MDW

Environmental Services

Specialising in:

Acid Sulphate Soils
Contaminated Site Assessment
Air Quality Investigations

Remediation Advice and Design
Groundwater Management
Industry Training

ABN 36 835 856 256

WORKS APPROVAL APPLICATION
&
SUPPORTING DOCUMENTS

Lot 20, Adelaide St
Hazelmere

March 2014

PREPARED FOR:

Wasterock Pty Ltd

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Synopsis:	This document has been prepared in accordance with the Environmental Protection Act (1986), Environmental Protection Regulations (1987), Contaminated Sites Act, Western Australia (2006) and Department of Environment Regulation (DER) Contaminated Sites Management Series guidelines. In addition, the Environmental Health Directorate of the Department of Health of WA provides DER with advice on the public health aspects of contamination that presents, or has the potential to present, a risk of harm to human health, the environment or an environmental value. This Works Approval Application (WAA) details function and operational management requirements for the excavation/remediation and regeneration of historical landfill soils during development works of Lot 20 Adelaide St Hazelmere.

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Table of Contents

1 INTRODUCTION 8
1.1 Previous Reports 8
1.2 Site Statistics 9
1.3 Project Background Information 10
1.4 Purpose of Application 10
1.5 Purpose of this Document 11
2 ADMINISTRATION 12
2.1 Applicant/Occupier Details 12
2.2 Premises Location Details 12
2.3 Surrounding Environment 12
2.4 Prescribed Premises Category 13
2.5 Timing of Construction and Operation 13
2.6 Stakeholder Consultation 14
2.7 Logistics 14
2.8 Fire Risk 14
3 ENVIRONMENTAL SETTING 15
3.1 Physical Environment 15
3.1.1 Climate 15
3.1.2 Topography 15
3.1.3 Surface and Groundwater 15
3.2 Biological Environment 16
3.2.1 Flora and Vegetation 16
3.2.2 Fauna 16
3.3 Social Environment 16
3.3.1 Residential Receptors 16
3.3.2 Groundwater Receptors 17
3.3.3 Air Receptors 17
3.3.4 Noise Receptors 17
3.4 Areas of Significance 18
4 PROJECT DESCRIPTION, DESIGN & CONSTRUCTION 19
4.1 Overview 19
4.2 Duration of Project 19
4.2.1 Projects Stages 19
4.3 Proposed Site Access 20
4.4 Site Boundary construction 21
4.5 Utilities 21
4.6 Water Management and Use 21
4.7 Drainage 22
4.8 Dust Suppression 23
4.8.1 Misting System Details 23
4.9 Excavation Progression 24
4.10 Production of Engineered Fill 24
4.10.1 Capping Layer 24
4.10.2 Physical Barrier Layer 25
4.10.3 Engineered, Repackaged Deep Cell 25
4.11 Required Soil Stream Volumes 25
4.12 Storage of Processed Material 25
4.13 Vehicle Parking 25

4.14 Fuel Handling 26
4.15 Vehicle Maintenance 26
4.16 Vehicle Wash...26
5 POLICY FRAMEWORK...28
5.1 Moving Zero Waste Streams 29
5.2 Environmental Protection Policy 29
5.3 State Environmental Policies 29
5.4 Part V, Sections 52 and 53 29
5.5 Air Quality 30
5.6 Water 30
5.7 Soil...31
5.8 Energy Efficiency Greenhouse Gas Emissions 31
5.9 Noise 32
5.10 Odour..32
6 RESOURCE RECOVERY & REMEDIATION FACILITY 34
6.1 Inputs & Outputs...34
6.1 Crushing Plant 35
6.2 Screening Plant 36
6.2 Heavy Duty Separator 37
7 SOIL ACCEPTANCE & AMENDMENT FACILITY 38
8 ENERGY USE AND GREEN HOUSE GAS EMISSIONS..39
8.1 Greenhouse Gas Emission Assessment Framework 39
References 43

TABLES WITHIN REPORT

Table A Summary of Site Statistics
Table B Surrounding Land Uses
Table C Prescribed Premises Categories Proposed for the Project
Table D Operational Hours
Table E Groundwater Direction, Layers & Aquifers
Table F Separation Distances According to Proposed Premise Categories
Table G Summary of Staged Construction
Table H Road Construction Details
Table I Details of Utility Providers
Table J Summary of Groundwater Abstraction
Table K Adopted Dust Suppression Techniques
Table L Estimated Required Volumes
Table M Description of Crushing Plant
Table N Description of Screening Deck
Table O Heavy Duty Separator
Table P Description of Soil Amendment Area
Table Q Estimated on Site Diesel Use

APPENDIX

Appendix A – Figures & Supporting Documents (including)

Figure 1 Site Location Map
Figure 2 Proposed Site Access Road
Figure 3 Proposed Engineered Landfill Details
Figure 4 Proposed Locations of RRRF and SAAF
Figure 5 Groundwater Abstraction - Well Location
Figure 6 Crushing Plant Data
Figure 7 Crushing Plant Noise Assessment
Figure 8 Screening Plant Data
Figure 9 Screening Plant Noise Assessment

Works Approval Application Form

Supporting Correspondents

Supporting Documents to the Works Approval Application Report

MDWES Environmental Site Management Plan (ESMP)

The ESMP includes the following Reports as supporting documents:

- *Greg Rowe Assoc. - Community Consultation*
- *Wasterock - Works Agreement & Site Management Plan (SMP)*
- *NTEC - Groundwater Modelling Hazeland (GWM)*
- *MDWES – Groundwater Abstraction for Dust Suppression (GWAMP)*
- *MDWES – Air Quality Management Plan (AQMP).*
- *MDWES - Soil Amendment Management Plan (SAMP)*

EXECUTIVE SUMMARY

Wasterock's project goal is to rejuvenate a 16.9ha site within the Hazelmere area east of Perth. This will be achieved by remediating a historical landfill which has been left dormant and has been a blight on the landscape of Perth for several years. Wasterock's turnkey proposals will create a viable, developable plot of land for commercial and economic growth which will benefit the local community and State of Western Australia.

The redevelopment of this land will not only reduce the current environmental impact of a historical landfill. It will also address the associated stigma and visual impact. At present the landfill rises above ground level to approximately 6 to 8 metres in places. It is unkempt, unsightly and has been used for ad-hoc illegal fly tipping and dumping.

The proponent aims to repackage the material within the historical landfill through excavation, sorting and reinstatement. This in turn will reduce the volume of the material and subsequent level of the site in conjunction with compaction. The material within the landfill is presumed to be predominantly inert material such as sands, builders' waste and rubble (concrete). However, records show that non-inert material was accepted in the form of waste slurries, asbestos sheeting, and waste metals, to name a few of the products accepted. Furthermore, as part of the remediation, the concrete and larger material will be repackaged and re-used as a visible break layer and barrier to ensure that any future development does not disturb the underlying soil material.

Further green credentials for recycling are gained via the acceptance of inert soil materials which would normally end up in a licensed landfill. The proponent aims to re-use Class I (hydrocarbon Impacted only) and Acid Sulfate Soils (ASS) for the Capping Layer. These soils will be obtained from the Perth metropolitan area. Soils will be adjusted or remediated within a Soil Acceptance and Amendment Facility (SAAF) which will validate and ensure the soils are fit for purpose. This will be achieved through field and laboratory testing undertaken before being transferred and used as capping material in the project.

The duration of the project has been estimated as 4-5 years, based on the volume of soils to be remediated and soils required for the capping layer.

1 INTRODUCTION

This Works Approval Application (WAA) has been prepared by MDWES for Wasterock Pty Ltd (the Client). The WAA is for the proposed management, remedial works and regeneration of an historical landfill at Lot 20 Adelaide St, Hazelmere WA (the Project), herein will be referred to as 'the Site'.

Wasterock proposes to remediate the Site using conventional excavation techniques for a 'fit for use' status (commercial). The proposal also includes a finished final level suitable for future development which comprises reducing the current height and fill content of the site.

The remedial works of the Site will involve the following stages:

1. Excavation, sorting and processing (crushing and/or screening) of existing material.
2. Acceptance of soil for amendment such as Acid Sulfate Soils (ASS) and Hydrocarbon Impacted Soils (HIS) (Class 1 only) for recycling and reuse. These soils will ultimately be used for the capping layer (Ground Level to 1.5mbgl).
3. Processing (crushing and/or screening) of construction and demolition (C&D) waste for recycling and reuse on Site to engineer a physical warning barrier, break layer 0.5m in thickness, 1.5 to 2.0mbgl.
4. Engineered placement, compaction and construction of excavated remediated soil material to form a controlled engineered cell. (2.0mbgl to base of landfill).

The remediation of the site includes the outsourcing and acceptance of soil material for the capping layer. This will be sourced from local building and development projects within the Perth metropolitan area. Soils will be screened, certified clean and environmentally cleared 'fit for use' and will be further validated before being used to construct the capping layer.

It should be noted that soils accepted for recycling will be analysed and assessed in accordance with the Environmental Site Management Plan (ESMP). Analysis will also be in line with the Department of Environmental Regulation (DER) Contaminated Site Management Series and Department of Health Guidelines to ensure compliance with current guidelines for soil, air and water.

1.1 Previous Reports

Several reports and investigations have been undertaken on the subject Site from c.2005 to present. The information and results of these investigations are compiled in the following documents and should be read in conjunction with this WAA:

- FOI 1233/05 by Department of Environment & Conservation (DEC) – Freedom of Information – Lot 20, Adelaide Street, Hazelmere (October 2005);
- 2145245A:PR2_16644.RevA by Parsons Brinckerhoff – Site Investigation (SI) – Hazelmere, WA (July 2006) (see figure 1);
- V392/2007 grw4469 by Knight Frank – Valuation Report – Lot 20 Adelaide Street, Hazelmere, WA (July 2007);
- 476300-0kjcv070709a by Burgess Rawson – Valuation Report – Lot 20 Adelaide Street, Hazelmere, WA (July 2007);
- 60150301 by AECOM – District Storm water Management Strategy – Hazelmere Enterprise Area (June 2010);
- Drilling Logs by Banister Drilling & Irrigation for 20 Adelaide Street, WA. (May 2012);
- E2012-031 (GME) – MDWES – Groundwater Monitoring Event #1 – Adelaide Street Hazelmere (May 2012);

- NTEC Environmental Technology – Groundwater Modeling for the Wasterock Hazelland Landfill Site in Hazelland. (September 2012).
- E2012-031 (GME) – MDWES – Groundwater Monitoring Event #2 – Adelaide Street Hazelmere (August 2012);
- E2012-031 (GWAMP) – MDWES – Groundwater Abstraction for Dust Suppression & Surface Compaction v2 – Adelaide Street Hazelmere (October 2012);
- E2012-031 (GME) – MDWES – Groundwater Monitoring Event #3 – Adelaide Street Hazelmere (January 2013);
- E2013-031 – (SAMP) - MDWES – Soil Amendment Management Plan – Lot 20 Adelaide Street, Hazelmere (March 2013).
- E2012-031 (GME) – MDWES – Groundwater Monitoring Event #4 – Adelaide Street Hazelmere (June 2013);
- E2012-031 (AQMP) – MDWES – Air Quality Management Plan (AQMP) v2 – Adelaide Street Hazelmere, (October 2013).
- E2012-031 (GMES) – MDWES – Annual Groundwater Monitoring Event Summary Report (GMES) v2 – Adelaide Street Hazelmere, (October 2013).
- GRA 7729 by Greg Rowe & Assoc. – Community Management Strategy for Remediation of Former Landfill Site: Lot 20 Adelaide Street, Hazelmere. (March 2014);
- 6045.k.09_09082_SMP by Waste Rock Pty Ltd – Site Remediation Works Agreement and Site Management Plan (Final) – Lot 20 Adelaide Street. (March 2014);

It should be noted that the MDWES ESMP report listed above has been included as supporting documentation to this Works Approval Application (The ESMP includes the MDWES reports: SAMP, GWAMP, SMP and AQMP reports (see Above).

1.2 Site Statistics

The project Site is approximately 565m in length and 300m wide which equates to an area of 16.9 hectares. Investigations to date have found that the fill material has been proven up to 6.5 metres below ground level (mbgl). However, it has been reported that the fill may be as deep as 8mbgl in places. The finished level of the historical landfill currently varies between 6 to 8 meters above surface level (masl). This is summarised in Table A below.

Table A: Summary of Site Statistics

Length (m)	**565**
Width (m)	**300**
Approximate Area (ha)	**16.9 ha (169,000m^3)**
Proven Depth of Landfill (mbgl)	**6.5 (maximum)**
Height of Landfill (magl)	**7.5 (maximum)**
Estimated Landfill Volume Total (m^3)[1]	**1,695,000 m^3**

[1] The volume is based on an average depth of 10m for the landfill material above and below ground level.

Within the non-land filled area of the Site situated along the western boundary. The surface appears to be generally flat in topography that ranges between 26.69m Australian Height Datum (AHD) in the southwest corner, sloping gently upwards to approximately 27.24m AHD in the northwest corner. (c.1990 site survey).

Steep battered edges between 6m and 8m in height define the edge of the landfill within the centre of the site. A shallow access ramp is located in the middle of the southern edge and leads to the top of the landfill which is generally flat and level. The north western edge of the landfill has a slighter gradient than the other edges of the landfill. The site's current status is 'Not Fit for Use' and varies with earthen benches and swales.

1.3 Project Background Information

The Site has been operated by multiple proponents as a licensed "inert" landfill from c.1987 to c.1997. This is after previously being mined for building and construction sands. It was reported that the sand was extracted down to the clay substrate which has been noted up to 6.5mbgl. However, it has been reported that it may be deeper. The true depth of the landfill will not be determined until the remediation begins.

Given the history and land use of the Site, a contamination assessment was undertaken by Parsons Brinckerhoff in 2006. This report summarised the extent and general nature of uncontrolled fill present and discussed the environmental significance of any impacts detected with reference to the *Western Australian Contaminated Sites Management Series Assessment Levels for Soil, Sediment and Water* (DoE 2003) (Parsons Brinckerhoff 2006).

It has been further reported that non-approved waste streams were disposed of at the Site. The non-inert waste included oil sludge, emulsion factory waste, drums of bitumen and kerosene, crayfish shells, asbestos sheeting and pipes and two large baker's ovens containing asbestos together with insulation material. Additionally, the landfill has been operated such that the current topography of the Site is unsuitable for development (Parsons Brinckerhoff 2006).

Parsons Brinckerhoff (2006) also concluded that the majority of fill material at the Site is inert construction and demolition waste in a sand matrix. However, fragmented asbestos containing materials (ACM) were identified at several surface locations across the site. Furthermore, studies have identified varying levels of contamination, primarily caused by Total Petroleum Hydrocarbons (TPH's), Monocyclic Aromatic Hydrocarbons (MAH's), Polychlorinated Biphenyls (PCBs) and Heavy Metals all present within the fill material.

In 2007, following the assessment of the Parsons Brinckerhoff report, the DER (formerly DEC) classified the Site under Section 13 of the *Contaminated Sites Act 2003* (CS Act) as 'Possibly Contaminated – Investigation Required' (DEC 2010a). Following a compliance inspection in October 2010, DER reviewed this classification and re-classified the site as 'Contaminated – Remediation Required' (DEC 2010a).

Wasterock is proposing to redevelop the area by remediating the Site via excavation and repackaging of materials. This will be soils as engineered inert material. An engineered barrier layer will be placed over the repackaged materials. This will be followed by a validated layer of clean cover. The project is expected to take approximately four to five years to complete the necessary works. The ultimate aim of the project is to rehabilitate the land, such that it can be utilised within the community, through subdivision into smaller light industrial/commercial lots.

1.4 Purpose of Application

The Wasterock project is subject to Works Approval Application (WAA) by the Department of Environment Regulation (DER) under Section 53 of the *Environmental Protection Act 1986* (EP Act), which lists a number of circumstances where activities at the prescribed premises trigger the need for Works Approval. In this case, it is due to proposed changes in the storage, handling, transport and treatment of soil currently at the Site. The Site also includes the generation of emissions such as Greenhouse Gases (GHG), odour, noise and dust. The purpose of the WAA is to ensure these discharges to the environment are minimised or adequately controlled in accordance with current regulations.

The Resource Recovery & Remediation Facility (RRRF) and Soil Acceptance & Amendment Facility (SAAF) facilities are expected to function until the Site is suitable for future development, ie following completion of remedial activities.

1.5 Purpose of this Document

This WAA will document and describe those processes that may cause environmental impact, and describe mitigating factors and provide solutions in a pragmatic manner. The report will draw on current legislation to ensure that discharges to the environment are minimised and/or adequately controlled by the Site's operations, such that they are environmentally acceptable.

The Department of Environment and Regulation (DER) regulates prescribed premises under Part V of the EP Act. Furthermore, under Schedule 1 of the *Environmental Protection Regulations 1987,* the Site would be classed as a "prescribed premise".

"The Occupier of a premise should obtain a works approval when undertaking work which would cause the premises to become a "prescribed premise". For established premises, the EP Act specifies when a works approval is required for a range of actions that may alter emissions or alter the operation of the premises".

"The purpose of the works approval is to ensure the premises, plant and equipment are designed, sited and can be managed, so that emissions from the premises are environmentally acceptable".

The following sections of the Works Approval Decision Matrix (DER industry guide) apply to the site and fall under section 52 and 53 of the EP Act. The relevant and applicable sections are stated below:

- Will the proposed work cause an emission, or alter the nature or volume of the waste, noise odour *[s.53(1) and 53 (2)]?*
- Will the proposed work alter the method of operation, or any process carried out at the prescribed premises *[s.53(1)(a)]?*
- Will the proposed work alter, construct or install any equipment on the prescribed premises for the following:
  - ➢ Storage, handling, transport or treatment of waste for the purpose of the discharge of waste?

  Or

  - ➢ Control of noise, odour prior to, and for the purpose of, the emission or transmission of noise and odour. [s.53(1)(b)]?

A copy of the completed application form for the Works Approval is provided in Appendix A. Further reference with regards to the legal precedent should be made to the letter presented in Appendix A. The letter is in reference to the classification of the site as a remediation project and not a landfill facility.

2 ADMINISTRATION

A Site Management Plan (SMP) has been developed by Wasterock Pty Ltd. The SMP details the roles and responsibilities of the shareholders involved and the on-Site operational measures to be undertaken for the duration of the project.

The Wasterock SMP provides details of operational and regulatory procedures to be utilised during the sites operations. This includes, but is not limited to, responsibilities of managers, first aid procedures, occupational health management, site traffic management and site reporting procedures. For further information on site management, reference should be made to the ESMP in the supporting documents, which includes the Wasterock SMP.

2.1 Applicant/Occupier Details

The applicant and occupier of the premises for which this application is being made are as follows:

Wasterock Pty Ltd (Wasterock)

1/32 Ledgar Rd, Balcatta, WA, 6021

Phone: (08) 6241 4100

Fax: (08) 9240 6220

Proponent representative: Peter Moltoni

2.2 Premises Location Details

The Site is located within the City of Swan, approximately 14 km east, north east of the Perth CBD, 6km east of the Swan River and 1 km west of the Darling Fault (See figure 1).

The Site is zoned ‘rural’ under the Metropolitan Region Scheme (WAPC 2012) with a frontage of approximately 565 metres onto Adelaide Street. The historical landfill covers the majority of the Site. The Site is mostly vacant with a small shed located in the south western corner. Grass and weeds cover the majority of the Site while some low lying shrubs and juvenile and semi-mature trees grow sporadically over the Site (also see Section 1.2 for site dimensions).

2.3 Surrounding Environment

Surrounding environs and land use in the vicinity of the Site are outlined in the Table, below:

Table B: Surrounding Land Uses

Orientation	Description
North	Scattered special residential dwellings on semi-rural properties which also includes a disused market garden and horse trotting tracks.
East	Roe Highway, to the immediate east (running north to south), followed by a small area of medium density residential dwellings. In addition, on the south-east boundary (subject Site) an operational sand quarry and landfilling operation can be observed.
South	Medium density residential dwellings are noted along Adelaide Street. A Bush Forever Site N^{o}122 can also be found approximately 10m to the south-east of the Site.
West	An ice works is located immediate to the west, followed by residential dwellings set on semirural properties.

Further details and descriptions are expanded upon in the ESMP within the supporting documents.

2.4 Prescribed Premises Category

The Project requires approval to construct and operate under the categories outlined in Table C as specified in Schedule 1 of the Environmental Protection Regulations 1987.

Table C: Prescribed Premises Categories Proposed for the Project

Category Number	Description of category	Production or design capacity (in tonnes)
12	Screening and processing of material: premises (other than premises within category 5 or 8) on which material extracted from the ground is screened, washed, crushed, ground, milled, sized or separated.	**50,000** or more per year
13	Crushing of building material: premises on which waste building or demolition material (eg bricks, stones or concrete) is crushed or cleaned	**1000** or more per year
61A	Solid waste facility: premises (other than premises within category 67A) on which solid waste produced on other premises is stored, reprocessed, treated, or discharged onto land.	**1,000** or more per year
62	Solid waste depot: premises on which waste is stored, or sorted, pending final disposal or re-use.	**500** or more per year
67a	Compost manufacturing and soil blending: premises on which organic material (excluding silage) or waste is stored pending processing, mixing, drying or composting to produce commercial quantities of compost or blended soils.	**1,000** or more per year

2.5 Timing of Construction and Operation

Construction and earthworks for the Site are proposed to commence in mid-2014. Wasterock proposes to construct and commence operation of the RRRF and SAAF once approval is granted by the relevant authorities. The anticipated duration of the project is 4 to 5 years to complete the remediation of the Site. However, this will be dependent on the availability and complexity of remediation for the on-site materials. The timing also depends on the availability of recyclable input soil material for the capping layer (ASS & HIS soils), which in turn is dependent on the level of building and construction work within the Perth Metropolitan Area.

