red cards for temporary traffic control issued by Roads and Maritime Services (RMS).

Significant Projects

ACT Design Projects:

- On Road Cycling 2013/14 Reseal Program
- On Road Cycling 2014/15 Reseal Program
- Ngunnawal Retirement Village
- Gungahlin College
- Monash Aged Care Village
- Hume West Industrial Subdivision
- Lawson South Residential Estate
- Section 48 Industrial sub-division

NSW Design Projects:

- 200-210 Jardine Drive
- Fairley Estate, Murrumbateman
- Ellerton Drive Extension
- Vincentia District Centre
- IKEA MFLU
- Hennessey Road Basin
- Capricorn Park Entry

Design/Construction Projects:

- Wright/Coombs: site support to Superintendence, including site meetings, RFIs and site surveillance.
- Braybrooke Street Extension and 900mm watermain: design support, site surveillance, RFIs, site meetings
- Selected ACT Streets Improvements: design, tender, site surveillance, handover
- The Canberra and Calvary Hospital Pay Parking implementation: site surveillance

- Monash Aged Care: site support to Superintendent, including site meetings, RFIs, site surveillance
- Lawson Intersections: site support to Superintendent, including RFIs and site surveillance.

Alison Stutchbury

Current Position
Designer/Drafter - Engineering

NSW/ACT Cadd Representative

Profession
12d Designer

Years' Experience
11

Joined Cardno
February 2007

Education
Advanced Diploma of Engineering Design

12d Solutions - Intro to 12d Model

12d Software - Basic Civil Design

12d Intermediate Civil Design, Stormwater Drainage Design

Summary of Experience

Alison is a Civil/Structural Design Drafter in the Canberra office undertaking design and documentation for civil infrastructure projects.

Alison's experience includes roads, carparks, sporting facilities and subdivisions. Alison has specific skills across a wide range of civil engineering earthworks, retaining walls, pits and similar structures, pavements and drainage, sewer, water and stormwater. Alison is highly proficient in AutoCAD and 12d modelling packages.

Prior to joining Cardno Alison trained as a Structural Draftsperson working on residential and commercial projects.

Alison has been Cardno's NSW/ACT CADD Representative since July 2009, which development includes developing and implementing Cardno Group CADD manuals and standards, CAD and 12d training and customisation of CAD and 12d products for use by Cardno ACT staff.

Significant Projects

> Capital Airport Group, Majura Car park,

> The Canberra Hospital: Acute Adult Mental Health Inpatient Unit including Civil engineering works, Early works package , Civil hydraulics package, Detailed civil works package

> Territory and Municipal Services, ACT: Gungahlin Wellbeing Precinct

> ACT Procurement Solutions, Lyneham Sports Precinct Culvert

> Australian Institute of Sport Tennis Courts

> Land Development Agency - Section 83 Site Servicing

> Gungahlin College, Civil Engineering, External Works, Early Works Package, Civil Hydraulics Package, Detail Civil Works Package

> Territory and Municipal Services Directorate: ACT Major Bus Stops Program

> Moreland City Council, East Coburg Tennis Club

> ACT Shared Services Procurement: Morriset Road

> Brighton Grammar School: Senior School Synthetic Turf Field, water harvesting, irrigation and ancillary works, civil engineering and electrical elements.

KEY TEAM MEMBERS

DOMINIC SCHLIEBS

Dominic is an environmental process engineer with over 16 years' experience in the waste industry. He specialises in advanced waste treatment technologies including mechanical processing, biological treatment and EfW technologies. Dom's detailed understanding of technologies is gained from his previous work including process design, project management, procurement, installation, commissioning and hands-on operations. His experience in advanced energy-from-waste processes includes pyrolysis, gasification and combustion. During his time working in the UK, Dom was involved in various EfW projects including an expert witness review of a failing plant, contributing to various private public partnership EfW project bids and the development of small scale energy recovery systems.

JOESPH KRUPA

Joseph has 22 years of experience specialising in solid waste projects. His experience spans all project life phases including: conducting technical feasibility and planning studies; providing permitting assistance; preparing conceptual, detail and final design drawings and specifications; preparing procurement documents; evaluating equipment and contractor bids; providing technical support during equipment vendor and contractor negotiations and design / construction, and operation phases; evaluating equipment, construction and operations contract compliance; conducting maintenance and outage facility inspections; providing technical assistance in support of bond financing to secure over $1B in capital project funding; evaluating facility and equipment demonstration and acceptance test results; and comparing operations to contractual performance metrics.