The Site will operate from Monday to Saturday each week. The site will be closed on Sundays and public holidays. Table D denotes the operational hours of the site.

Although there are no operations on Sundays, machine maintenance could be carried out on Saturday afternoons and Sundays. Such maintenance would be remote from residential areas and carried out on the northern boundary of the site.

Table D: Operational Hours

Day	Opening Time	Closing Time
Monday to Friday	07:00 am	17:30pm
Saturday	08:00 am	16:00pm
Sunday	Closed	

2.6 Stakeholder Consultation

Community consultation and assessment was undertaken as part of an Environmental Site Management Plan (ESMP) by MDWES. The report is presented in the supporting documetns. The following stakeholders for the Project have been identified as being:

- Department of Environment Regulation (DER).
- Department of Health (DoH).
- State and local government, including the City of Swan and Shire of Kalamunda.
- Local Community members.

2.7 Logistics

Several two-way truck movements are expected each day of operation, involving both rigid and semi-trailer vehicles. All vehicle access to the Site is limited to a designated Site entry location. There will be no truck access from Adelaide Street. The speed limit within the Site will be restricted to 10 Km/hr (off road). Users of the Site are notified of site entry requirements. Offenders, after reasonable warning, would be banned from future use of the facility.

All facilities on Site are to be portable so that they can be moved as progress across the site. It is also preferred to have the facilities as close as possible to the current stage of works. A single location far away from the works is not practical for the land rehabilitation operation.

2.8 Fire Risk

The risk of fire occurrence at the Site is very low. However, the following contingency plan will be adopted and detailed in the SMP which is attached to the ESMP in the supporting documents.

- Continual water supply has been established for dust suppression and would be deployed for fire suppression if needed.
- On-site earthmoving equipment will be incorporated into efforts to extinguish a fire.
- Earth moving equipment will be fitted with appropriate fire extinguishing equipment.
- Area Managers and the Site Manager will be supplied with a mobile phone, iPad or similar to enable contact with emergency services.
- Where existing vegetative material may be at risk from site operations, this material will be stripped back as the project progresses. This is to ensure that a reasonable buffer zone exists to ensure that no accidental ignition occurs.

In the unlikely event that a fire occurs, details of the date, time and location, cause or suspected cause and action taken to extinguish the fire will be accurately recorded. These details will be communicated to the DER and appropriate authorities within 24 hours of the event.

3 ENVIRONMENTAL SETTING

The Site has been extensively investigated and reported with regard to environmentally characterising and profiling the condition of the soil and groundwater. Furthermore, MDWES has presented an Environmental Site Management Plan (ESMP) which outlines the environmental monitoring for the duration of the project. For further information, reference should be made to the MDWES ESMP report in the supporting doucments.

3.1 Physical Environment

A summary of the physical, biological and social environment is presented in the following sections.

3.1.1 Climate

The Site experiences a Mediterranean climate, characterised by hot, dry summers and mild, wet winters. These seasons transition into the autumn and spring months. Annual average rainfall is 869 mm, 80% of which falls between May and September.

3.1.2 Topography

The original surface level of the Site has been altered due to historical sand mining at the site and the resulting historical landfill. The lowest part of the Site is approximately 27mAHD (Relative Level metres Australian Height Datum) within the southwest corner of the Site where there is no evidence of historical landfilling.

The Site slopes gently upwards to approximately 35mAHD in the south-eastern corner of the Site where some of the highest points on site occur. Furthermore, the central portion of the site fluctuates between 33 and 35mAHD which comprises the landfill. See section 2.1 for site dimensions.

3.1.3 Surface and Groundwater

Water-bearing layers and aquifers that potentially occur beneath the site as set out in Table E below (DoW, 2012):

Table E: Groundwater Direction, Layers & Aquifers

Aquifer	Depth From	Depth To	TDS mg/L	Use	Permeability	Groundwater Flow Direction
	mbgl					
Superficial Aquifer Cloverdale Area	12	31	500 - 1000	suitable for garden use	High	North Westerly

Standing water level measurements were recorded by MDW Environmental Services (MDWES) during the four quarterly groundwater visits from May 2012 to May 2013:

Groundwater was intercepted between 18.6 RL mAHD and 23.8 RL mAHD. Therefore, it is anticipated that Groundwater will not be intercepted during the proposed project.

Groundwater levels in the wells changed by 0.8m over the 2012-2013 test periods (4). This was attributed to seasonal variations.

An interface meter was used to verify the presence / absence of free-phase hydrocarbon products in the groundwater. No free-phase products were detected during any of the visits.

No surface water bodies were identified within 500 m of the site. The nearest natural surface water bodies are two wetlands located approximately 1.5 km to the northwest of the site (Parsons Brinckerhoff, 2006).

3.2 Biological Environment

3.2.1 Flora and Vegetation

There is no remnant native vegetation on-site. Vegetation cover at the Site is sparse, consisting of introduced weed species, predominantly grasses and low level bushes, juvenile and semi-mature trees. The flora will be systematically stripped as part of the remediation process as the project progresses and not en-mass is to reduce wind blown loose surface sands and so not to generate a dust issue. Care will be taken to ensure that a fire is not started by site operations, particularly in the summer months.

3.2.2 Fauna

As there is no remnant vegetation remaining on-site, the Site is unlikely to provide a suitable habitat for fauna.

There is a recorded Bush Forever site (Ref:122) located approximately 10m south east of the project Site. Adelaide Street dissects the area, so it is possible that native and non-native fauna species have traversed this area.

3.3 Social Environment

3.3.1 Residential Receptors

EPA Guidance Statement No. 3 - *Guidance for the assessment of environmental factors (in accordance with the Environmental Protection Act 1986):*

"Separation distances between industrial and sensitive uses (EPA 2004) define residential areas as a sensitive receptor".

The closest sensitive receptor to the Site is approximately 30 m of the southern boundary of the property. This comprises the medium density residential development that fronts on to Adelaide Street. Recommended separation distances for the five premise categories applied for are presented in Table F below.

Table F: Separation Distances According to Proposed Premise Categories

Category Number	Description of category	Separation distance (m)
12	Screening, etc. of material: premises (other than premises within category 5 or 8) on which material extracted from the ground is screened, washed, crushed, ground, milled, sized or separated. NOT POSSIBLE as the proponents have to treat excavate and process the landfill up to Adelaide St, however a earth bund and fencing will reduce any noise and the visual impact from local residents.	**500m**
61A	Solid waste facility: premises (other than premises within category 67A) on which solid waste produced on other premises is stored, reprocessed, treated, or discharged onto land.	**Case by case**
62	Solid waste depot: premises on which waste is stored, or sorted, pending final disposal or re-use.	**200**
63	Waste disposal – Crushing of building material: premises on which waste building or demolition material (eg bricks, stones or concrete) is crushed or cleaned. Site only accepting inert waste, contaminated solid waste (Class 1), special wastes (Type 1) as specified, for burial.	**150**
67A	Compost manufacturing and soil blending: premises on which organic material (excluding silage) or waste is stored outdoors/uncovered pending processing, mixing, drying or composting to produce commercial quantities of compost or blended soils. SAAF located on the Eastern boundary.	**500**

3.3.2 Groundwater Receptors

The closest down gradient groundwater receptor/expression is Ollie Worrell reserve, located 4.5 kilometres (km) south east of the Project site. This reserve is managed by the Shire of Kalamunda. Surface hydrology is unlikely to be impacted by the proposed development.

3.3.3 Air Receptors

Air monitoring was not included as part of the original scope of works during the environmental investigations. This is because the Conceptual Site Model (CSM) for the Site did not identify any Contaminants of Potential Concern (CoPC) in relation to air and, therefore, there were no airborne contaminants of note under its current status.

The closest sensitive receptor to the Site is approximately 30 m of the southern boundary of the property within the medium density residential development that fronts onto Adelaide Street.

The proposed site works has the potential to impact the residents on Adelaide Street through dust and particle deposition via excavation. However, mitigating measures such as perimeter fencing upon an earth bund, dust suppression and water misters, coupled with dust/air monitoring, will significantly reduce the potential risks of impact.

As part of the community consultation, local residents will be offered an opportunity to voice any concerns or impact, through dedicated official channels with regards to the project. If odour or dust deposition becomes a issue, Wasterock will address the issue and investigate any breaches. If a breach has been noted, then operational procedures and strategies will be reviewed and revised.

3.3.4 Noise Receptors

The closest sensitive receptor to the Site is approximately 30 m from the southern boundary of the property, within the medium density residential development that fronts onto Adelaide Street.

The proposed site works have the potential to impact the residents on Adelaide Street through noise generated on site. However, mitigating measures such as an earth bund and reasonable hours of work, coupled with noise monitoring, will reduce the potential for impact.

The following aspects of the Site's operation have been identified as requiring management to ensure noise and vibration emissions from the Site do not affect the amenity of nearby noise-sensitive premises:

- Sorting and Screening.
- Loading and Transport.

Noise from these activities can be further amplified by certain meteorological conditions, such as atmospheric temperature inversions and the speed and direction of wind. The level of noise and ground vibration associated with proposed works is also variably dependent on the local geology.

Noise emissions from day to day operations at the Site will meet the criteria set out in the *Environmental Protection (Noise) Regulations 1997*. Applicable noise limits under Regulations 7 and 8, relevant to Industrial and Utility Premises, prescribe the following noise limits at the premises boundary at all times:

- peak noise not to exceed 90dB (L_{max})
- noise not to exceed 80dB more than 1% of the time (L_{A1})
- noise not to exceed 65dB more than 10% of the time (L_{A10}).

As part of the community consultation, local residents will be offered to opportunity to voice any concerns or impact, through dedicated official channels with regards to the project. If noise becomes an issue, Wasterock will address the issue and investigate any breaches. If a breach has been noted then operational procedures and strategies will be reviewed and revised.

3.4 Areas of Significance

The Site is situated within an Environmentally Sensitive Area (ESA), administered under the EP Act. The ESA is associated with Bush Forever Site area 122, located to the south of the site. Due to its ecological importance, the project will ensure that stormwater controls are in place to prevent negative impact to the Bush Forever Site.

4 PROJECT DESCRIPTION, DESIGN & CONSTRUCTION

4.1 Overview

To enable remediation of the site, Wasterock proposes to construct and operate a Resource Recovery and Remediation Facility (RRRF) and Soil Acceptance and Amendment Facility (SAAF) located within the site boundary. The RRRF will re-use existing on-site construction and demolition (C&D) waste as clean crushable material for the physical warning barrier layer. The SAAF will also accept ASS and HIS impacted soils from the Perth Metropolitan Area. This will supply significant volumes of sand recycled for the capping layer.

Material for the SAAF is expected to be sourced from other developers, as the site will provide a convenient and sustainable disposal option for treatment of ASS / HIS soils. Due to the location and operation of the site, the use of the SAAF will be both cost effective and environmentally attractive to developers.

Material at the Site will be excavated and segregated on-site. This will involve separating material that is suitable for reinstatement from materials that may contain contaminants. Waste products that do contain contaminants identified through on site analysis have the potential to leach into the groundwater beneath the site. Therefore, Wasterock will ensure that any soil material repackaged and placed back into the ground is suitable for its intended use. The soils shall not contravene current legislative soil guidelines or the terms of the licence for the works application. Excavated waste material that is deemed to be unsuitable for reuse will be removed from Site and disposed of at an appropriately licensed landfill.

4.2 Duration of Project

The Site is expected to operate for approximately 4 to 5 years, until the site is fully remediated and appropriate for the intended end use "commercial/industrial development". The site operational time frames will depend on the remediation of current landfill material and the sourcing of soils to complete the capping layer.

4.2.1 Projects Stages

Before remediation operations begin in earnest, several milestones of the project have to be implemented. The key milestones are detailed in Table G. These stages may run concurrently.

Table G: Summary of Staged Construction

Stage 1	Construct the site access road and security gate.
Stage 2	Erect the Site bund and boundary fencing / construction office compound.
Stage 3	Connect power and water to the site. To include wash facilities and changing rooms.
Stage 4	Create, prepare and construct - RRRF and SAAF areas (including required plant).
Stage 5	Installation of groundwater abstraction bore, pipe network and storage tank for dust suppression.
Stage 6	Set up environmental monitoring stations and site office.
Stage 7	Ensure that all procedures, paperwork, health and safety documents have been signed off before project starts.
Stage 8	Excavate and remove clean sands to the clay aquitard in the western portion of the site. This is to be the first cell to except the recycled remediated material. All site plant will also be on site at this stage.
Stage 9	Commence remediation, excavation, screening and processing of materials.

4.3 Proposed Site Access

To allow the project Site to operate, access to the site has to be created. Current access to the site in the south west is via Adelaide Street. However, this is not a viable option as an on-going truck / transport vehicle access, as it is considered that operational traffic would cause additional nuisance to the local community. The access proposed road location is shown on figure 2.

Therefore, Development application DA-791/2010 and DA-740/2010 was approved by the City of Swan in May 2012. This is for the construction and use of an access route to the site via Talbot Road (north of the site) (see figure 2). This has also been approved by WAPC. On-site roads will comprise the same construction methodology.

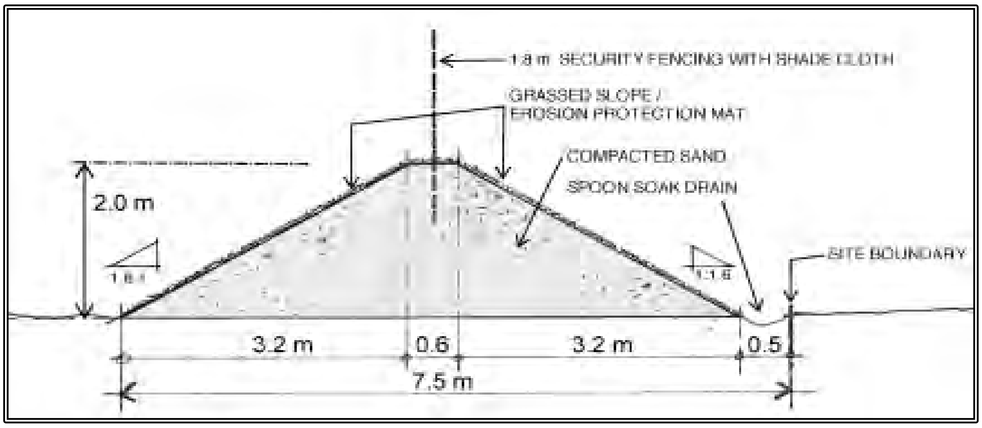
Table H: Road Construction Details

Construction Material	The construction of the access road will comprise limestone, aggregate and recycled bitumen for the composition. This will be rolled and engineered to accept anticipated site traffic under the construction design.
Dimensions	The proposed access road is approximately 335m in length (Talbot Road to North west corner of Site). The road will comprise a single lane access for one vehicle with the facility to allow vehicles to pass via three passing bays.
Maintenance	The access road will be maintained by the projects sites personnel. Operational tasks such as grading, sweeping, wetting down and repairing pot holes will be undertaken when required.
Volume of Traffic	• Traffic to the site will be minimal and periodic. Access is required for the work force daily. However, other traffic such as trucks carrying ASS and HIS material for the RFFF & SAAF will be on an ad-hoc basis when it becomes available. • Maintenance and refuelling trucks will also use the access road again this will periodic when it is required on site. • The material that cannot be used on site will require removal to a landfill facility, this will involve a truck leaving site periodically.
Surface Run off	The road will be cambered and graded to allow for surface run off to the verge (bush land).
Dust Suppression	Periodically the road will be suppressed for dust by a water tanker. Within the warmer, drier, summer months of the project the tanker will be deployed more frequently to ensure that dust generation is kept to a minimum.
Decommissioning Access Road	Upon completion of the project the road will be excavated and removed from its location. Validation of the underlying soils will be required to ensure that no impact has occurred.
Security	A 1.5m high boundary fence made up of posts, metal mesh and shade cloth will be constructed along the length of the access road. This will provided physical control of unauthorised entry to the Site. Vehicle access will be controlled by a lockable gate located at the entrance of the Site. The entry gate is to be kept locked at all times when the premises are not attended by staff in order to prevent illegal dumping of waste materials.

4.4 Site Boundary construction

A 1.8m high boundary fence will be constructed along the north, east and western boundary of the site. This will provide physical control and restrict unauthorised entry to the Site. Along the southern boundary of the site a 2.0m high earth bund with a 1.8m fence will be constructed (see diagram below).

The earth bund will be battered and compacted back to a 45º angle, root matting will be fixed in place and the bund will be seeded (grass) to allow for durability and stability. The bund and fencing will assist to improve security to the site, minimise/reduce any potential noise, dust impacts and reduce potential for contaminants moving off site. The perimeter fence will also reduce the visual and environmental impact of the works to residents on Adelaide Street.



Earth bund and fence construction for the Southern Boundary of the site (Adelaide Street).

4.5 Utilities

Power, telecommunications and potable water supply will be connected to the site offices for the duration of the project. The utility services will be laid along the new access road, with connections made via Talbot Road.

No Sewer connection will be required as the site will be serviced by a portable toilet block.

No Gas is required on site and therefore no gas supply will be instelled.

Table I: Details of Utility Providers

Power	Western Power	13 10 87
Water	Water Corp	(08) 9424 8115
Telecommunication	Telstra	1800 810 443

4.6 Water Management and Use

MDWES presented a Ground Water Abstraction Plan (GWAMP) in the MDWES ESMP which is presented in supporting documents.

The Perth Groundwater Atlas (2003 contours) indicate that groundwater is encountered on average at approximately RL 14 to 16mAHD (DoE, 2004). The groundwater levels measured by MDWES from the four monitoring visits on site were noted to be between RL 19.2 - 23.6 mAHD with levels potentially varying by 0.1 – 0.8 m annually.

It is proposed that abstraction through a single pumping bore station located in the south west corner of the Site will be sufficient to supply the Site with its water needs. Three separate bores will be used for the proposed abstraction, pumping simultaneously within 30 m of each other.

The bore will be screened at the bottom of the Superficial Swan Aquifer with allowances for draw down being made. The applied licence and approval for the Site allows for pumping rates of 300 ML/yr (or 821.3 m^3/day).

Table J: Summary of Groundwater Abstraction

No of Bores	X 3 (WRPB1, WRPB2, WRPB3)
Located	Southwest corner of Site
Aquifer	Superficial Swan Aquifer
Depth to Aquifer (RL)	21m (15mAHD) (DoE) - (*Reported 19.2m to 23.6mAHD)*
Depth of Water (RL)	10m (21mAHD) (DoE)
Base of Aquifer (RL)	31m (5.0mAHD) (DoE)
Pumped	Yes - groundwater pumps attached to each bore head. (1.5 kW Capacity).
Pumping Rates	Allowance 300 ML/yr = 821.3 m^3 / day
Metered	Yes – groundwater abstraction will be metered (Total of x3 wells).
Groundwater Quilty	Yes – groundwater quality will be monitored through a monitoring program.
Storage	X2 - 50,000L above ground storage tanks connected to the dust suppression water disbursement system
Distribution	Stored groundwater will be distributed via tap and hose into the sites sprinkler system and demisting fan units.

4.7 Drainage

Wasterock will ensure that all stormwater up to a 1 in 10 year storm event is contained within the Site. All working areas will be graded appropriately to prevent run off from the Site. The approved bunding and fencing will act as a barrier and direct stormwater into appropriate filtration or drainage areas. If drains are built for this purpose, they will be inspected regularly and any material that could possibly block or inhibit stormwater flow will be removed immediately.

4.8 Dust Suppression

Section 4.6 details water management and the extraction of bore water being utilised on site. The abstracted water will service and supply the site with its water needs for dust suppression. The Site will adopt multiple dust suppression techniques to ensure the dust is kept to a minimum and suppressed during site operations. For the dumping of C&D waste at the crushing plant, there will be a beam-activated sprinkler which will dampen material during tipping into the RFFF area.

Table K: Adopted Dust Suppression Techniques

Suppression Technique	Description
Tankers	Tankers will be used to supress access road (via Talbot Road) and internal site roadways.
Misting Machines	Misting machines will be constant at the face of the excavation, and on the screen deck and crushing plant areas.
Sprinklers	A reticulation mainline will be connected to a sprinkler network from the on site storage tank for unrestricted use. The network will comprise the use of lay flat hose at source which will connect to a rigid PVC pipe network around the boundary away from excavation. This is to provide flexibility if a sprinkler needs to be moved, without re-establishing the network. This will allow for suppression on demand and if there is a fire. Sprinklers will be used when/where required and/or if a substantial volume of water is required at one time. In particular, stockpiled soil material.

4.8.1 Misting System Details

Although stockpiles will be wet with sprinklers, misting units (fog cannons) will be sited in the work area as close as practicable to the workface. This is to effectively control any emissions from excavation and screening processes. The fog cannons will provide efficient and effective dust suppression.