DUNCAN LUMMIS

Duncan is an experienced manager of multi-disciplinary teams and stakeholders for the delivery of a wide range of waste and environmental management projects for industry and government. Private sector experience includes waste, environment, utilities, construction, energy and highways projects for key clients including Veolia, Viridor, Biffa, United Utilities and Rio Tinto. Public sector clients include local, regional and national government in the UK and overseas, regional police forces, NHS, WRAP and LOCOG.

AMIT CHATTOPADHYAY

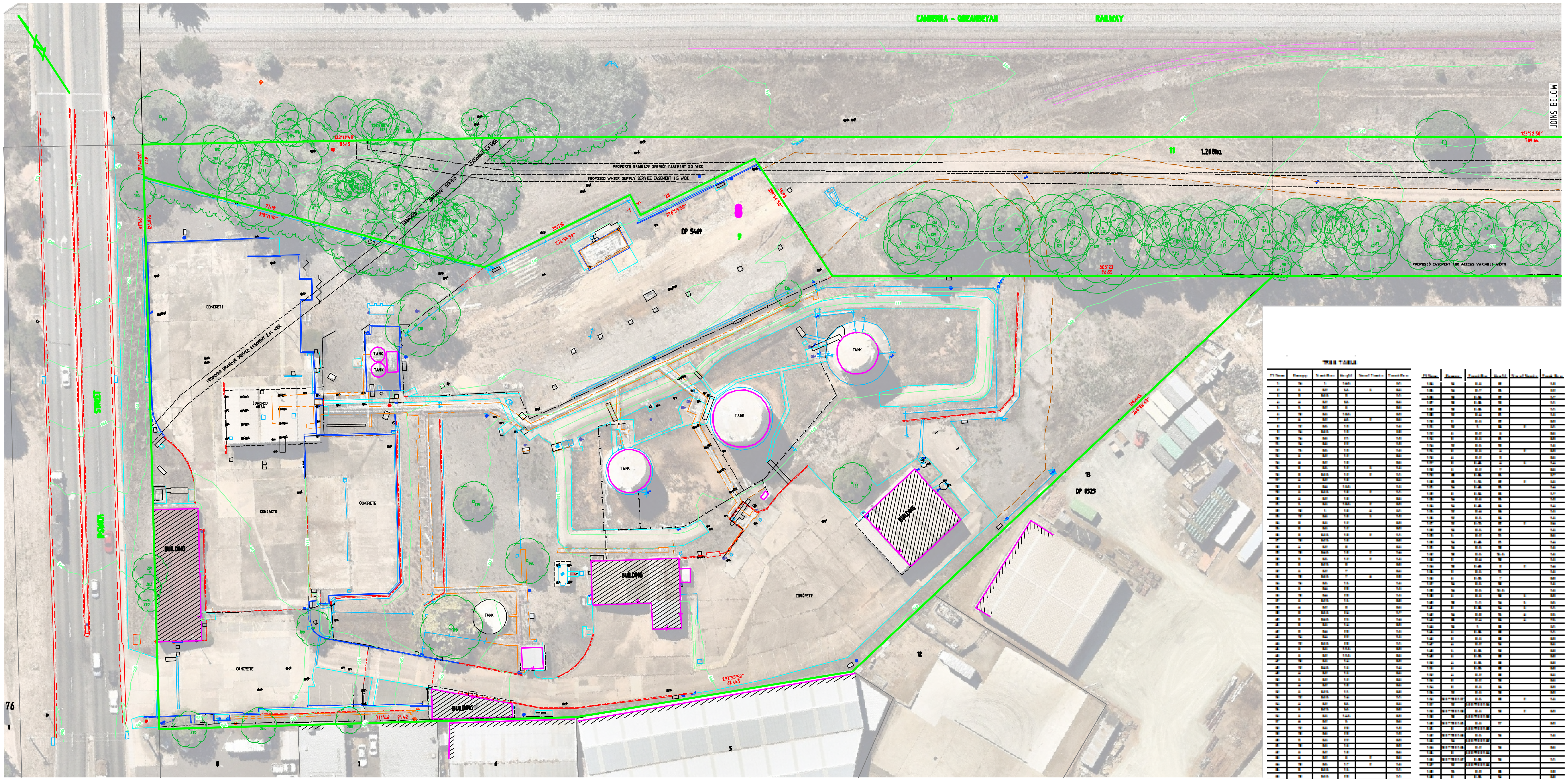
As the national thermal systems expert for Arcadis, Amit provides design expertise and project management for thermal transfer/energy recovery projects. His municipal waste-to-energy experience involves over two dozen projects. He is proficient in steam power system design. Amit has recently served as the Senior Thermal Advisor for the resource recovery projects for Palm Beach County, FL, including the existing 2,000 tpd facility refurbishment and upgrade, and the new 3,000 tpd waste-to-energy facility.