Hydraulic fog cannons are designed for low power and water use, combining a powerful fan with high launch efficiency of between 20m and 65m and can cover areas of up to 1,000 square metres. Micro nozzles mounted on individual crowns atomise water into billions of micro-fine droplets that readily bond to similar sized airborne dust particles, resulting in an extremely effective means of dust suppression.

Variable water flow allows the user to manage the volume of mist to suit the current conditions and the intensity of the dust present. Water use is reduced dramatically when compared to the amount of water employed by traditional irrigation systems, sprinklers and handheld hoses.

The misting technology effectively captures dust particles of PM_{20} or less, significantly reducing breathable or fugitive dust in the surrounding air.

The benefits of using a misting system over conventional dust suppression are listed below. An image for the use of dust suppression is presented below also.

- Use significantly less water than traditional water sprinklers and hose systems.
- Limit muddy and boggy conditions/problems as there is minimal or no surface water present.
- Reduce clean up costs as the surrounding surface area has little moisture.
- Decrease machine maintenance costs by lowering equipment abrasion rates caused by dust.
- Improve workforce safety with an automated remote controlled system.
- Support local Council and EPA/DER regulations by significantly reducing dust emissions from business operations and facilitating compliance with ambient air quality standards

Images of a Mister/Fog Cannon

4.9 Excavation Progression

Wasterock propose to commence excavation in the western portion of the site mid-2014 and move in an easterly direction until the project is complete. The western portion of the site has been investigated and has been classified as clean sands, as no landfill operations have occurred in this area. The first phase of operations is to remove the clean sands, thus creating the first cell, ready to accept reinstated material.

Remedial works will lower the finished final level of the Site by removal of bulky materials such as concrete and brick, which will be crushed and used for the physical warning barrier layer.

Excavated materials such as concrete and masonry, metal and timber will be separated and reprocessed for reuse or recycling. If deemed unfit for use, they will be transferred to an appropriate licensed landfill facility. Recycling and remediation of bulky waste is expected to result in a significant volume reduction, which will be essential to achieve a finished landform level which conforms to adjoining finished contours.

4.10 Production of Engineered Fill

Wasterock's project remediation strategy aims to ensure that there is no risk or long-term damage to the environment, ecology and/or human health, due to influence from the project Site.

The repackaged design forms three distinct engineered layers:

- The capping layer which will extend to 1.5mbgl and will comprise recycled out-sourced sand (ASS & HIS) from the Perth area, remediated through the SAAF facility.
- This will subsequently be followed by a physical warning barrier layer or barrier comprising crushed concrete and brick material, which will be 0.5m thick. This will define the horizontal boundary of the landfill cells.
- Finally the engineered repacked cell will be created from repackaged engineered fill material. The construction of these layers is further expanded upon in the following sections and is depicted in Figure 3.

4.10.1 Capping Layer

Wasterock proposes to cap the Site with a recycled sand layer with a minimum thickness of 1.5m. This sand will be processed through the SAAF recycling facility, which will accept HIS and ASS soil material (class 1) only. This material will be sourced externally from the Perth Metropolitan Area and will be certified as 'clean fill'.

Wasterock propose to commence excavation in the western portion of the site and move in an easterly direction until complete. The western portion sands have been deemed 'clean' and have not been impacted by landfill operations and so can be mechanically sorted and processed through the SAAF facility to provide volume to the capping layer.

4.10.2 Physical Barrier Layer

The RRRF will screen and process construction and demolition (C&D) waste (clean). This will supply significant volumes of clean recycled sand and clean crushable material. This will be rolled and compacted to create a solid barrier layer.

The capping layer will be a minimum of 0.5m thick. Its main function will be to act as a drainage aggregate layer while also acting as a physical warning barrier to the recycled engineered fill material processed from material underneath.

4.10.3 Engineered, Repackaged Deep Cell

The deep engineered cell is designed to contain material resulting from the reprocessing of excavated landfill material. Asbestos-impacted fill material recovered from the remediation will be placed into the deep cell and will be equal to or greater than 3 metres below finished level (mbfl).

Other waste materials that pose no risk of leaching contaminants into the groundwater system and are geotechnically suitable will also be placed at depth on-site as foundation material, following processing.

4.11 Required Soil Stream Volumes

It is expected that during the life span of the project, Wasterock will process up to 1500m^3 of landfill material per day. A compaction factor of 1.5 (sand) has been applied to the volumes of soil to remediate the site.

Therefore, depending on the depth of the parcel of land, the estimated required volume of soil needed to repackage the site is estimated to be 1.62million m^3 (volume totals for capping, break and deep cell layers). This is shown on Table L below.

Table L: Required Soil Volumes

Material	Intended Location	Depth	Volume[2] (LxWxD)	Compaction Factor	Estimated Volume Required
ASS & HIS	Capping	1.5	254,250	x1.5	**381,375**
C & D	Break Layer	0.5	84,750	x1.5	**127,125**
Recycled Landfill	Deep Cell[1]	4.5	762,750	x1.5	**1.144,125**

[1]: Current Depth of Clay substrate has been reported to 6.5mblg. (additional volumes may be required is the landfill is deeper).
[2]: Site area is 565m (length) x 300m (Width).

4.12 Storage of Processed Material

The proposal includes the provision for several movable concrete-bunded bunkers which will hold processed soil material. The bunkers will hold approximate 8 tonne of soil with a dimension of 5m (W) x 1m (L) x 1m (H).

The bunkers will be located in close proximity to the screening deck to allow for any validation or analysis required on the soil before re-use or storage. Stored stockpiled soils will be suppressed using water misters on site.

Crushed concrete and brick material will be transported from the excavation face to the crushing plant to be processed (RRRF). The crushed C&D will be stored on-site in bunded bunkers until required.

4.13 Vehicle Parking

During the initial stages and site set up, before the site becomes operational, a temporary car park will be positioned in the south-west corner of the site. Access will be via Adelaide Street (this may be subject to change). Once the site becomes operational a semi-permanent car park will be constructed on the northern boundary, next to the site compound.

The car park construction will use rolled aggregate/limestone. The car park will only be used for site personnel vehicles and small delivery trucks. For further details the Wasterock SMP should be consulted in the supporting documents.

4.14 Fuel Handling

Fuel for plant and machinery will not be stored on site. All fuel will be delivered as required by a mobile fuel contractor. All plant/trucks and machinery will be re-fuelled at their location within the site boundary.

Any fuel spillage will be immediately addressed and an environmental investigation and report will be conducted followed by required remediation and validation. Outcomes of the investigation may result in the re-writing of operational procedures for re-fuelling and/or fuel handling, to ensure no additional incidents and/or environmental impacts occur.

Fuel and chemical handling will be in accordance with the current Australian Standards for the storage and handling of flammable and combustible liquids under the Dangerous Goods Safety Act 2004 and associated Dangerous Goods Safety Regulations 2007. This is administered by the Department of Mines and Petroleum and includes the following associated guidelines.

- AS4452 - the Storage & Handling of Toxic Substances.
- AS1940 - the Storage & Handling of Flammable and Combustible Liquids.
- AS3740 - the Storage & Handling of Corrosive Substances.

The appropriate Material Safety Data Sheets (MSDS) of all chemicals used on site will be kept in a register.

4.15 Vehicle Maintenance

A portable movable structure will be located within close proximity of the works excavation face to maintain the vehicles. It will be located at the most northerly point, away from the residents of Adelaide Street to ensure reduced impact. On-site plant maintenance will be undertaken by a contractor.

Light commercial vehicles will be kept within the Site's car park/works compound on the northern boundary. All large plant equipment will be kept at the face of the excavation whilst the project progresses.

4.16 Vehicle Wash

Site plant equipment and vehicles will be washed down regularly in the work area with a low volume pressurised water jet system. Any soil matter will be retained within the Site area. Water runoff will benefit dust suppression in the area. Vehicles will remain in their designated areas to reduce any environmental impact.

4.17 Vehicle Load Acceptance

Vehicles used for the transportation of materials from external sources to the Site will be inspected when arriving at Site by the on-site Manager who will also check each load of incoming material before it is tipped into the RRRF or SAAF (Note: ESMP 12.4 Soil Tracking). Each incoming truck of soil (ASS and Class 1) will be checked by the Site Manager or his representative to classify material prior to deposition on-Site. A laboratory soil analysis will be required for soil from each individual off-site soil source. Only soil from off-site locations with 'clean' laboratory analyses will be accepted.

In the unlikely event that asbestos or other unsuitable material is encountered, the following procedures will apply:

- Tipper will be instructed to remove the material immediately.
- Site manager will reload the offending customer with the material.
- Customers will receive one warning only, then be prevented from using the Site.

The customer will be responsible to remove and dispose of the unsuitable material offsite to an appropriately licenced landfill facility.

5 POLICY FRAMEWORK

The Environmental Protection Act 1986 (EP Act) is the primary legislation dealing with the protection of the environment in Western Australia. It provides for an Environmental Protection Authority (EPA), for the prevention, control and abatement of pollution and environmental harm, for the conservation, preservation, protection, enhancement and management of the environment and for matters incidental to or connected with the above.

The EP Act establishes a waste hierarchy for Western Australia and provides a list of management options in the following order of preference.

- Avoidance
- Reuse
- Recycle
- Recovery of Energy
- Treatment
- Containment
- Disposal

Implementation of State Environmental Policies (SEPs) and Environmental Protection Policies (EPPs) will also ensure that the natural environment is sustained. Therefore, the range of different uses and values that the natural environment can support is managed in an integrated manner.

Parts IV and V of the EP Act discuss ‘Environmental Impact Assessment’ and ‘Environmental Regulation’, respectively.

The Department of Environment Regulation (DER) regulates prescribed premises under Part V of the EP Act (1986). See table C within this report, Section 2.4. Part V of the EP Act requires the occupier of premises to obtain a Works Approval when undertaking works which would cause the premises to become a prescribed premisis. For established prescribed premises, the EP Act specifies when a Works Approval is required for a range of actions that may alter emissions or alter the operation of the premises.

The purpose of a Works Approval is to ensure that premises plant and equipment are designated, sited and can be managed so that emissions from the site are environmentally acceptable.

Prescribed premises are listed in Schedule 1 of the *Environmental Protection Regulations* 1987.

A licence is also required under Part V of the EP Act to prevent, reduce or control particular emissions and discharges, including noise and odour, or to the monitoring or recording of them. A licence is required prior to discharging, emitting noise and/or for the treatment or storage of prescribed industrial waste from the scheduled premises and commissioning of any works subject to a works approval.

These documents constitute the Works Approval Application (WAA) and licence application, and include technical information relevant to the remediation, screening, crushing, excavation and storage of material. Further comment is drawn on the environmental aspects of the application with includes ‘greenhouse gas emissions (GHGs)’, ‘noise’, ‘odour’ and ‘dust' for the project Site. Additional comment has been provided by an environmental lawyer with the regard to the classification of the site and its use and role as a remediation project. A copy of the letter is provided in Appendix A.

5.1 Moving Zero Waste Streams

The Project will involve the reprocessing and recycling of an inert land development as part of a sustainable program. Construction waste material generated from developments specifically within the Perth Metropolitan area will be utilised and accepted at the SAAF and RRRF facilities on site. The volumes of soil generated would otherwise have been disposed of at a licensed landfill.

The ability to accept this waste stream will provide the volumes of clean sands and aggregates required to complete the remediation for the barrier layer and capping layer sands in a sustainable and cost-effective manner.

It is important for the proponents of projects to help the Western Australian community shift to a low-waste society which is the objective of the Western Australian Waste Strategy (Waste Authority 2012).

5.2 Environmental Protection Policy

Environmental Protection Policies (EPPs) are statutory policies in a framework which is developed under Part III of the *Environmental Protection Act 1986* (EP Act). They are whole-of-Government policies that are ratified by Parliament and have the force of law from the day they are published by the Western Australian Government. EPPs are developed, for instance, to establish environmental values and environmental quality objectives for a particular environment or component of the environment.

5.3 State Environmental Policies

State Environmental Protection Policies (SEPs) are non-statutory policies developed by the EPA under Part II, Section 17(3)(d), of the EP Act. They are considered by Cabinet for adoption on a whole-of-Government basis.

A SEP, being non-statutory, is a more general and flexible instrument than an EPP. However, both documents can establish environmental values and environmental quality objectives for a particular environment or component of the environment. Implementation of SEPs is primarily through the powers of the EP Act, including environmental impact assessment, industry licensing, clearing regulations and environmental harm and pollution provisions.

5.4 Part V, Sections 52 and 53

Part V of the *Environmental Protection Act 1986* (the Act) requires the occupier of a premises to obtain a works approval when undertaking works which would cause the premises to become a prescribed premises.

The purpose of a works approval is to ensure that premises, plant and equipment are designed sited and can be managed, so that emissions from the premises are environmentally acceptable.

Section 52 of the Act makes it an offence to do work on or in relation to a premises, which would cause it to become, or become capable of being, a prescribed premises, unless in accordance with a works approval.

Section 53 of the Act makes it an offence under various circumstances to carry out certain works without a works approval.

5.5 Air Quality

An Air Quality Assessment & Management Plan has been commissioned as part of the MDWES EMSP report. However, policies relating to air quality management are presented below bases on the (draft) State Environmental (Ambient Air) Policy 2009

The purpose of the Ambient Air SEP is to provide all Western Australians with air quality that is protective of human and environmental health and amenity. The Ambient Air SEP will allow any significant sources of air pollutants in WA to be managed in order to meet the environmental quality criteria. This involves the management of not only the large, individual point sources but also the small, dispersed non-point sources that collectively contribute to episodes of unacceptable air quality in an area or region. This includes dispersed emissions from motor vehicles, stationary fuel combustion and land management activities. It should be noted that the Ambient Air SEP is applicable to air quality outside enclosed structures and is not intended to manage indoor air quality or air quality in an occupational setting.

The Policy aims to:

(a) Establish the basis on which ambient air quality is to be protected;

- Establish, protect and maintain the environmental value of ambient air;
- Establish and give effect to the environmental quality objectives and the environmental quality criteria for an approved ambient air related National Environment Protection Measure; and
- Provide the basis for establishing and giving effect to environmental quality criteria for local pollutants as identified by the Chief Executive Officer.

(b) Abate pollutants and restrict activities that diminish the environmental value of ambient air; and

(c) Establish a framework and program to protect and enhance environmental quality to support the environmental value of ambient air.

The Department of Environment Regulation’s, *A guideline for managing the impacts of dust and associated contaminants from land development sites, contaminated sites remediation and other related activities* (2011), supersedes *EPA Guidance No 18 – Prevention of Air Quality Impacts from Land Development Sites* provides guidance on preparing a plan for the management of dust and associated contaminants arising from various activities including land clearing for development, remediation of contaminated sites and bulk materials handling and storage.

5.6 Water

The Rights in Water and Irrigation Act 1914

The Department of Water is responsible for managing the state's water resources. By issuing licences and permits under the *Rights in Water and Irrigation Act 1914 (RIWI)*, the Department protects the state's water resources and promotes the sustainable and efficient use of water. The objects of the Act include:

To provide for management of water resources, and in particular -

i) for their sustainable use and development to meet the needs of current and future users; and

ii) For the protection of their ecosystems and the environment in which water resources are situated, including by the regulation of activities detrimental to them;. (Section 4 (1)).

State-wide Policy no.5: Environmental Water Provisions Policy (2000), under the Environment Protection Act 1986, protects ecological values in the allocation process, determines ecological water requirements and develops environmental water provisions. This policy describes the approach to be followed by the Water and Rivers Commission in determining how water will be provided to protect ecological values when allocating the rights to use water in Western Australia.

The policy lists the guiding principles to be followed when making such decisions and outlines a water allocation planning framework in which these principles are to be applied. The policy also describes the relationship between the Commission's approach to water resources planning and management processes under the provisions of the *Rights in Water and Irrigation Act 1914* and the Environmental Protection Authority's responsibilities under the provisions of the *Environmental Protection Act 1986.*

5.7 Soil

The *Contaminated Sites Act 2003* (WA) was passed in November 2003 and the Contaminated Sites Regulations were gazetted on 8 August 2006.

The Act complements the *Environmental Protection Act 1986* (WA) by establishing a framework for the identification, management and remediation of contaminated land and groundwater in Western Australia. It provides a legal framework for reporting, assessment and management of contaminated sites. The Department of Environmental Regulation (DER) administers the Act, but the Environmental Health Directorate of the Department of Health of WA provides DER with advice on the public health aspects of contamination. The Act defines a site as 'contaminated' where there is a "substance present in or on that land, water or site at above background concentrations that presents, or has the potential to present, a risk of harm to human health, the environment or an environmental value".

The DER has produced *Contaminated Sites Guidelines*, which will be used in conjunction with the recently amended *National Environment Protection (Assessment of Site Contamination) Measure 1999* (ASC NEPM). The Department of Environmental regulation (DER) will be incorporating the amended NEPM in its guidelines and/or gazetting the NEPM schedules as guidelines under s.97 of *the Contaminated Sites Act 2003*.

The (former) Department of Environmental Protection (DEP) has also produced a *Contaminated Sites Management Series*, which is now regulated by DER. The Series lists numerous guidelines including "*Assessment Levels for Soil, Sediment and Water*", "*Guidelines for the Acceptance of Solid Waste to Landfill", "Bioremediation of Hydrocarbon-Contaminated Soils in Western Australia", "Potentially Contaminating Activities, Industries and Landuses*" and *"Guidelines for the Remediation and Management of Asbestos-Contaminated Sites in Western Australia*".

5.8 Energy Efficiency Greenhouse Gas Emissions

EPA Guidance Statement Number 12, "Minimising Greenhouse Gases", specifically addresses the minimisation of greenhouse gas emissions from significant new or expanding operations.

In addition, National Greenhouse Accounts (NGA) Factors have been prepared by the Commonwealth Department of Climate Change and Energy Efficiency and is designed for use by companies and individuals to estimate greenhouse gas emissions. The methods for calculating emissions listed in this document are "Method 1" from the National Greenhouse and Energy Reporting (Measurement) Determination 2008, incorporating the National Greenhouse and Energy Reporting (Measurement) Amendment Determination 2013 (No. 1) and the National Greenhouse and Energy Reporting (Measurement) Technical Guidelines July 2013.

The default emission factors listed in the NGA have been estimated by the Commonwealth Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education using the Australian Greenhouse Emissions Information System (AGEIS) and are determined simultaneously with the production of Australia's National Greenhouse Accounts. This ensures that consistency is maintained between inventories at company or facility level and the emission estimates presented in the National Greenhouse Accounts. The emission factors are referred to in this document as National Greenhouse Accounts default emission factors.

5.9 Noise

The Department of Environment Regulation (DER) regulates noise from large industries, develops and implements noise policy, reviews and provides advice on noise issues for major projects and provides support to local governments dealing with noise complaints.

Draft EPA Guidance Number 8 'Environmental Noise', deals with the assessment of environmental noise emissions, where those emissions come under the Environmental Protection (Noise) Regulations 1997, or other relevant acceptable standards.

Regulation 13 of the Environmental Protection (Noise) Regulations 1997, 'Construction sites', Division 2, Regulation 7 does not apply to noise emitted from a construction site as a result of construction work carried out between 0700 hours and 1900 hours on any day which is not a Sunday or public holiday if the occupier of the premises or public place, shows that —

(a) The construction work will be carried out in accordance with control of environmental noise practices set out in section 4 of AS 2436-2010 Guide to noise and vibration control on construction, maintenance and demolition sites.

(b) The equipment used on the premises will be the quietest reasonably available.

(c) If the occupier was required to prepare a noise management plan under sub-regulation (4) and (5A) in respect of the construction site:

 (i) The noise management plan would be prepared and given in accordance with the requirement, and approved by the CEO.

 (ii) The construction work would be carried out in accordance with the noise management plan, excluding any ancillary measure.

A Noise Management Plan is included as part of this report and the Site Environmental Management Plan (ESMP by MDWES) which includes, but is not limited to:-

(a) Details of, and reasons for, construction work on the construction site.

(b) Details of, and the duration of, activities on the construction site likely to result in noise emissions that fail to comply with the standard prescribed under regulation 7.

(c) Reductions of noise emissions on the construction site.

(d) Details of measures to be implemented to control noise (including vibration) emissions

(e) Procedures to be adopted for monitoring noise (including vibration) emissions

(f) Complaint response procedures to be adopted.

In addition, if any noise emissions received are identified as likely to fail to comply with the standard prescribed under Regulation 7, written notice of the proposed construction work will be given to the occupiers of all adjacent premises.

A review of the Noise Management Plan would be required for any non-conformance.

5.10 Odour

The EPA has set criteria in its Guidance Statement No 47 *Assessment of Odour Impacts from New Proposals* (EPA, 2002) for new proposals and expansions of existing facilities. Odour criteria for existing facilities will differ depending on the situation. It is not anticipated that odour will be a issue on the site. However it has been addressed as part of this WAA report.

The EPA Guidance allows that odour measurement may be used for assessment of a range of situations including:

1. Proposals for a new and expansion of an existing odorous facility.
2. Proposals for sensitive land use near an existing odorous facility.
3. Investigation of complaints to the DEP of odour from existing facilities.

4. Setting of licence conditions.
5. Buffer definition studies where surrounding land is not yet zoned for urban use.
6. Assessing odour during contaminated site remediation.
7. Determination of odour emission rates before and after a plant upgrade in order to quantify emission reduction.

The (former) Department of Environmental Protection (DEP) produced an *Odour Methodology Guideline (*2002), which considers the appropriate methods for measuring odour concentration to be:

- The Dutch Standard NVN 2820 "Air Quality, Sensory odour measurement using an olfactometer", March 1995.
- Committé Européen de Normalisation, "Odour Concentration measurement by dynamicolfactory, CEN TC264/WG2 'Odours' Final WG2 Draft prEN", 1995; or
- Australian Standard 4323.3:2001 *Stationary source emissions - Determination of odour*

  Concentration by dynamic olfactometry (Note: the Australian Standard has been based on the CEN standard).

The German Standard VDI 3882 Part 1, "Olfactometry Determination of Odour Intensity", October 1992 should then be used for the subsequent odour intensity calculations.

A review of the odour management plan would be required for any non-conformance

6 RESOURCE RECOVERY & REMEDIATION FACILITY

To assist in the remediation of the site, plant is required to process and repackage material, as well as to source other material from other sites. Materials will be processed by a crushing plant and screening deck. The following sections provide further specification and information with regards to processes, inputs and outputs. The location of the RRRF is shown on figure 4.

6.1 Inputs & Outputs

Inputs of material to the Site would contain the following inert materials for recycling and reuse in the construction of the repackaged land. Approximate annual intakes:

- Sand, limestone and concrete – approximately 30,000 ton/year.
- Construction and demolition waste – approximately 60,000 ton/year.

As the site does not have enough suitable material to use as the capping layer, to allow the site to be remediated, waste material will be sourced from approved suppliers in the construction industry from the Perth Metropolitan area. This will allow for greater confidence that the waste material will not include asbestos or other contaminants. Products that will be taken from accredited sources and suppliers include:

- bitumen
- limestone
- asphalt
- concrete
- brick waste
- builders rubble
- ASS / HIS impacted soils
- sand, gravel,
- demolition rubble

6.1 Crushing Plant

It is anticipated that a large volume of construction and demolition waste (C&D) will be utilised for the break layer/barrier between the repacked deep cell and the clean capping layer. The following plant will be used to process this material.

Table M: Description of Crushing Plant

	Description
Image	For a further details See Figure 6. 
Location	The crusher will be sunk into a constructed pit, positioned within the site compound along the northern boundary of the site.
Name	Crusher.
Model	Terex Finlay 1175 crusher. Incorporating Terex Jaques JW42 single toggle jaw crusher with a heavy duty VGF feeder.
Dimensions	15.7 metres long, 3.5 metres tall, 6.2 wide Including bypass conveyor and magnet.
Mass	53.5 ton including bypass conveyor and magnet.
Crushing Capacity	475 ton per hour based on bulk density of 1.67/m^3 *(capacities may vary depending on feed characteristics).*
Output	Product output varies in size see Figure 6, expected output from jaw >90 to <150 mm. Output from bypass <75 mm (mostly sand), ferrous material removed via electro-magnet and cross directional rotating belt.
Operation hours	As required between 9:30am and 4:30pm weekdays.
Operation Frequency	Average 3-4 hours per day, 6-8 days per month. Equates to ~12% operational capacity (based on operational hours - Table D).
Operational Personnel	Automatic operation – However, requires periodic inspection, the waste stream is fed via loader.
Power pack	CAT C9, power rating 261kW @ 1900 rpm (350HP).
Fuel Consumption	Based on 216 kW @ 1900 rpm 76.2Lph full load, 58.3Lph 75% load, based on operational capacity and 75% load consumption 22.4 kL diesel annually.
Noise (dBA)	At 5 metres running unloaded L_{A10}[1] 87 dB, running loaded estimated L_{A10} 97 db.
Receptor Noise (dBA)	Nearest receptor ~280 metres away, allowing for +5 dB pulsing, noise decay -35 dB [$\log_{10}$ (distance/5) dB], barrier attenuation across the site -20 dB (separate cutting & embankment), plus a noise influencing factor[1]. Therefore, noise levels from source at nearest receptor equals L_{A10} 47 dB (See **figure 7** for diagram and expanded calculation).
Dust Suppression	Not built in. This will be controlled by wetting down the feed through misting machines/sprinklers.
Odour	It is not envisaged that Odour will be a problem from the waste streams being processed.

[1] A +3 dB noise influencing factor from roads (Roe Hwy & Stirling Cres) has been applied to assigned L_{A10} level for receptors. This has been adopted due to noise sensitive premises within 15 metres of a building directly associated with a noise sensitive use between 0700 and 1900 hours Monday to Saturday this tolerable noise limit equates to 47 dB L_{A10}.

Operational crusher noise derived from Hitachi HR320G specifications. Noise distance decay and barrier attenuation is in accordance with basic acoustical principle of hemispherical radiation described in Noise Impact Assessment – Proposed Soil Remediation activities, as per BS 5228-1. Impulsiveness and influencing factor applied are as per DEP Environmental Protection (Noise) Regulations1997.

6.2 Screening Plant

The excavated historical on-site material will be processed through the screening plant deck. The following plant will be used to process this material into sized components for recycling and re-use.

Table N: Description of Screening Deck

	Description
Image	For a further details See Figure 8. 
Location	Excavation zone – *However, will not be positioned less than 100m from residential Receptors. (The plant will be positioned close to the excavation face and will move with the remediation).*
Name	Screening plant.
Model	Terex Finlay 883 Heavy Duty Screen (reclaimer) with variable speed apron feeder.
Dimensions	14.9 metres long, 3.4 metres tall, 15.7 wide with side conveyors extended.
Mass	32 ton standard machine configuration.
Screening Capacity	500 ton per hour based on bulk density of 1.6/m^3 (based on sand / gravel feed mix) Throughput may vary depending on type of material, moisture and clay content.
Output	Product output varies in size depending upon screen configuration Figure 8, expected screen size 100 mm and 30 mm producing three products; >100 mm oversize passes over screen deck, <100 mm >30 mm passes through first screen, <30 mm passes through second screen, provision for <30 mm to be further sized, ferrous material captured via suspended overhead electro-magnet.
Operation Hours	As required between 7 am and 5:30 pm weekdays, 8 am and 4 pm Saturdays.
Operational Personnel	Automatic operation, however requires periodic inspection, waste stream is fed via loader.
Operation Frequency	Average 6 hours per day, 6 days per week, equates to ~61% operational capacity (based on operational hours - Table D).
Power Pack	Water-cooled Deutz BF4M2010 100-hp (74.54 kW) diesel engine.
Fuel Consumption	12 Lph full load, 8 Lph 75% load, based on operational capacity and 75% load consumption 15.0 kL diesel annually.
Noise (dBA)	At 10 metres running loaded estimated L_{Aeq} 84 dB.
Receptor Noise (dBA)	The crusher is mobile the closest it will be positioned to the receptor is 100 metres away, no allowance for impulsiveness or tonality is given. Noise decay 26dB [$\log_{10}$ (distance/5) dB], barrier attenuation 10 dB (embankment), plus a noise influencing factor[1]. Therefore, noise levels from source at nearest receptor equal L_{A10} 48dB (See figure 9 for diagram and expanded calculation).
Dust Suppression	Not built in. This will be controlled by wetting down the feed through misting machines.
Odour	It is not envisaged that Odour will be a problem from the waste streams being processed.

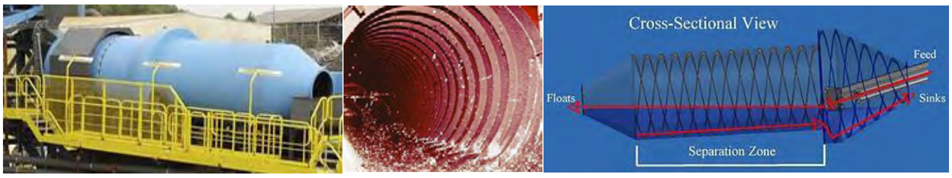
[1] A +3 dB noise influencing factor from roads (Roe Hwy & Stirling Cres) has been applied to assigned L_{A10} level for receptors. This has been adopted due to noise sensitive premises (residents) within 15 metres of a building directly associated with a noise sensitive use between 0700 and 1900 hours Monday to Saturday this tolerable noise limit equates to 47 dB L_{A10}.

Operational crusher noise derived from Hitachi HR320G specifications. Noise distance decay and barrier attenuation is in accordance with basic acoustical principle of hemispherical radiation described in Noise Impact Assessment – Proposed Soil Remediation activities, as per BS 5228-1. Impulsiveness and influencing factor applied are as per DEP Environmental Protection (Noise) Regulations1997.

6.2 Heavy Duty Separator

Wasterock Pty Ltd. have been researching and investigating the use of a heavy duty separator using specific gravity to separate the waste. The viability and suitable is still being decided by the client. However, the following has been included as an over view of the process.

Table O: Heavy Duty Separator

	Description
Image	
Location	Compound
Name	Optional Heavy medium separator.
Model	ERS Dense medium separator.
Dimensions	As required (bespoke design specifications).
Mass	As required (bespoke design specifications).
Screening Capacity	Estimated 300 Tonnes/Hour (T/H)
Output	Product output varies depending upon specific gravity (SG) of media bath, two products produced: sinks and floats; sinks are heavier than SG of bath (separator barrel) and are screwed out of barrel in a counter flow direction. Floats progress through the barrel, SG of media is altered by suspension of dense fines in water. The shallow nature of the bath and agitation from sinks scrolls prevents stratification of liquids, dewatering and rinsing is achieved via a scrubber-rinser that scrubs and drains solids, classifying cyclones in the float stream are used as required to retain fines. Separation efficiency is reported to be very high (<0.01 SG), with expected feed size > 30 mm and SG 1.5 sinks include sand, brick, concrete and metal, floats include cardboard, paper, wood, plastic and asbestos containing material.
Optional Separation	Addition separators can be used to class floats e.g. with SG of 2.6 metals can be removed from bricks and concrete
Operation Hours	As required between 7 am and 5:30 pm weekdays, 8 am and 4 pm Saturdays
Operational Personnel	Semi-automated, requires control of SG by operator.
Operation Frequency	Undetermined, if utilised its likely to be similar to screening plant usage with average 6 hours per day,6 days per week, equates to ~61% operational capacity (based on operational hours – Table D)
Power Pack	Mains electrical power
Fuel Consumption	Undetermined.
Noise (dBA)	Undetermined, likely to be less than screening plant and $<L_{Aeq}$ 84 dB
Receptor Noise (dBA)	Nearest receptor variable 280 metres away, no allowance for tonality, modulation or impulsiveness. Noise decay +35 dB [20 log (distance/5) dB], barrier attenuation 20 dB (separate cutting & embankment), noise level at nearest receptor equals L_{A10} 29 dB Nearest receptor 280 metres away, an allowance +5 dB pulsing. Noise decay -35 dB [log_{10} (distance/5) dB], barrier attenuation across the site +20 dB (separate cutting & embankment), plus a noise influencing factor[1]. Therefore, noise levels from source at nearest receptor equals L_{A10} 47 dB.
Dust Suppression	All product wet down via quiescent bath and rinsing
Odour	Not applicable

7 SOIL ACCEPTANCE & AMENDMENT FACILITY

The Soil Acceptance & Amendment Facility (SAAF) will accept and amend ASS soil and Class I (HIS) soils. The SAAF is detailed on figure 4.

Accepted soils are to be amended and treated before use as capping material as part of the remediation project. HIS soils will be allowed to volatilise and reduce their hydrocarbon content, through solar energy gain and periodic rotation. The capping layer for the remediated site will require a large volume of clean sand material sourced from the Perth Metropolitan region as suitable capping layer sands are not available on-site. To purchase large volumes of clean sand for capping would be cost-prohibitive.

Table P: Description of Soil Amendment Area

	Description
Image	 *Visual representation and example of the proposed soil amendment area.*
Location	The soil amendment facility will be positioned on the eastern boundary of the site. Access will be via a service road along the northern boundary of the site. (See figure 4).
Name	Soil Amendment Facility.
Model	15-35 tonne Kamatsu or CAT excavator will be used to rotate the soils.
Dimensions	300m in length, (north to south) / 50m in with (East West) and 400mm in height.
Approximate Volume of Lime Required	To create the soil amendment area a limestone pad a volume of approximately 6000m^3 of lime is required.
Soil Capacity	At any one time approximately 5000m^3 of ASS or HIS impacted soils could be processed. This allows for storage and movement of plant to rotate the HIS windrows.
Operational Personnel	X1 to drive the excavator and rotate the soil periodically.
Power input	Solar energy to volatilise the HIS impacted soils.
Odour	A hydrocarbon malodour may be present during volatilisation. It is unlikely that this will impact residential receptors in Adelaide Street.

8 ENERGY USE AND GREEN HOUSE GAS EMISSIONS

8.1 Greenhouse Gas Emission Assessment Framework

In the case of this proposal, the EPA Guidance No 12, Minimising Greenhouse Gases would expect reporting on the emissions of:

- carbon dioxide (CO_2).
- methane (CH_4).
- nitrous oxide (N_2O).

In terms of their "carbon-dioxide equivalent" (CO_2–e).

The "carbon dioxide equivalent" is calculated by multiplying the actual mass of emissions by the appropriate Global Warming Potential (GWP) factor published by the Intergovernmental Panel on Climate Change (IPCC).

The National Greenhouse Accounts (NGA) Factors (July 2013) has been prepared by the Commonwealth Department of Climate Change and Energy Efficiency and is designed for use by companies and individuals to estimate greenhouse gas emissions. The default emission factors listed have been estimated by the Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education using the Australian Greenhouse Emissions Information System (AGEIS) and are determined simultaneously with the production of Australia's National Greenhouse Accounts. This ensures that consistency is maintained between inventories at company or facility level and the emission estimates presented in the National Greenhouse Accounts. The emission factors are referred to in this document as National Greenhouse Accounts default emission factors or "NGA Factors".

The principle greenhouse gas generated by the combustion of fossil fuels for energy is carbon dioxide. The quantity of gas produced depends on the carbon content of the fuel and the degree to which the fuel is fully combusted (i.e. the oxidation factor, which usually ranges between 98% and 99.5%). Very small quantities of methane and nitrous oxide are also produced, depending on the actual combustion conditions.

Fuels used for transport purposes produce slightly different methane and nitrous oxide emissions than if the same fuels were used for stationary energy purposes. However, for the purposes of this document, the differences were seen as insignificant and fuels are used for general transport purposes. A range of optional emission factors are provided for use with post-2004 vehicles and heavy vehicles conforming to Euro design standards.

The greenhouse gas emissions assessment for this project takes into account the following data:

- The National Greenhouse Accounts (NGA) Factors (July 2013) estimated diesel and electricity consumption by mining operation.
- Estimated diesel consumption during transport of material to and from Perth.
- Estimated fuel consumption from on-site plant equipment.

Estimates of emissions from the combustion of individual fuel types are made by multiplying a (physical) quantity of fuel combusted by a fuel-specific energy content factor and a fuel specific emission factor. This is performed for each relevant greenhouse gas (in this case, carbon dioxide, methane and nitrous oxide (as CO_2–e).

The following formula can be used to estimate greenhouse gas emissions from the combustion of fuel for transport energy purposes.

$$E_{ij} = \frac{Q_i \times EC_i \times EF_{ijoxec}}{1\ 000}$$

where:

Eij is the emissions of gas type (j), carbon dioxide, methane or nitrous oxide, from fuel type (i) (CO_2-e tonnes).

Qi is the quantity of fuel type (i) (kilolitres or gigajoules) combusted for transport energy purposes

ECi is the energy content factor of fuel type (i) (gigajoules per kilolitre or per cubic metre) used for transport energy purposes.

If ***Qi*** is measured in gigajoules, then ***ECi*** is 1.

EFijoxec is the emission factor for each gas type (j) (which includes the effect of an oxidation factor) for fuel type (i) (kilograms CO_2-e per gigajoule) used for transport energy purposes

NGA factors for diesel oil combustion in post-2004 vehicles are:

Energy Content Factor *(ECi)* = 38.6 GJ / kL
Emissions Factor *(EFijoxec)* = 69.2 kg CO_2-e / GJ

6.2 Estimation of Energy Consumption

Predicted onsite diesel use for the project is presented on Table Q.

Table Q: Estimate Onsite Diesel Use

Project Equipment / Plant	Number of vehicles on site	Consumption (Med Load	Annual Fuel Use (L/yr) 313 days ie 3130 hrs
Loaders 15 to 35 tonne (Kamatsu / CAT)	3	20L/hr (CAT 980H)	206,600
Excavators 15 to 35 tonne	4	30 L/hr (330 CAT)	368,000
Water Truck 12 Tonne	1	30 L/hr (CAT 769)	368,000
Compactor (Terex TC400)	1	Assume same as CAT 815F	80,480
Compactor (13 Tonne CAT)	1	26 L/hr (815F)	80,480
Separator (CAT C9)	1	58.3 L/hr	182,400
Crusher (Terex 1175)(CAT C9)	1	58.3 L/hr	182,400
Screen (Terex Reclaimer 883)	1	18 L/hr	56,300
Screening Deck (Deutz)	1	15kL/yr (BF4M2010)	15,000
CAT D 10 Dozer	1	(D10T) 70L/hr	219,100
Light commercial vehicles (Av 25km/day)	2	1 L/hr	6,260
	Total		1,765,020

This is based on a operation 8 hr day, for a 6 day week, Total 303 operational days a year (WA public holidays & Sundays have been taken into account).

NB: A conservative annual fuel use has been calculated for each vehicle.

6.3 Estimation of Greenhouse Gas Emissions

The remediation and regeneration project will consume an estimated 1765kL of automotive diesel for transport purposes.

Therefore, the emissions of greenhouse gases (carbon dioxide, methane and nitrous oxide) in tonnes of CO_2–e are estimated as follows;

Emissions of CO_2–e

= (1765 x 38.6 x 69.2)/1,000 = 4714 t CO_2–e

Emissions of methane:

(1765 x 38.6 x 0.2)/1,000 = 14 t CO_2–e

Emissions of nitrous oxide:

(1765 x 38.6 x 0.5)/1,000 = 34 t CO_2–e

Total scope 1 GHG emissions

= 4714 + 14 + 34 = 4762 t CO_2–e

Direct GHG emissions from this project are estimated to be 4762 t of carbon dioxide equivalent / year. This represents 0.006% of the 77.1 million tonnes (2009) of GHG emissions for Western Australia.

6.4 Measures to Reduce Greenhouse Gas Emissions

The EPA's environmental objective for greenhouse gas management is to reduce emissions to a level which is as low as is practicable. To achieve this the EPA's environmental assessment objective is to ensure that potential greenhouse gas emissions emitted from proposed projects are adequately addressed in the planning/design and operation of projects.

This project will ensure that best practice is applied to maximise energy efficiency and minimise emissions, including:

- Installation of direct driven equipment in lieu of belt driven systems, where this is technically feasible, to avoid energy wastage on mechanical conversion elements
- Locating infrastructure with high loads as close as possible to power lines to reduce line loss on Site.
- Ensuring that Site plant and equipment is correctly sized for work and production requirements.
- Minimising the size of the plant/vehicle fleet.
- Minimising haulage distances.
- Minimising abstraction requirements and hence pumping energy required by minimising pit length for dust suppression.
- Ensuring that vehicles and equipment are mechanically sound, regularly serviced and fitted with appropriate emission control equipment.
- Integrating processes to reduce soil movement to a minimum where possible, to minimise stockpile handling.

- Controlling compound lights through timers and fitting low-energy florescent lamps in the site compound and offices.
- Installing video conferencing facilities at the site and using these facilities for external communication in preference to travelling to meetings, thus reducing the travelling distance.
- Working with third parties to reduce emissions (i.e: suppliers, distributors, and contractors.

6.5 Energy Assessment

Electricity use and diesel consumption will be monitored throughout the project life span so that green house gas emissions can be monitored. This will enable additional sources of greenhouse gases to be identified and for the implementation of new economically-viable opportunities to reduce greenhouse gas emissions.