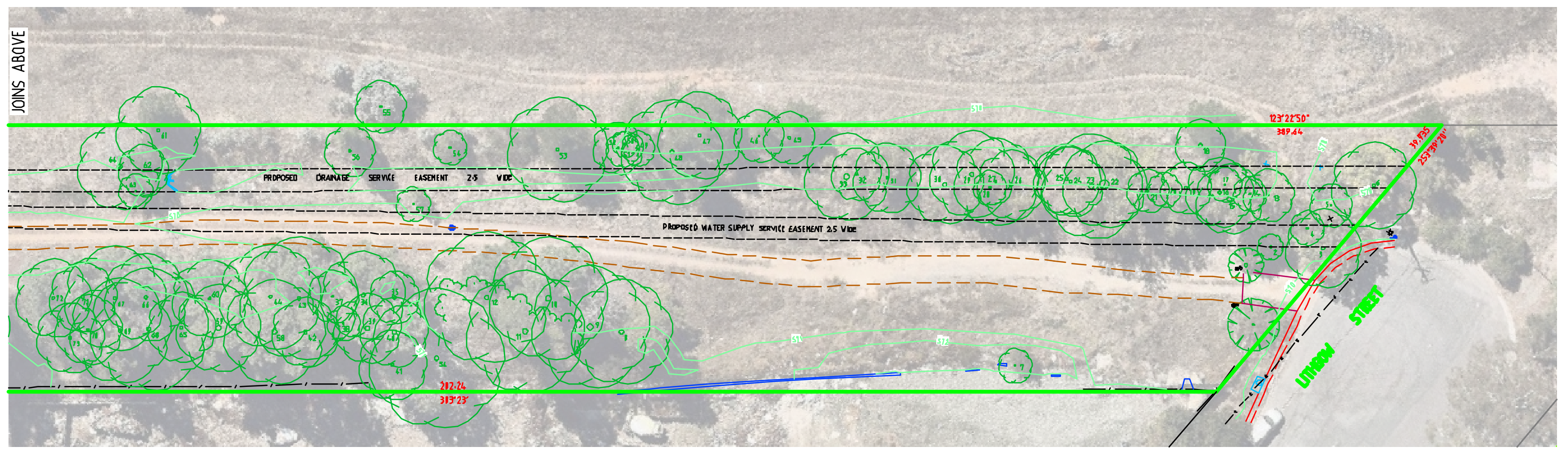
Blocks 9 & 11 Section 8, Fyshwick

APPENDIX J

SITE SURVEY

Cardno
Shaping the Future





For the purpose of this plan, the boundary information shown is from DPXXXX. Boundaries have not been remarked. For future development, further survey and marking of boundaries may be necessary.

The symbols used in this plan and associated digital data do not necessarily reflect the size and orientation of the object they represent.

Tree canopies are shown as a circular representation only and may not reflect irregular canopies.

Services shown hereon have been determined from visual evidence only. Prior to any demolition, excavation or construction on the site the relevant authority should be contacted to establish detailed location and depth.

Survey data including services shown on this plan is correct at the date of survey. Site conditions may have altered since the date of survey & we advise that the survey data may need verification.

The easements shown have been derived from the relevant deposited plan and the ACTmapi data base. We recommend that the easement information shown be verified with a title search to ensure that it is accurate and current.

Every effort has been made to ensure that the model within this data set is an accurate representation of the actual surface. Isolated deflections in the surface could occur between surveyed data points and these deflections may not be in the model.

Plan to be read in conjunction with the digital data.

LEGEND

STORMWATER MANHOLE	MISC UTILITY
SHRUB	SIGN
TREE	RED LIGHT CAMERA
LIGHT POLE	MISC PIT
STOP VALVE	TICKET DISPENSER
STAY WIRE	COLUMN
BOLLARD	GRATED PIT
PIPE INVERT	SEWERAGE MANHOLE
HYDRANT	COMMS PIT
PIPE OBVERT	FLAGPOLE
BORE/WELL	SEAT
COVER LEVEL	ELECTRICITY PIT
TAP	WATER METER

TREE TABLE

[illegible]

CLIENT
Benedict Industries Pty Ltd

DISCLAIMER:
This plan of survey and its associated digital data was prepared under instructions and specification as agreed. This information should not be used or relied upon by any other party.

REVISION	DATE	ZONE

Contour Interval 0.25 | BM SR605
Datum AHD | RL 666.690

Scale 1:300 (0 5 10)

Surveyed	K.Ingram	29/05/2017
Drawn	S.Wade	30/05/2017
Checked		
Approved	.... Surveyor, Registered under the Surveyors Act 2005	

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Detail Survey
Blocks 9 and 11 Section 8
Fyshwick

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Sheet No. 1 of 1 08118.02_DT_001
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