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Appendix A – Figures and Supporting Documents

MDW Environmental Services
PERTH | PEEL
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info@environmentalservices.com.au

Client:

WASTEROCK PTY LTD

Project:

Hazelmere Landfill

Location:

Lot 20 Adelaide Street, Hazelmere

Drawing Title:

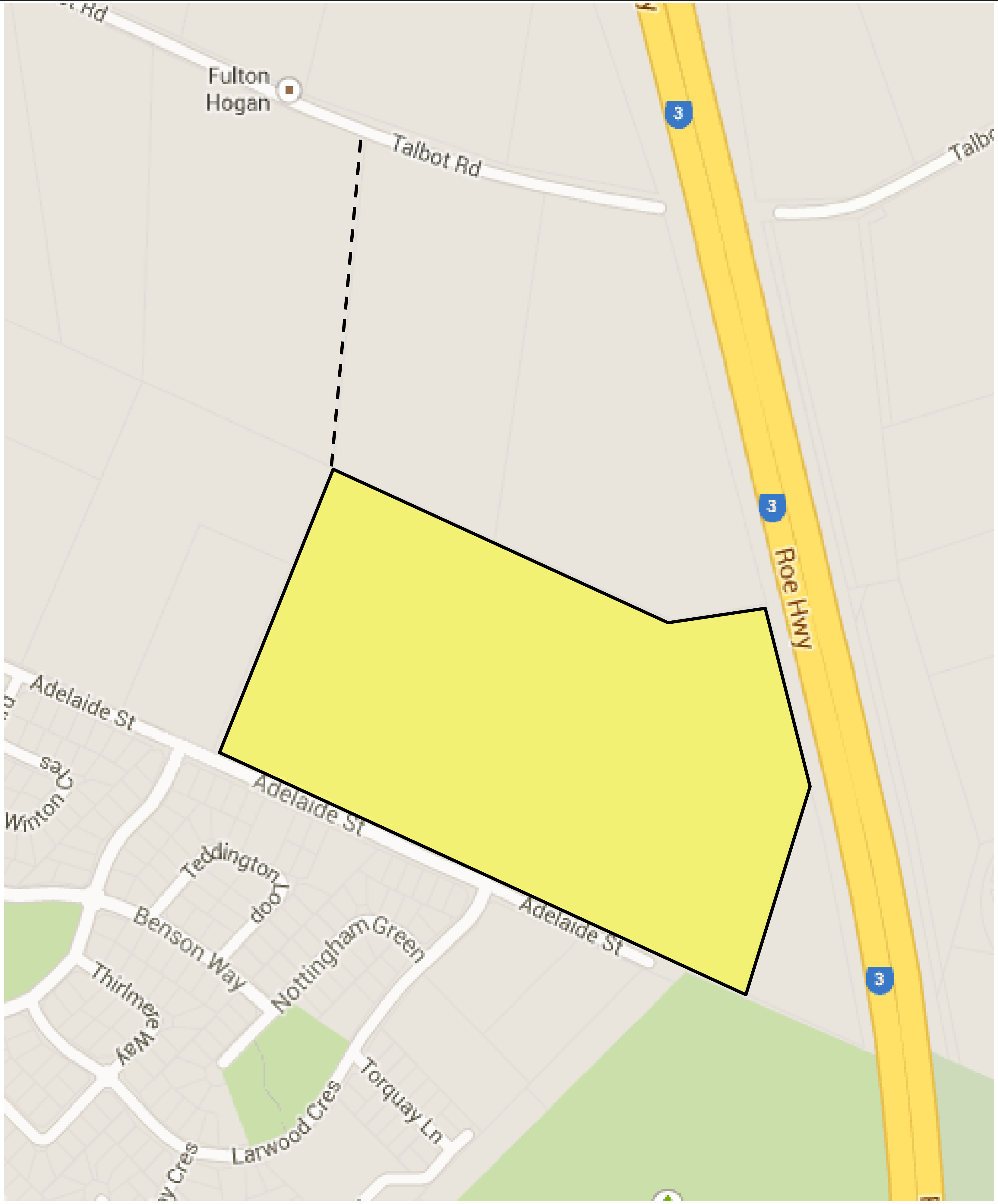
SITE AND REGIONAL VIEW

Notes:

Site Location

Drawn by:	Scale:	
Dale A.	Scale Not Used	North
Date: 10/09/2013		

Project No:	Figure No:	Rev:
E2012 - 031	1	v1



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Client:

WASTEROCK PTY LTD

Project:

Hazelmere Landfill

Location:

Lot 20 Adelaide Street, Hazelmere

Drawing Title:

PROPOSED ACCESS ROAD

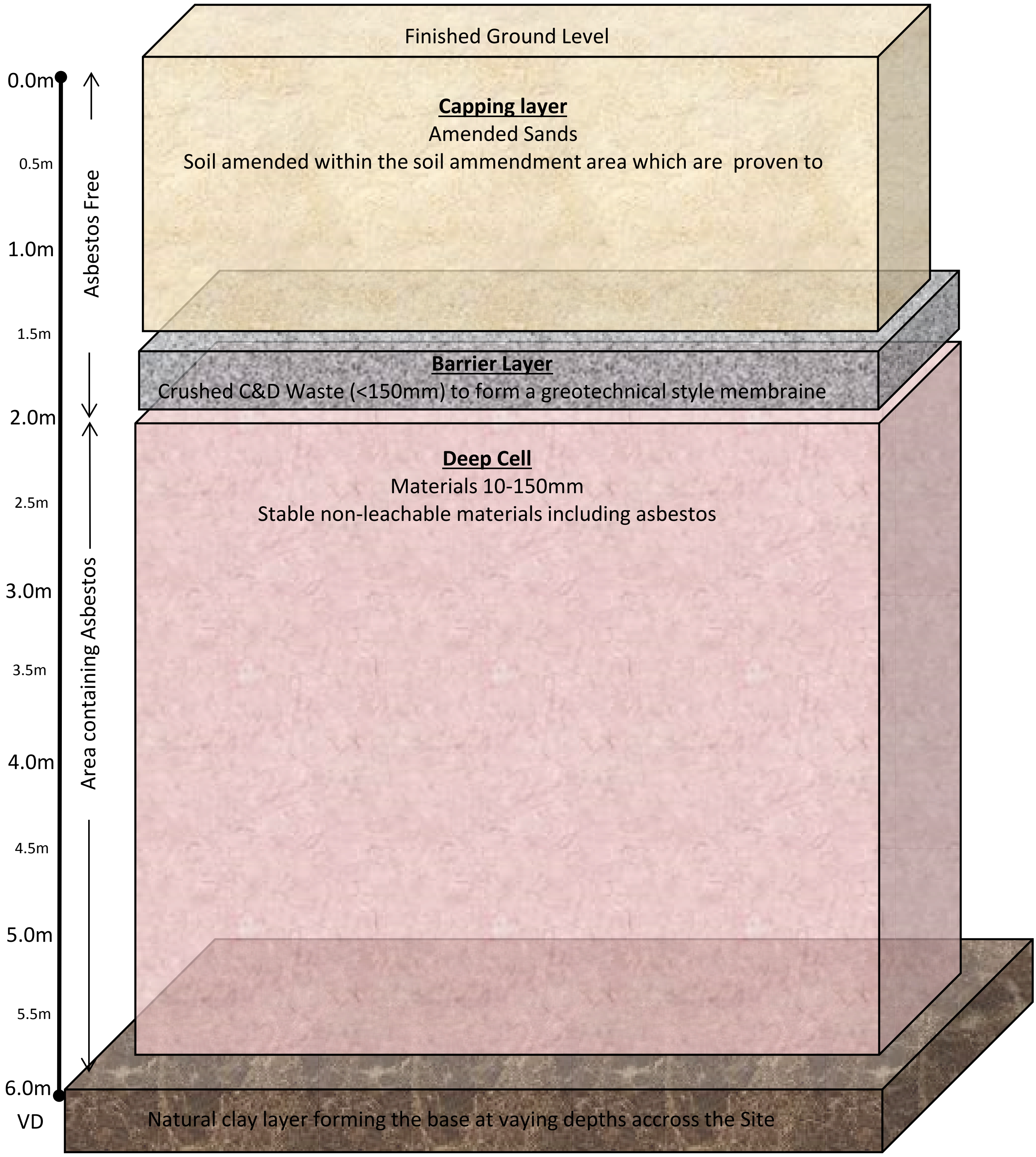
Notes:

Site Location

Proposed Site Access

Drawn by:	Scale:	
MB	Scale Not Used	North
Date: 7/01/2014		

Project No:	Figure No:	Rev:
E2012 - 031	**2**	v1



MDW Environmental Services
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Client: WASTEROCK PTY LTD

Project Title: Hazelmere Landfill

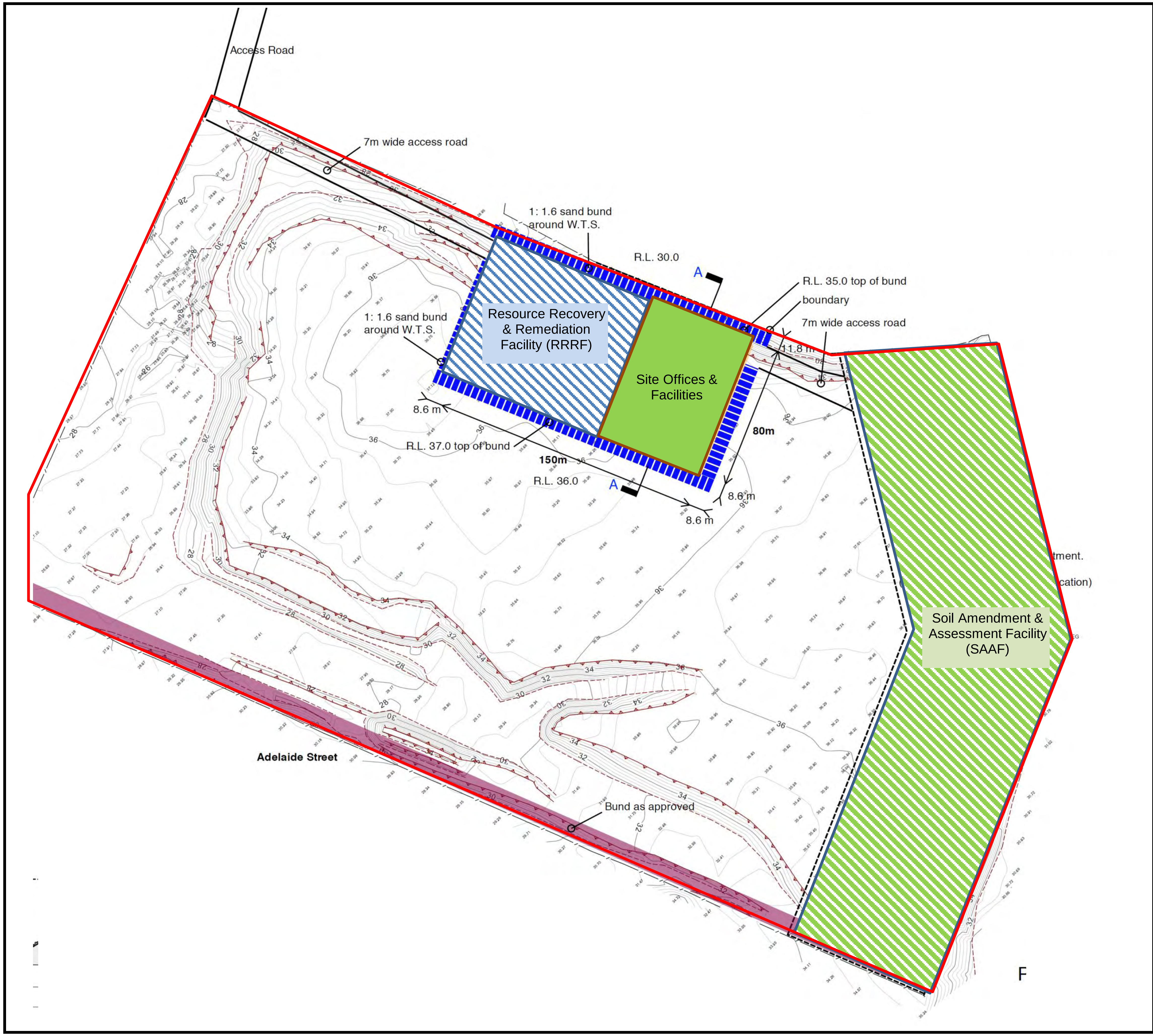
Location: Lot 20 Adelaide Street, Hazelmere

Drawng Title: Proposed Engineered Construction Diagram for Remediation

Notes:

- Depths indicated are below proposed finished ground level.
- VD = Varying depths dependent on natural levels and the volume of Deep Fill.

Drawn By:	Date:	Scale:		Project Number:	Figure No:	Rev:
MB	7/01/2014	No Scale Used		E2012 - 031	3	v1



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Client:

WASTEROCK PTY LTD

Project:

Hazelmere Remediation and Regeneration Project

Lot 20 Adelaide Sreet

Drawing Title:

Survey of Site

Notes:

Location of :

Resource Reconvery & Remediation Facility

Soil Amendment & Assessment Facility

Site Boundary

Drawn by: MB	Scale: 0 – 100 m	North
Date: 7/01/2014		

Project No:	Figure No:	Rev:
E2012 - 031	4	v1

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Client:

WASTEROCK PTY LTD

Project:

Hazelmere Remediation and Regeneration Project

Location:

Lot 20 Adelaide Street, Hazelmere

Drawing Title:

Proposed Location of Groundwater Bores for Abstraction for Dust Suppression

Notes:

Proposed Location of Abstraction Bores and holding tanks (50,000L x2) for groundwater's to be used as dust suppression

Drawn by: Dale A

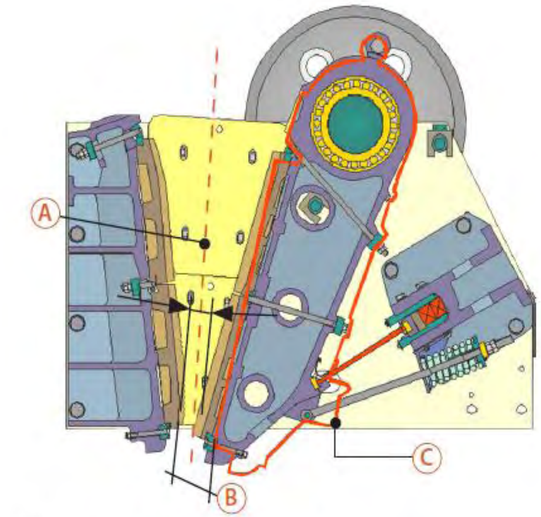
Date: 10/09/2013

Scale: 0 50 m

North

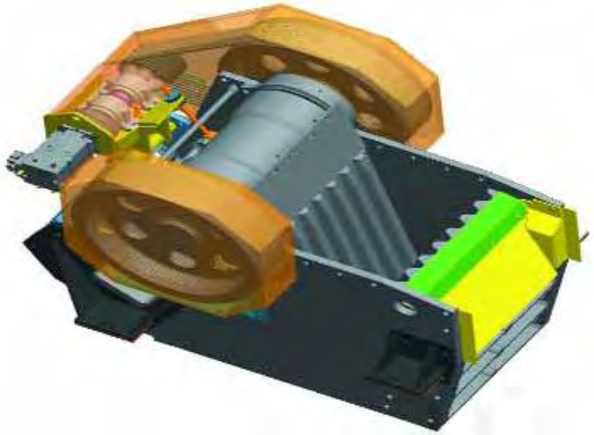
Project No:	Figure No:	Rev:
E2012 - 031	5	v1

Jaw Crusher cross section showing closed and open side setting and at rest

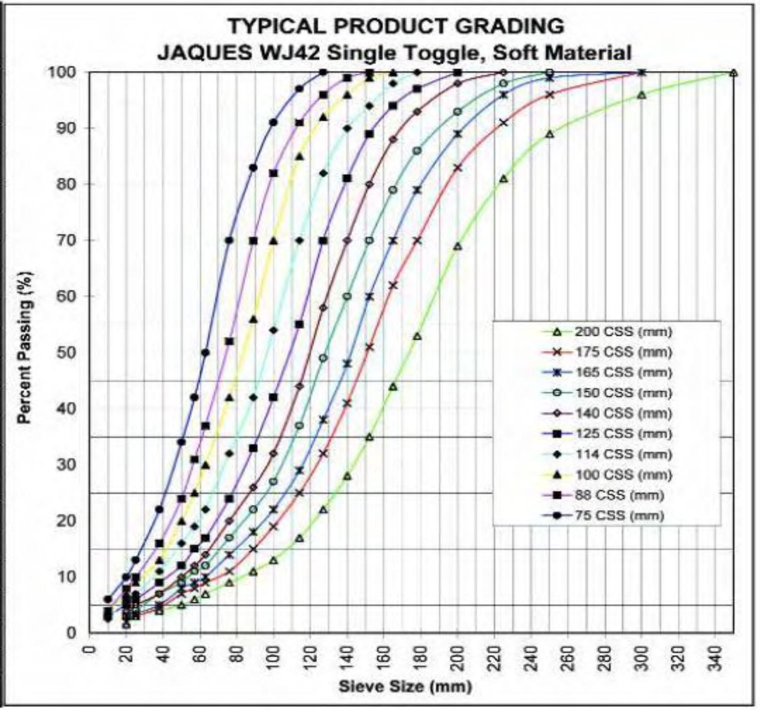


CSS (A), OSS (B) and stopped (C)

Width of CSS determines size of product, characteristics of material determine size range of product



Sieve Size (mm)	200 CSS (mm)	175 CSS (mm)	165 CSS (mm)	150 CSS (mm)	140 CSS (mm)	125 CSS (mm)	114 CSS (mm)	100 CSS (mm)	88 CSS (mm)	75 CSS (mm)
400										
350	100									
300	96	100	100							
250	89	96	99	100						
225	81	91	96	98	100					
200	69	83	89	93	98	100				
178	53	70	79	86	93	97	100			
165	44	62	70	79	88	94	98	100		
152	35	51	60	70	80	89	94	99	100	
140	28	41	48	60	70	81	90	96	99	
127	22	32	38	49	58	70	82	92	96	100
114	17	25	29	37	44	55	70	85	91	97
100	13	19	22	27	32	42	54	70	82	91
89	11	15	18	22	26	33	42	56	70	83
76	9	11	14	17	20	24	32	42	52	70
63	7	9	10	12	14	17	22	30	37	50
57	6	8	9	11	12	15	19	25	31	42
50	5	7	8	9	10	12	16	20	24	34
38	4	5	5	7	7	9	11	13	16	22
25	3	3	4	4	5	6	7	9	10	13
20	2	2	3	3	4	5	6	7	8	10
10						3	3	4	4	6



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Client:

WASTEROCK

Project:

Wasterock

Location:

Lot 20 Adeliade Street, Hazelmere

Drawing Title:

JAW CRUSHER

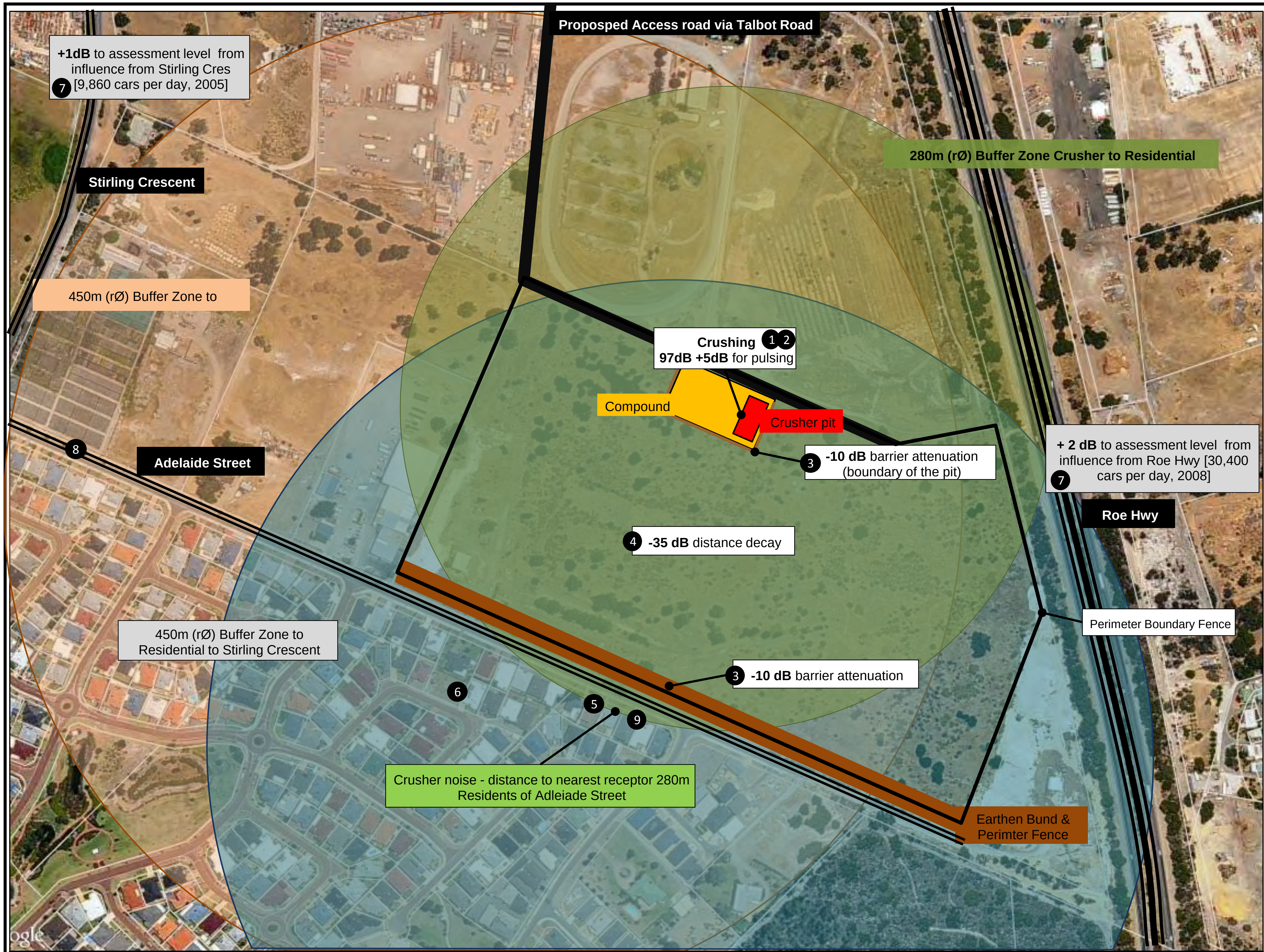
Notes:

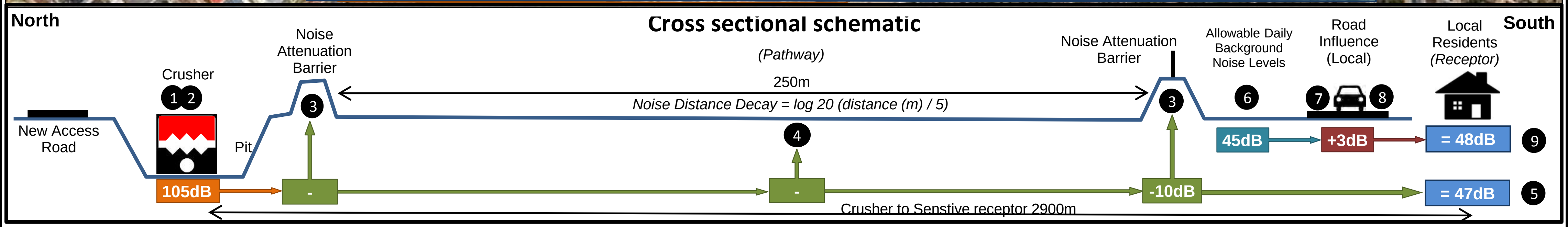
Capacities may vary depending on type of material, gradation of material, feed method, moisture, bulk density, clay content and fracture characteristics for the material

Drawn by: KW

Date: 17/01/2014

Project No:	Figure No:	Rev:
E2012-031	6	v1





MDW Environmental Services

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Client:

WASTEROCK PTY LTD

Project:

Lot 20 Adeliade Street

Location:

Lot 20 Adeliade Street, Hazelmere, Perth

Drawing Title:

NOISE ASSESSMENT - Crusher

Notes:

Noise From source to Receptor Calculation

1 Noise at nearest receptor equal to noise measured 5 metres from source **(97 dB)**

2 plus impulsiveness **(+5 dB)**, modulation and tonality

Impulsiveness from crunching of material as it is crushed.

3 Less barrier attenuation x2 **(Total -20 dB)**

4 less distance decay **(-35 dB)** as per BS5228-1

5 Equivalent measured noise at receptor **47 dB** L_{A10}

Allowable Assessment Criteria at Receptor Calculation

6 Assessment criteria for nearest houses

7 am to 7 pm Monday to Saturday

Allowable noise level as per regulations **(45 dB)**

7 plus influencing factor from raods

add **2 dB** due to proximity to Roe Hwy

add **1 dB** due to proximity to Stirling Cres

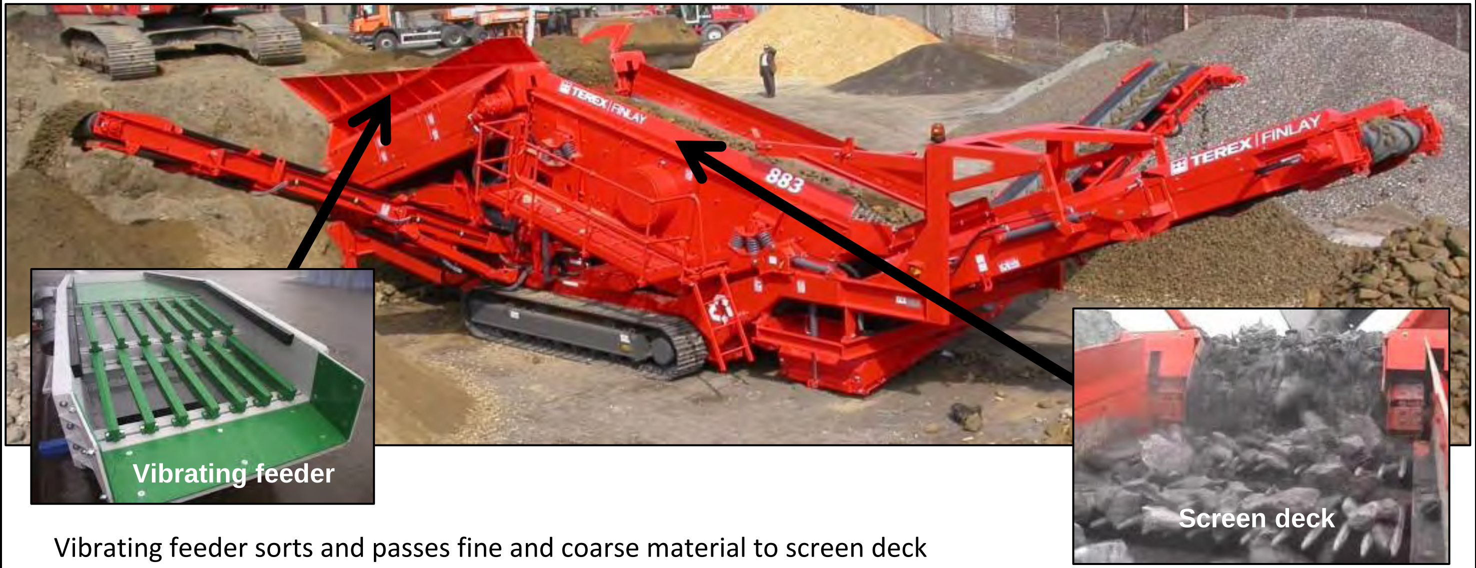
8 No allowance made for noise from the trucks using Adelaide St could add an additional 5db (not included)

9 Calcualted Assessment level **48 dB** L_{A10}

Drawn by:	Scale:	
KW	0 100 m	North
Date: 17/01/2014		

Project No:	Figure No:	Rev:
E2012 031	7	v1

Process flow description



Vibrating feeder sorts and passes fine and coarse material to screen deck

Clean **oversize** material passes over top screen to end conveyor

Mid-size material passing through top deck but too large to pass through bottom screen passes to rear off-set conveyor

Fine material passing through bottom screen is conveyed forward to front off-set conveyor

MDW Environmental Services

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Client:

WASTEROCK PTY LTD

Project:

Hazelmere Landfill

Location:

Lot 20 Adelaide Street

Drawing Title:

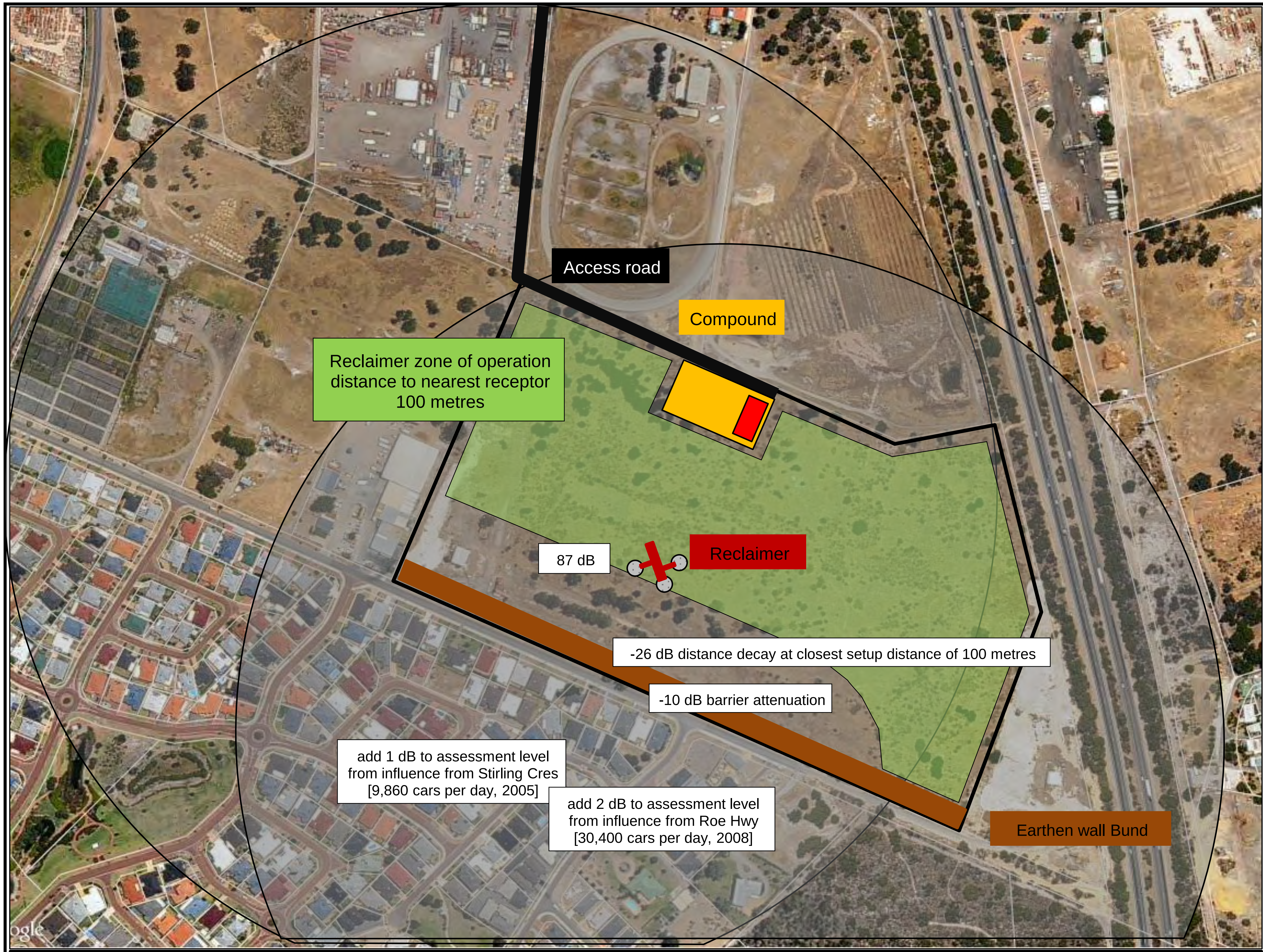
SCREENING PLANT

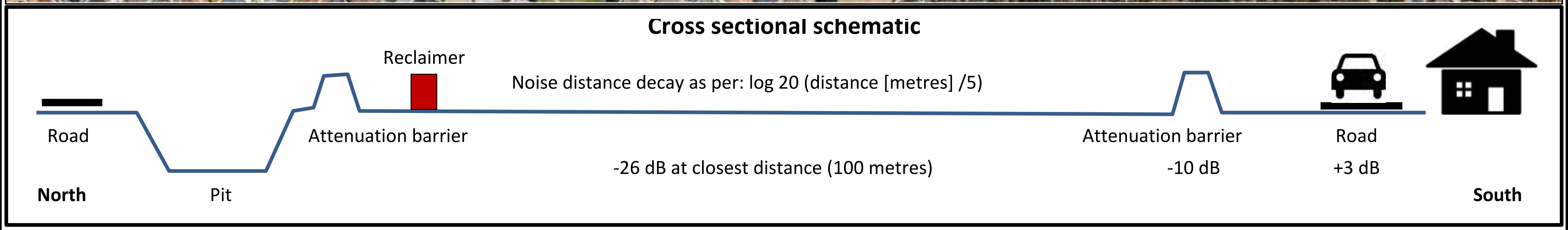
Notes:

Vibrating feeder overlays coarse material over fines as it passes to screen deck.
Size of product determined by size of top and bottom screens.

Drawn by:	KW
Date:	17/01/2014

Project No:	Figure No:	Rev:
E2012-031	8	v1





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Client:

WASTEROCK PTY LTD

Project:

Lot 20 Adeliade Street

Location:

Lot 20 Adeliade Street, Hazelmere, Perth

Drawing Title:

NOISE ASSESSMENT - Reclaimer

Notes:

1. Noise at nearest receptor equal to noise measured 5 metres from source **(87 dB)**
2. plus impulsiveness, modulation and tonality **(nil)**
3. Less barrier attenuation **(-10 dB) and**
4. distance decay **(-26 dB)** as per BS5228-1
5. Equivalent measured noise at receptor **47 dB** L_{A10}

6. Assessment criteria for nearest houses 7 am to 7 pm Monday to Saturday Assigned level as per regulations **(45 dB)**
7. plus influencing factor from roads add **2 dB** due to proximity to Roe Hwy add **1 dB** due to proximity to Stirling Cres
8. No allowance made for noise from trucks currently using Adelaide St
9. Calculated Assessment level **48 dB** L_{A10}

Drawn by:	Scale:	
KW	0 — 100 m	North
Date: 17/01/2014		

Project No:	Figure No:	Rev:
E2012 031	9	v1

holman fenwick willan hfw

Jane Moltoni
Project Manager
Wasterock Pty Ltd
Level 1/32 Ledgar Road
BALCATTA WA 6021

Via email: jmoltoni@moltoni.com.au
And by Post

Level 19 Alluvion
58 Mounts Bay Road
Perth
WA 6000
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T: +61 (0)8 9422 4700
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hfw.com

Your Ref:
Our Ref: 072556/01

Direct Line: +61 (0)8 9422 4700
Email: Andre.Maynard@hfw.com
Robert.Desmond@hfw.com

Date: 9 September 2013

Dear Jane,

Lot 20 Adelaide Street, Hazelmere

We refer to your instructions to draft a submission for Wasterock Pty Ltd to provide to the Western Australian Department of Environmental Regulation with details why the proposed remediation works to be undertaken at Lot 20 Adelaide Street, Hazelmere by Wasterock should not require a works approval licence under category 63 of Schedule 1 *Environmental Protection Regulations 1987* (WA).

Submission

Wasterock Pty Ltd (**Wasterock**) will be applying for a licence(s) under Part V *Environmental Protection Act 1987* (WA) (**EP Act**) for works to be undertaken at Lot 20 Adelaide Street, Hazelmere (**Site**). This submission describes the activities that will be undertaken at the Site and then provides recommendations as to how these activities would be most appropriately licensed under the *Environmental Protection Regulations 1987* (WA) (**Regulations**).

Remediation of a contaminated site

Originally used for rural purposes, the Site was used for sand mining between 1978 and 1982 and operated as an inert landfill facility, licensed by the Department of Environmental Regulation (**DER**), from 1987 to 1997. The Site is classified as '*contaminated – remediation required*' pursuant to section 13 of the *Contaminated Sites Act 2003* (WA) (**CS Act**). Under the CS Act the owner of the Site has a statutory responsibility to remediate the Site.

Wasterock has been contracted to undertake remediation works on the Site and has prepared a draft Remediation Management Plan describing how the remediation works will be implemented. A copy of the draft Remediation Management Plan is included within the document entitled "Remediation of Landfill Site

Hazlemere – 7229 Development Application Report" dated 30 May 2013 which was previously sent to the DER. An independent Contaminated Sites Auditor has been engaged by Wasterock to monitor the remediation works and report to the DER in accordance with the CS Act.

The works that need to be undertaken on the Site are a civil engineering operation which is being undertaken for the specific purpose of remediating the Site and preparing it for future development. These works are unrelated to the operation of a landfill site and/or a waste disposal operation.

Remediation process

Remediation of the Site will involve excavation of the entire site and sorting of existing landfill into various grades of size and quality for reuse or disposal. Processing of some imported construction and demolition (**C&D**) waste for reuse as clean sand, roadbase and inert engineered fill will also occur. The sand "capping" layer will be sourced from clean fill created from a soil amendment process and clean imported C&D waste. During the excavation process, the Site will receive and process select C&D waste collected from specific locations within the wider metropolitan area for the purpose of sand recovery and creating an upper layer of inert fill.

The C&D waste will be stockpiled and sorted on-site and non-conforming materials will be segregated and dispatched to a licensed landfill facility. Once stockpiled and sorted the inert materials will be crushed and screened to the required size. This process of stockpiling, sorting, crushing and screening is crucial to achieving the successful remediation of the Site, allowing deep placement of asbestos impacted waste, and achieving an optimum grade of compacted materials across the Site to reduce the risks of differential settlement.

The final step in the remediation process is the establishment of a capping layer of clean fill over the Site. The will be achieved by receiving and processing acid sulphate soils (**ASS**) and hydrocarbon impacted soils (**HIS**) collected from specific sites within the wider metropolitan area, as well as natural yellow sands when available and a large volume of recovered sands from incoming C&D wastes. ASS and HIS will be treated to neutralise the active elements in the soil. When available, natural yellow sand will be mixed with the treated soils. Once the ASS and HIS has been treated it will be placed in the ground to create the final capping layer over the Site. The process is a well established practice for remediating a contaminated site. Any excavated contaminated soil that cannot be reused on Site will be scheduled for disposal at a designated landfill site.

An application for a licence under Part V EP Act will therefore be made to the DER for the purpose of obtaining approval to operate as a remediation and resource recovery facility and a soil acceptance and amendment facility for the duration of the remediation. Crushing and screening licenses will form part of the licensing requirement.

Note: No materials from the existing landfill will be crushed prior to sorting. Only oversize concrete retrieved from the Site will be considered for crushing and reuse.

Activities to be undertaken on Site that require a Part V EP Act licence

We understand that the activities that are part of the Remediation Management Plan for the Site that require licensing as a prescribed premises under the EP Act are:

- screening, sorting, crushing and separation of fill on the Site;
- crushing of C&D waste;
- receiving C&D waste on Site for sorting, processing and re-use; and
- soil amendment of ASS and HIS.

We understand that the screening and crushing activities would be most appropriately licensed under prescribed premises categories 12 and 13 respectively. The activity of receiving waste onto the Site for sorting, storage and reuse would be most appropriately licensed under prescribed premises category 62. The category 62 licence applies to "*premises on which waste is stored, or sorted pending final disposal or re-use.*" The term 'reuse' is not defined in the Act, the Regulations. Under *the Landfill Waste Classifications and Waste Definitions 1996 (As Amended)* (**Definitions**) reuse is defined as '*use of a product again for the same or different purpose without further manufacture.*'

Wasterock receive C&D waste onto the Site at the designated transfer station cell so as to extract reusable materials such as sand and crushed concrete. The C&D waste is received onto the Site from specific locations and the general public do not have the right to dispose of C&D waste at the Site. The waste is sorted with usable materials either being reused on Site a part of the earthworks or sent offsite as processed materials. Unusable materials are sent offsite to a licensed landfill for final disposal.

The works occurring at the Site amount to the sorting of and processing of C&D waste to create a product known as engineered fill which is then placed, following recognised earthworks standards of practice, to establish geotechnically stable foundations for the future development of the Site. This activity is clearly what is known as a transfer station operation (or resource recovery facility) and is most appropriately licensed as prescribed premises under category 62 of the Regulations.

Reuse is identified in the objects of the *Waste Avoidance and Resource Recovery Levy Regulations 2008* (WA) (**Levy Regulations**) as a form of resource recovery, an efficient use of resources and a higher 'resource management option' than disposal. The Levy Regulations, like the Regulations make a clear distinction between the final disposal of waste and the reuse of waste.

Category 63 Licence – licensed Class I landfill

The activities of receiving, processing and reusing waste on the Site do not fit under prescribed premises category 63 of the Regulations. Category 63 of the Regulations describes the category as:

"Class I inert landfill site: premises on which waste (as determined by reference to the waste type set out in the document entitled "Landfill Waste Classification and Waste Definitions 1996" published by the Chief Executive Officer and as amended from time to time) is accepted for burial."

According to Supreme Court Justice Corboy the expression "*premises on which waste is accepted for burial*" within category 63 of the Regulations was intended to refer to premises on which waste satisfying the criteria for each of the classes of landfill referred to in those categories was accepted for disposal by burial as landfill.[1] The Definitions define "landfill" to mean "*a site used for disposal of solid material (ie, is spadeable) by burial in the ground that is licensed as landfill under [the EP Act]*."

The term burial is not defined in the Act, the Regulations or the Definitions. The ordinary meaning of 'burial' is '*the action of burying something*' and 'bury' means '*to put under the ground in sign of final abandonment or abrogation; dispose of thus*.'[2] The term 'disposal' is not defined in the EP Act, the Regulations or the Definitions. The ordinary meaning of 'disposal' is '*the action of disposing of or getting rid of*' and dispose means to '*get rid of; deal conclusively with*.'[3]

It is clear then that under the Regulations a category 63 licence applies to a site that is used for the conclusive act of getting rid of solid material by putting it under the ground and this act amounts to the final abandonment of the waste material.

A landfill has a clear role as a disposal facility for waste. The Site, on the other hand, is receiving waste for processing and subsequent reuse as engineered fill, which fulfils two principal roles:

1) the product is used as a critical part of the remediation of the Site as it was classified *contaminated – remediation required* under the CS Act; and

2) the product is part of the geotechnical process of preparing a stable foundation for the future development of the Site.

The activities of processing and reuse of waste materials on the Site and the taking of unusable materials to a licensed landfill do not amount to the final disposal of waste through burial on the Site and therefore do not fit within the description of category 63 prescribed premises.

Category 61A – Solid Waste Facility

Whilst Wasterock firmly believes that the activities it will undertake on the Site are best regulated under category 62 it is worth noting that the activities on the Site are still better suited to classification under catategory 61A than 63. Category 61A is described as follows:

"Solid waste facility: premises (other than premises within category 67A) on which solid waste produced on other premises is stored, reprocessed, treated or discharged onto land."

Under the reasoning given for classifying the Dalyellup Waste Residue Disposal Facility (**Dalyellup Facility**) as a category 61A solid waste facility it was stated by the DER that "*This site is not considered to be classified as a "landfill" because other waste material and the public do not have access to the DWRF facility. The material disposed has been assessed against landfill classification as the most suitable relevant guidelines.*"[4]

---

[1] *Eclipse Resources Pty Ltd v McNamara, Chief Executive Officer, Dept of Environment and Conservation (No 2)* [2012] WASC 264 at [125]
[2] Stevenson, A., New Shorter Oxford Dictionary, 2007, Oxford University Press
[3] Stevenson, A., New Shorter Oxford Dictionary, 2007, Oxford University Press
[4] Licence L6130/1989/12, Millenium Inorganic Chemicals Ltd, 21/01/2010 - http://www.dec.wa.gov.au/pdf/licensingregs/K-Z/K-O-number/1208.pdf

Both the Site and the Dalyellup Facility do not grant access to the public to dispose of waste. The Dalyellup Facility accepts solid waste from the Kemerton and Australind processing plants. In a similar way the Site will only accept C&D waste, ASS and HIS from a limited number of sources.

At the Dayellup Facility the solid waste is reprocessed and treated by re-wetting the waste into a slurry and then placed into position using a simple gravity feed system on site. In comparison the Site receives C&D waste, ASS and HIL. The wastes are sorted and then treated using established remediation and earthworks practices to ensure that the materials conform to the correct engineering specifications (and DER guidelines). The engineered fill and clean fill materials created as a result of the on-Site processing are then reused as a foundation material for the future development of the Site. The Site's activities do, therefore, involve the storing, reprocessing and treatment of solid waste that is produced on other premises. However, due to the fact that waste will be again sent offsite for disposal at a licensed landfill category 62 most appropriate.

We look forward to hearing from DER regarding its view on the correct classification of the Site and we are happy to meet with DER to discuss this submission.

Yours sincerely

Holman Fenwick Willan

Government of Western Australia
Department of Environment Regulation

Industry Licensing System

Success!

Your application has been successfully submitted! Please keep a record of your AIN for future reference. Your AIN is [**wpj3gv**]

If you would like a PDF copy of the application submitted please click here. **Please Note:** You must have pop-ups enabled to access the PDF copy of your application.

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Department of Environment Regulation

BOORAGOON
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ils@der.wa.gov.au

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Industry Licensing System

Application Page 3 of 5
Works Approval Fees

Fee start date 30/04/2014

Fees calculator

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Fees relate to the cost of the works, including all capital costs (inclusive of GST) associated with the construction and establishment of the works proposed under the works approval application. This includes, for example, costs associated with earth works, hard stands, drainage, plant hire, equipment, processing plant, relocation of equipment and labour hire.

Costs exclude:

Premises Component(s)

Category	Capacity Range	Fee	
12 - Screening, etc. of material	More than 500 000 but not more than 5 000 000 tonnes per year	N/A	Remove
13 - Crushing of building material	More than 500 000 but not more than 5 000 000 tonnes per year	N/A	Remove
67A - Compost manufacturing and soil blending	More than 5 000 but no more than 50 000 tonnes per year	N/A	Remove
62 - Solid waste depot	More than 5 000 tonnes per year	N/A	Remove
61A - Solid waste facility	More than 10 000 but no more than 100 000 tonnes per year	N/A	Remove
Selection required	Select category first		Add
Total Premises Component(s)	N/A		

Premises construction cost

Total cost	Rate
More than $150,000 but not more than	55

Calculate

Total Fee

Total Works Approval Fee $1672.00

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If you require a Purchase Order Number to pay for an invoice, please enter into the field below before submitting your application. You can view this page as a PDF by clicking the 'Print' button.

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ENVIRONMENTAL SITE MANAGEMENT PLAN

Lot 20, Adelaide St
Hazelmere

March 2014

PREPARED FOR:

Wasterock Pty Ltd

Environmental Services

DOCUMENT DETAILS

Title:	Environmental Site Remediation Works Agreement & Environmental Site Management Plan Report
Project Address	Lot 20, Adelaide Street, Hazelmere.
Client	Wasterock Pty Ltd
Job Number	E2012 – 031
Author:	Dale Andrews, Mathew Bulmer
Project Manager	Greg Watts
Email:	greg@environmentalservices.com.au
Status:	Final v4
Synopsis:	This document has been prepared in accordance with the Contaminated Sites Act, Western Australia (2006) and Department of Environment and Regulation (DER) Contaminated Sites Management Series guidelines. This Environmental Site Management Plan (ESMP) details the management and monitoring requirements for the excavation/remediation of landfill soils during development works of Lot 20 Adelaide St Hazelmere.

DOCUMENT DISTRIBUTION

Version No	Written by Date	Reviewed by Date	Issued by Date	Distributed to	Copies
Final	Mathew Bulmer 14/02/14	Greg Watts 14/02/14	Greg Watts 20/02/14	Wasterock Pty Ltd	Email
Signed					
Final v4	Mathew Bulmer 04/03/14	Mike Waite 06/03/14	Greg Watts 06/03/14	Wasterock Pty Ltd & DER & Department of Health (DoH) & Australian Environmental Auditors (AEA) & Glen McLeod Consulting Lawyers	Hard Copy & CD
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Table of Contents

1 INTRODUCTION 11
1.1 Previous Reports 11
2 BACKGROUND 13
2.1 Site History 13
2.2 Development Proposals 13
2.3 Geology 14
2.4 Hydrogeology 15
2.5 Hydrology 16
2.6 Contaminants of Potential Concern - Soil 16
2.7 Contaminants of Potential Concern - Groundwater 16
2.8 Contaminants of Potential Concern - Air 16
3 IDENTIFIED CONTAMINATION 17
3.1 DSI – Soil Results 17
3.2 DSI – Asbestos Results 18
3.3 MDWES Groundwater Monitoring Results 19
3.4 Metals 19
3.5 Total Petroleum Hydrocarbons (TPH) 19
3.6 Monocyclic Aromatic Hydrocarbons (MAH) 20
3.7 Polycyclic Aromatic Hydrocarbons (PAH) 20
3.8 Phenolic Compounds 20
3.9 Benzene, Toluene, Ethyl Benzene, Xylene (BTEX) 20
3.10 Organochlorine Pesticides (OC) 20
3.11 Organophosphorous Pesticides (OP) 20
3.12 Major Anions and Cations 20
3.13 Nutrients 20
3.14 Groundwater Summary 20
4 ENVIRONMENTAL OBJECTIVES 21
5 PROPOSED SCOPE OF WORKS 23
5.1 Soil Monitoring Scope (Landfill) 23
5.2 Soil Monitoring Scope (Soil Amendment) 23
5.3 Air Monitoring Scope 24
5.4 Groundwater Monitoring Scope 25
5.5 Additional Environmental Scope 25
5.6 Roles and Responsibilities of the Site Contractor 25
6 SITE IDENTIFICATION & INFORMATION 27
6.1 Environmental Site Setting 27
7 ENVIRONMENTAL PERFORMANCE & ASSESSMENT LEVELS 29
7.1 Reporting 29
7.2 Frequency of Sampling and Reporting 29
7.3 Adopted Assessment Criteria 30
7.4 Regulatory Guidelines 31
8 RISK ASSESSMENT 32
8.1 Human Health Risk Assessment 32
8.2 Risk Assessment methodology 32
8.3 Tiered approach 32
9 CONCEPTUAL SITE MODEL & RISK ASSESSMENT 34

9.1 Contaminants of Potential Concern 34
9.2 Identified Contaminants of Potential Concern 35
9.3 Site Risk Assessment 36
9.4 Site Risk Assessment – Sources 36
9.5 Potential Receptors 37
9.6 Potential Exposure Pathways 38
9.7 CSM Conclusions 39
10 COMMUNITY CONSULTATION 41
10.1 Deciding Stakeholders 41
10.2 Stakeholders 41
10.3 Level of Community Involvement 42
10.4 Consultation Strategy 43
10.5 Consultation Program 44
11 ENVIRONMENTAL MANAGEMENT – SITE 45
11.1 Mitigating Procedures 45
11.2 Site Operation Hours 45
11.3 Personal Protective Equipment (PPE) 45
11.4 Hydration and Breaks 46
11.5 Perimeter Fencing 47
11.6 Dust Suppression – excavation 47
11.7 Dust Suppression – machines 48
11.8 Vehicle Wash down 48
11.9 Loading & unloading of Soils 49
11.10 Machine operators and Drivers 49
11.11 Discovery 49
12 ENVIRONMENTAL MANAGEMENT – Soil Management 50
12.1 Objective 50
12.2 Overview 50
12.3 Excavation Procedures 50
12.4 Soil Tracking 51
12.5 Engineered Landfill Construction 52
12.6 Sampling of soils 52
12.7 Soil Amendment – ASS Soils 52
12.8 Soil Amendment – Class I waste Soils (Hydrocarbon Impacted) 52
12.9 Stockpiling Processed Spoil 53
12.10 Exporting Soils from site 53
13 ENVIRONMENTAL MANAGEMENT – Resource Recovery 54
13.1 Objective 54
13.2 Overview 54
13.3 Actions 54
13.4 Monitoring and Reporting 54
14 ENVIRONMENTAL MANAGEMENT – ASBESTOS 55
14.1 Objective 55
14.2 Overview 55
14.3 Asbestos Management 55
15 ENVIRONMENTAL MANAGEMENT – AIR MONITORING 56
15.1 Objective 56
15.2 Overview 56

15.3 Rationale for Monitoring Positions 56
15.4 Responsibilities 57
15.5 Area of Excavation 60
15.6 Stations for Public Exposure Monitoring (on-site boundaries) 60
15.7 Dust (PM10 & PM2.5) 60
15.8 Asbestos Contained Material (ACM) Fibres 61
15.9 Respirable Dust (Silica) 61
15.10 Metals 62
15.11 Personal Filtering (on-site) 62
15.12 Method of Sampling and Analysis 62
15.13 Air Quality Assessment Criteria 63
15.14 Sample Recovery 64
15.15 Weather Conditions 64
15.16 Climate 64
15.17 Contingency Measures 64
16 ENVIRONMENTAL MANAGEMENT – WATER 65
16.1 Interim Peached Groundwater Monitoring 65
16.2 Perched or leached Groundwater on site 65
17 ENVIRONMENTAL MANAGEMENT – NOISE & VIBRATION 66
17.1 Objective 66
17.2 Target 66
17.3 Action 66
17.4 Noise & Vibration Monitoring 67
17.5 Noise Compliance 67
18 ENVIRONMENTAL MANAGEMENT - POST CONSTRUCTION 68
18.1 Groundwater Monitoring (Post Construction) 68
18.2 Soil Vapour Monitoring 68

Tables in Report

Table A – Groundwater Information (DoW)
Table B – Summary of Soil Laboratory Results
Table C – Summary of Asbestos Laboratory Results
Table D – Summary of Total Dissolved Metals against LOR
Table E – Summary of TPH against LOR
Table F – Site Identification
Table G – Environmental Performance Assessment Criteria
Table H – DER defined Potential CoPC for a Landfill
Table I – Risk Assessment Matrix
Table J – Risk Assessment Criteria
Table K – Possible Receptors of Contamination
Table L – Potential Exposure Pathway
Table M – Summary Conceptual Modal and Environmental Risk Assessment
Table N – Selecting the Level of Community Involvement
Table O – Timetable of Community Consultation Program
Table P – Operational Hours
Table Q – Engineered Landfill Construction
Table R – AMS Rational & Location
Table S – Roles and Responsibilities for Air Monitoring Program
Table T – Air Contaminant and Assessment Criteria
Table U – Asbestos Air Quality Assessment Criteria
Table V – Potential Noise Sources & Control Measures

Figures

Figure 1 – Site Location Plan
Figure 2 – Previous Borehole & Test Locations
Figure 3 – Current Monitoring Well Location Plan
Figure 4 – Groundwater Flow Diagram
Figure 5 – Survey of Site
Figure 6 – Conceptual Site Model
Figure 7 – Proposed Site Layout with Bunded Areas/Fences and Diagrams
Figure 8 – Proposed Site Layout and Remediation Plan
Figure 9 – Soils Life Line Diagram
Figure 10 – Proposed Engineered Landfill Construction Diagram
Figure 11 – Air & Dust Monitoring Stations
Figure 12 – Summer Locations & Wind Variations
Figure 13 – Winter Locations & Wind Variations
Figure 14 – Monthly Wind Roses – January to June
Figure 15 – Monthly Wind Roses – July to December

Tables

Table 1a - Assessment Criteria (Soil)

Table 1b - Assessment Criteria (Soil) (NEPM

Table 2 - Assessment Criteria (Soil Vapour)

Table 3 - Assessment Criteria (Air)

Table 4 - Assessment Criteria (Water)

Appendices

Appendix A – Site Summary form and CoT

Appendix B – Community Consultation *(Greg Rowe Assoc)*

Appendix C – Hazelmere Site Remediation Works Agreement & Site Management Plan *(Wasterock)*

Appendix D – Groundwater Modelling and Hazelmere *(NTEC Environmental Technology)*

Appendix E – Groundwater Abstraction & Dust Suppression Management Plan *(MDWES)*

Appendix F – Soil Amendment Management Plan *(MDWES)*

Appendix G – Air Quality Management Plan *(MDWES)*

EXECUTIVE SUMMARY

This ESMP is for the proposed management, remedial works and regeneration of an historical landfill at Lot 20 Adelaide St, Hazelmere WA. It has been prepared in order to protect both workers operating at the Site and residents within the local environment from potentially contaminated soils, nuisance dust, odour and ACM inhalation.

After previously being mined for building and construction sands, the Site was operated by multiple proponents as a licensed “inert” landfill from c.1987 to c.1997. Sands were extracted down to the Guildford Clay layer this geological boundary acts as aquitard. The landfill has been operated such that the current topography of the Site is unsuitable for development. It has been reported that the base depth of the landfill is approximately 6mbgl. However, it has also been reported that the base maybe deeper than what has been reported.

The majority of fill material at the Site is inert construction and demolition waste in a sand matrix, but fragmented asbestos containing materials (ACM) were identified at several surface locations across the site and further studies have identified varying levels of contamination. The DER classified the site as ‘Contaminated – Remediation Required’ in 2010.

Wasterock proposes to remediate the Site using conventional excavation techniques to reduce the current height and fill content of the site and make it suitable for “commercial / industrial” use.
The remedial works of the Site will involve the following stages:

1. Excavation, sorting and processing (crushing and/or screening) of existing material.
2. Acceptance of soil for amendment such as Acid Sulfate Soils (ASS) and Hydrocarbon Impacted Soils (HIS) (Class 1 only) for recycling and reuse. These soils will ultimately be used for the capping layer.
3. Processing (crushing and/or screening) of construction and demolition (C&D) waste for recycling and reuse on Site to engineer a physical warning barrier.
4. Engineered placement, compaction and construction of excavated remediated soil material to form a controlled engineered cell.

Wasterock is proposing to redevelop the area by remediating the Site via excavation and repackaging of materials. The remediation of the site will include the outsourcing and acceptance of external off-site soil material for the capping layer, sourced from local building and development projects within the Perth metropolitan area. An engineered barrier layer will also be placed over the repackaged materials, followed by a validated layer of clean cover.

The use of the Site’s resources to remediate the Site itself will minimise any requirement to transport waste to appropriate waste facilities off-site, or to transport large quantities of sand to site. Although there may be a requirement for off-site disposal for this project, if a resource can be reused and does not have an environmental impact, then Site re-use should be paramount as it is the only cost-effective mechanism for sustainable remediation of the site.

The project is expected to take approximately four to five years to complete the necessary works. The ultimate aim of the project is to rehabilitate the land, such that it can be utilised within the community, through subdivision into smaller light industrial/commercial lots.

1 INTRODUCTION

This Environmental Site Management Plan (ESMP) has been prepared by MDWES for Wasterock Pty Ltd (the Client) for the management of soil, groundwater and air/dust monitoring during the remediation of a former uncontrolled landfill. The Site is located within the City of Swan, approximately 14 km east north east of the Perth CBD, 6km east of the Swan River and 1 km west of the Darling Fault (Figure 1). It is currently vested with Wasterock Pty Ltd and has been since 2006. The Site is located at Lot 20 Adelaide Street, Hazelmere, Perth, herein referred to as 'the Site'

The ESMP has been written to detail management and identify the possible issues and potential risks that may exist/occur during the remediation of the subject Site. The management plan aims to present reasoned rationale and propose solutions to mitigate identified risks during the remediation and redevelopment of the Site.

1.1 Previous Reports

Several reports and investigations have been undertaken on the subject Site from c.2005 to present. The information and results of these investigations are compiled in the following documents and should be read in conjunction with this management plan:

- FOI 1233/05 by Department of Environment & Conservation (DEC) – Freedom of Information – Lot 20, Adelaide Street, Hazelmere (October 2005);
- 2145245A:PR2_16644.RevA by Parsons Brinckerhoff – Site Investigation (SI) – Hazelmere, WA (July 2006) (see figure 1);
- V392/2007 grw4469 by Knight Frank – Valuation Report – Lot 20 Adelaide Street, Hazelmere, WA (July 2007);
- 476300-0kjcv070709a by Burgess Rawson – Valuation Report – Lot 20 Adelaide Street, Hazelmere, WA (July 2007);
- 60150301 by AECOM – District Storm water Management Strategy – Hazelmere Enterprise Area (June 2010);
- Drilling Logs by Banister Drilling & Irrigation for 20 Adelaide Street, WA. (May 2012);
- E2012-031 (GME) – MDWES – Groundwater Monitoring Event #1 – Adelaide Street Hazelmere (May 2012);
- NTEC Environmental Technology – Groundwater Modeling for the Wasterock Hazelland Landfill Site in Hazelland. (September 2012).
- E2012-031 (GME) – MDWES – Groundwater Monitoring Event #2 – Adelaide Street Hazelmere (August 2012);
- E2012-031 (GWAMP) – MDWES – Groundwater Abstraction for Dust Suppression & Surface Compaction v2 – Adelaide Street Hazelmere (October 2012);
- E2012-031 (GME) – MDWES – Groundwater Monitoring Event #3 – Adelaide Street Hazelmere (January 2013);
- E2013-031 – (SAMP) - MDWES – Soil Amendment Management Plan – Lot 20 Adelaide Street, Hazelmere (March 2013).
- E2012-031 (GME) – MDWES – Groundwater Monitoring Event #4 – Adelaide Street Hazelmere (June 2013);
- E2012-031 (AQMP) – MDWES – Air Quality Management Plan (AQMP) v2 – Adelaide Street Hazelmere, (October 2013).

- E2012-031 (GMES) – MDWES – Annual Groundwater Monitoring Event Summary Report (GMES) v2 – Adelaide Street Hazelmere, (October 2013).
- GRA 7729 by Greg Rowe & Assoc. – Community Management Strategy for Remediation of Former Landfill Site: Lot 20 Adelaide Street, Hazelmere. (March 2014);
- 6045.k.09_09082_SMP by Waste Rock Pty Ltd – Site Remediation Works Agreement and Site Management Plan (Final) – Lot 20 Adelaide Street. (March 2014);

2 BACKGROUND

Stage I, Preliminary Site Investigation (PSI) and Stage II Detailed Site Investigation (DSI) were undertaken by Parson Brinkerhoff (2006) and the following sections summerise the investigation information.

The Site historically operated as a licensed uncontrolled inert landfill from c.1987 to c.1997 after first being mined for building and construction sand. It was reported that the sand was extracted down to the clay substrate.

The landfill covers the vast majority of the Site rising up to a maximum of 8m above ground level in parts. Steep battered edges between 5m and 8m in height define the edge of the landfill. A shallow access ramp is located in the middle of the southern edge of the landfill which leads to the top of the landfill. The north western edge of the landfill has a slighter gradient than the other edges of the landfill.

A number of studies have taken place over the years upon the Site. These studies have identified varying levels of contamination primarily caused by Total Petroleum Hydrocarbon (TPH), Monocyclic Aromatic Hydrocarbons (MAH's), Heavy Metal impacts and potential Asbestos.

Based on the findings of the reports the Department of Environment Regulation (DER) (formally DEC) classified the Site as *'Possibly Contaminated – Investigation required'* on 27 April 2007 (VDM, 2008). In November 2010 the DER revised this judgment and reclassified the Site to – *'Contaminated - remediation required'*.

2.1 Site History

It has been reported as part of the PSI, that the Site was primarily mined (opencast) for sand between c.1978 and c.1982. The sand was mined up to a reported 6m below natural ground level. However, this may have been deeper. The mined area was then utilised as an inert landfill which was common practice for this time period.

Although primarily licensed for inert waste during its operational cycle, a number of non-inert wastes were received at the landfill. The non-inert material was received with the knowledge and approval of the regulating authority, which at the time was the Shire of Swan. Records show that the received materials were described as inert building waste, car bodies and asbestos sheeting/pipes/tiles. In addition, it was reported that sludge's containing hydrocarbons, together with emulsified factory wastes were also accepted. Furthermore, drums (unknown), plus drums of kerosene, bitumen, pesticide-contaminated soils and hospital wastes were also accepted.

The landfill recorded a finish level of approximately 6.0 to 8.0m above surface level (c.1990).

The Site is located at Lot 20 Adelaide Street, Hazelmere within the City of Swan. Current Site owners Hazelland Pty. Ltd (Owner) have subcontracted Wasterock Pty Ltd (WRK) to undertake the required remediation work in order to make the Site developable for the future use (commercial/industrial).

2.2 Development Proposals

It was understood from the client's scope that the Site development proposals consisted of remediation and engineering of an historical landfill at the current Site. It is proposed that the Sites future development would be zoned industrial/commercial. The Site development may include but not be limited to soft landscaping (verges), underground services/utilities, and a new road layout and associated infrastructure.

2.3 Geology

The underlying geology has been reported from the following data sources. The Geological Survey Western Australia (1986) 1:50,000 sheet number *2034 I and 2034 II* entitled "Perth" and Davidson (1995). These sources indicate that the Site's underlying natural geology comprises Bassendean Sand inter-fingered with Guildford Clay. The geology maps do not denote the Site as being a landfill site (made ground). However, details are provided below.

The term '**Fill' or** '**Made Ground'** is used to describe material which has been placed by man either for a particular purpose e.g.: to form an embankment, or to dispose of unwanted material. For the former use, the Fill and/or Made Ground may well have been selected for the purpose and placed and compacted in a controlled manner. With the latter, great variations in material type, thickness and degree of compaction invariably occur and there can be deleterious or harmful matter, as well as potentially methanogen-generating organic material. Consideration when investigating any site with Fill/Made Ground should be given to the following: *"all Made Ground should be treated as suspect, because of the unknown nature of source and likelihood of extreme variability".*

Bassendean Sand is present over most of the central Perth Region and lithologically, it is readily identifiable from drill cuttings. The unit varies in known thickness and can extend to a maximum of approximately 80mbgl, depending mainly on the topography.

Bassendean Sand is pale grey to white and is fine to coarse but predominantly medium grained. It consists of moderately sorted, sub rounded to rounded quartz sand and commonly has an upward fining progression in grain size. Fine-grained, black, heavy minerals are commonly scattered throughout the formation but in places are more concentrated in thin layers or lenses probably indicating a shallow-marine origin. A layer of friable, limonite-cemented sand, colloquially called 'coffee rock', occurs throughout the strata. The coffee rock is usually encountered near the water table.

Bassendean Sand unconformably overlies the Cretaceous and Tertiary strata and interfingers to the east with Guildford Clay, and conformably overlies the Gnangara Sand. To the west, it is unconformably overlain by the Tamala Limestone. The stratigraphic relationships of the Bassendean Sand with the Guildford Clay and Gnangara Sand indicate that the formation was deposited under changing and conceivably alternating fluvial, estuarine, and shallow-marine pre-historic time periods.

Guildford Clay is predominantly of fluvial origin and is restricted mainly to the areas of its outcrop. However, it is also found locally in areas removed from present drainages such as Menora (north of Perth) and Fremantle (southwest of Perth). To the south of Perth, in the Ferndale-Lynwood area, widespread thick, black, silty clay is possible and could be of a lacustriune or fluvial origin. This outcrop of Guildford Clay exists over much of the eastern Perth Region and unconformably overlies the Jurassic and Cretaceous rocks, Kings Park Formation, Ascot Formation and Yoganup Formation.

The Guilford Clay consists of pale-grey, blue, but predominantly brown silty and slightly sandy clay, and interfingers to the west with the Gnangara Sand and Bassendean Sand. The geological unit can be observed up to 35 m thick. It commonly contains lenses of fine to coarse grained, very poorly sorted, conglomeratic and (in places) shelly sand at its base, particularly in the Swan Valley area. These basal lenses, which occur sporadically along the eastern margin of the coastal plain, are probably remnant deposits of the Ascot Formation or the Yoganup Formation which the Guildford Clay can overlay.

2.4 Hydrogeology

The uppermost aquifer underlying the region of the Site is the unconfined Superficial Aquifer (Water Register, 2012). Leederville and Yarragadee North aquifers underlie the Superficial. The base of the Superficial Swan Aquifer is mapped (DoE, 2004) indicating a depth of 5–7 mAHD at the Site, sloping upwards towards the Darling Fault and downwards towards the Swan River in the west (NTEC, 2012) with an estimated thickness of 10–25m (Davidson and Yu, 2006). The maximum thickness is around 26m at the Site.

Based on the groundwater levels, the hydraulic gradient of the Superficial Swan Aquifer at the Site is approximately 0.01 (NTEC, 2012) sloping downwards along a transect - that dips in the direction of the flux (to the north west corner of the Site). Regional investigations (Davidson and Yu, 2006) indicate that groundwater flow rate (or transmissivity) travelling through the Superficial Swan Aquifer ranges from 50m/yr to over 1000m/yr, with Site conditions likely to comprise the lower end of this range. Salinity in the Cloverdale area of the Superficial Aquifer beneath the surface, ranges from 500mg/L to 1000 mg/L (DoW, 2004b) which classifies groundwater quality as being fresh to mildly acidic at the Site.

The underlying aquifer has a maximum saturated thickness of approximately 30\m (Davidson 1995). However, the Perth Groundwater Atlas (DoW 2004a) indicates that the aquifer depth may be approximately 22.0m to 31.0m beneath the Site. The upper portion of the aquifer is reported to be found at depths of between 12m-21mbgl.

The Perth Groundwater Atlas (DoW 2004a) indicates that groundwater is encountered at approximately 4m to 5m (depending on topography) below the region of the Site, with levels potentially varying between 0.5m to 3.0m seasonally.

According to the online Perth Groundwater Atlas (Department of Water, 2009) the average groundwater table is at 15.0m AHD and flowing from Southeast to Northwest.

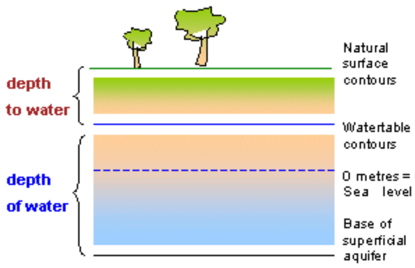
Due to the unusual topography of the Site, the expected depth to groundwater ranges between 12mbgl in the west and 21mbgl in the east. Relative groundwater levels are 15mAHD over the majority of the Site. However, they may increase to 14mAHD in the North West corner of the Site.

Groundwater levels were recorded as part of the monitoring events undertaken on site from 2012 through to 2013 by MDWES. In general, the groundwater levels recorded were between 3.60mbgl (23.24mAHD) for MW1 (North West) and 11.72mbgl (22.39mAHD) for MW3 (South East).

Table A: Groundwater Information (DoW)

Depth to water: 21.0 metres*

Depth of water: 10.0 metres



The above figures were calculated from the following values which were extracted from the three surfaces at location 116.01490 degrees East and 31.92901 degrees South **

Levels relative to ground level

Watertable:	21.0 metres
Base of Aquifer:	31.0 metres

Levels relative to AHD (Australian Height Datum)

Natural Surface Level:	36.0 metres
Watertable Level:	15.0 metres
Base of Aquifer Level:	5.0 metres

2.5 Hydrology

There are no surface water bodies on site or in close proximity to the Site. However, the Ollie Worrell Reserve is noted approximately 2.1km to the south-east and Kadina Brook is noted 2.2km to the east of the Site. Both of these surface water features are not likely to be affected by the groundwater flow, as they are considered to be up-gradient to the groundwater flow of the Site.

2.6 Contaminants of Potential Concern - Soil

The Parsons Brinckerhoff DSI identified the following Contaminants of Potential Concern (CoPC), based on the information obtained regarding the materials accepted into the landfill:

- Total Petroleum Hydrocarbons (TPH);
- Monocyclic Aromatic Hydrocarbons (MAH's);
- Asbestos;
- Heavy Metals.

2.7 Contaminants of Potential Concern - Groundwater

As part of the groundwater monitoring program undertaken by MDWES, the following CoPC were identified, based on historical use, current Site activities, regional soils, proximity to classified contaminated sites and off-site sources and impacts:

- Dissolved and Total Metalloids: Arsenic (As), barium (Ba), beryllium (Be), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), manganese (Mn), molybdenum (Mo), nickel (Ni), silver (Ag), selenium (Se), vanadium (V), zinc (Zn), and mercury (Hg);
- Benzene, Toluene, Ethyl Benzene, Xylene (BTEX);
- Polynuclear Aromatic Hydrocarbons (PAH);
- Monocyclic Aromatic Hydrocarbons (MAH);
- Phenolic compounds;
- Total Petroleum Hydrocarbons / Total Recoverable Hydrocarbons (TPH/TRH);
- Total PCB's
- Organochlorine and Organophosphorous Pesticides (OC/OP).

2.8 Contaminants of Potential Concern - Air

Air monitoring has been outside the scope of works and remit of investigations to date. This was due to there being no perceived risk from emissions or airborne particulates and no requirement to investigate this source.

As part of the management plan, air monitoring will feature and will be a requirement, due to the proposed operations being undertaken on Site. During excavation and engineering of the landfill, dust and particulate matter have the potential to be created. Therefore, the following CoPCs have been identified:

- Asbestos fibres;
- Metals;
- Dust Particulates (TSP, $PM_{2.5}$ & PM_{10}).
- Volatile Hydrocarbons - Monocyclic Aromatic Hydrocarbons (MAH).

  (It should be noted that volatiles are not anticipated to be a nuisance during the excavation and remediation of the historical landfill. Previous investigation for soil and groundwater have not revealed or encountered a hydrocarbon source of note (See section 3.5). However the SAAF located on site could be considered a source during the remediation process.

3 IDENTIFIED CONTAMINATION

3.1 DSI – Soil Results

As part of the Parsons Brinckerhoff report (2006), laboratory assessment of the soils was undertaken. This investigation was completed in order to determine the nature and extent of the fill currently present at the Site.

Techniques used during this investigation included both a desktop study and the collection of limited soil samples through the excavation of fifteen (15) test pits to a depth of 5m below the surface of the landfill. (See figure 2) The location of the test pits was based on systematic grid sampling over the landfill area, with a bias to position locations within the north eastern corner where the Omex oil refinery waste was thought to be buried. Excavated material from each test pit was visually logged and soil samples were taken for laboratory analysis.

The Parsons Brinckerhoff report indicates that the majority of fill material was inert construction and demolition waste within a sandy soil matrix. Minor amounts of fragmented asbestos-containing materials (ACM) were identified in several test pit excavations.

Table B below, summerises the number of soil samples analysed, analytes tested for, and minimum/maximum constituent concentrations. The table also denotes the identified samples that were identified as exceeding the investigation levels. *Note: the laboratory results were compared to the investigation levels (ILs) and Assessment Criteria (AC) at the time of writing the report (DoE July 2006).*

The soil investigation criteria adopted for the investigation was based on the Western Australian Department of Environment (DoE) *Assessment Levels for Soil, Sediment and Water*, Draft for Public comment, Contaminated Site Management Series, November 2003 V3 - “Table 1 Assessment Levels for Soils”. At the time of writing the DSI report, the future use of the Site was unknown. The Site was a landfill therefore; Health Investigation Levels (HIL-Fs) for commercial/industrial land use were considered the most appropriate. Reference was also made to the Ecological Investigation Levels (EILs) as a conservative measure.

Table B: Summary of Soil Laboratory Results (Table 6.2 Parsons Brinckerhoff, 2006)

Number of Samples Analysed	Analyte	Min Conc. (mg/kg)	Max Conc. (mg/kg)	Results Exceeding Investigation Levels	Samples Exceeding Class I Waste Classification
Metals					
20	Mercury	0.01	0.14	None	TP11-2, TP12-1
20	Arsenic	<2.0	6.8	None	None
20	Cadmium	<2.0	<2.0	None	None
20	Chromium	3.5	24	None	TP8-1, TP9-1, TP9-3, TP10-1, TP10-2, TP11-2, TP12-2.
20	Cobalt	<2.0	2.3	None	None
20	Copper	5.8	390	TP3-2, TP9-1, TP12-1	None
20	Lead	12	240	None	All Samples submitted
20	Manganese	14	220	None	None
20	Nickel	<2.0	31	None	TP3-2, TP8-1, TP8-2, TP9-1, TP9-2, TP9-3, TP10-1, TP10-2, TP11-2, TP12-1
20	Selenium	<2.0	<2.0	None	None
20	Zinc	18	770	TP6-1, TP9-1, TP9-3	None

Number of Samples Analysed	Analyte	Min Conc. (mg/kg)	Max Conc. (mg/kg)	Results Exceeding Investigation Levels	Samples Exceeding Class I Waste Classification
Hydrocarbon Results					
20	TPH $C_{10} – C_{14}$	<20	30	None	None
20	TPH $C_{15} – C_{28}$	30	710	None	None
20	TPH $C_{29} – C_{35}$	24	850	-	-
20	Benzene	<0.2	<0.2	None	None
20	Ethyl Benzene	<1.0	<0.1	None	None
20	Toluene	<1.0	<0.1	None	None
20	Xylenes	<3.0	<3.0	None	None
20	Total PCB's	<1.0	<5.7	TP9-2, TP9-3, TP11-2	None

NB: The information presented in the table above is taken from the Parsons Brinkerhoff DSI Report (2006). It is noted that within the report table TPH, BTEX, PCBs have a analysis count of 20. However the laboratory report details nine samples for each of the aforementioned analytes. MDWES has reported as per the PB report as we are unsure as to which is correct.

3.2 DSI – Asbestos Results

As part of the Parsons Brinckerhoff investigation, asbestos analyses were also undertaken. Table C below summarises the results of laboratory identification of potentially Asbestos Containing Materials (ACM) sampled. The table includes the test pit location, description of sample, whether asbestos was detected by polarised microscopy and, if positively identified, the type of asbestos present.

Table C: Summary of Asbestos Laboratory Results (Parsons Brinckerhoff)

Test Pit Location	Description	Type of Asbestos Detected
TP1	Grey Fibrous Sheeting Grey Fibrous Sheeting painted white	Chrysotile, Crocidolite Chrysotile, Amosite
TP3	Pale Brown Flooring White Fibrous backing Brown Fibrous sheeting (curved) Grey Fibrous Sheeting (Painted White)	No Chrysotile No Chrysotile
TP6	Brown Fibrous sheeting	No
TP7	Pale Brown Fibrous Sheeting, Painted Pale Yellow Pale Brown Fibrous Sheeting, Painted White	Chrysotile, Amosite No
TP8	Brown Fibrous sheeting (curved) Brown Fibrous sheeting (curved)	No No
TP9	Brown Fibrous sheeting (curved)	No
TP10	Brown Fibrous sheeting (curved)	No
TP11	Brown Fibrous sheeting (curved)	No
TP12	Grey Fibrous Sheeting painted white Grey Fibrous Sheeting painted white Off White-Flooring Off-White Fibrous backing	Chrysotile Chrysotile, Crocidolite, Amosite No No
TP13	Grey Fibrous Sheeting	Chrysotile, Amosite
TP14	Pale Brown Fibrous Sheeting, painted White Grey Fibrous Sheeting, Painted White	No Chrysotile, Crocidolite

3.3 MDWES Groundwater Monitoring Results

A summary of the groundwater results from four (total) seasonal groundwater monitoring events (GME) are summarised in the following sections. The GME's were conducted by MDWES from May 2012 to June 2013 to capture seasonal variations, as well as chemical and physical properties of the groundwater. The sampling program was completed within the six (6) groundwater wells strategically placed around the perimeter of the Site boundary (Figure 3). The groundwater flow has been calculated as flowing in a north west, westerly direction (Figure 4).

The Groundwater analysis results were compared against Freshwater Ecosystems, Marine Ecosystems, DER Trigger values and Water Corporation Criteria. These guidelines levels are presented in the document entitled "*Contaminated Site Management Series - Assessment Levels for Soil, Sediment and Water* "(DEC, 2010).

3.4 Metals

Metals were also analysed as part of the groundwater monitoring program (see Table D). The following table summarises dissolved and total metals that were detected above the LOR. Metal results could be considered higher than expected for background waters due to elevated levels of suspended solids within majority of the samples. This could have contributed to the artificial increase in the results.

It should be noted that iron and aluminium results were elevated above short term and long term irrigation levels (Iron, Aluminium) in Table 4.2.10 of the ANZECC & ARMCANZ (2000) Australian Water Quality Guidelines for Fresh and Marine Water Quality. The results were constant throughout the year's program with no notable outlier peaks observed.

Table D: Summary of Total and Dissolved Metals against LOR

Location	Dissolved Metals	Total Metals
WRMW1	Aluminium, Zinc and Iron.	Aluminium, Copper, Lead, Nickel, Zinc and Iron.
WRMW2	Aluminium, Nickel, Zinc and Iron.	Aluminium, Copper, Lead, Zinc and Iron.
WRMW3	Aluminium, Zinc and Iron.	Aluminium, Copper, Lead, Manganese, Nickel, Zinc, Iron and Mercury.
WRMW4	Aluminium, Nickel, Zinc and Iron.	Aluminium, Copper, Lead, Nickel, Zinc and Iron.
WRMW5	Aluminium, Zinc and Iron,	Aluminium, Copper, Lead, Zinc and Iron.
WRMW6	Aluminium, Nickel, Zinc and Iron.	Aluminium, Copper, Lead, Nickel, Zinc and Iron.

3.5 Total Petroleum Hydrocarbons (TPH)

TPH was analysed as part of the groundwater monitoring program. The following table summarises TPH fractions above the LOR. However, none of the groundwater analysed for TPH during the year identified concentrations above the adopted assessment criteria.

Laboratory results from the GME's have shown that TPH has impacted within locations WRMW1, WRMW3 and WRMW6 throughout the year. Referring to the laboratory data, it is considered that TPH has an intermittent presence within the groundwater at WRMW3.

Further note is made to the locality of well WRMW3, in that it is not located within the historical landfill. It is likely that seasonal rainfall infiltration from the surface has potentially affected landfill material and could be considered the influential factor. This being said, the concentration levels are only slightly elevated and remain below assessment criteria.

Table E: Summary of TPH against LOR

Analytes	LOR	Location and concentration of analytes above the LOR concentration
$C_{15} – C_{28}$	100	**WRMW1** (200µg/L)**, WRMW3** (110µg/L), **WRMW6** (260µg/L, 380µg/L, 380µg/L)
$C_{29} – C_{36}$	50	**WRMW3** (270µg/L, 100µg/L) , **WRMW6** (60µg/L, 60µg/L)
$C_{10} – C_{36}$ (*sum*)	50	**WRMW1** (200µg/L)**, WRMW3** (270µg/L, 210µg/L), **WRMW6** (320µg/L, 380µg/L, 440µg/L)

3.6 Monocyclic Aromatic Hydrocarbons (MAH)

Each of the speciated MAH analysed was below the LOR for each location.

3.7 Polycyclic Aromatic Hydrocarbons (PAH)

Each of the speciated PAH analysed were below the LOR for each location.

3.8 Phenolic Compounds

Each of the speciated Phenolic compounds analysed were below the LOR for each location.

3.9 Benzene, Toluene, Ethyl Benzene, Xylene (BTEX)

Each of the speciated BTEX analytes analysed were below the LOR within those samples analysed for each location.

3.10 Organochlorine Pesticides (OC)

Each of the speciated OC analysed was below the LOR for each location.

3.11 Organophosphorous Pesticides (OP)

Each of the speciated OP analysed was below the LOR for each location.

3.12 Major Anions and Cations

There were no elevated concentrations of the major anions and cations above the adopted assessment criteria.

3.13 Nutrients

Elevated nutrient levels were experienced across the Site with concentrations peaking around August. This can be attributed to the higher groundwater table following the wet season. Although concentrations are elevated above ANZECC criteria, surface waters are not located in the immediate vicinity of the Site and downstream receptors are likely to be more significantly impacted upon by land uses to the north of the Site including rendering facilities. Total Nitrogen and Total Phosphorus exceed 'Fresh Waters' assessment criteria at all locations.

3.14 Groundwater Summary

The laboratory results were generally consistent throughout the monitoring program, with the exception of TPH concentrations. Groundwater quality below the Site appears relatively stable within all locations. At present, sufficient data is not available to indicate the location and extent of TPH below the Site. However, as concentrations remain below assessment criteria, impact is considered to be low. Groundwater will be continually monitored as part of the management plan and as part of the Sites' remediation and redevelopment program.

4 ENVIRONMENTAL OBJECTIVES

This ESMP has been prepared in order to protect both workers operating at the Site and residents within the local environment from potentially contaminated soils, nuisance dust, odour and ACM inhalation.

This management plan details proposed environmental management procedures during excavation and soil disturbance activities being undertaken at the Site, as part of the proposed remediation and redevelopment of the landfill Site. In particular, the activities and operations on Site have the potential to create dust and particulate matter which may release ACM fibres and particulates containing metals. Wasterock Pty Ltd will ensure full compliance with the objectives set out within this ESMP.

The objectives of this ESMP are to:

- Protect life and the wellbeing of human and other forms of life from dust, possible ACM and soil contamination exposure;
- Comply with relevant statutory environmental requirements – DEC (2011), NOHSC / Safe Work Australia (1995), WA EP Act (1986), Department of Health (DoH);
- Provide strategies and contingencies aimed at reducing environmental exposure during earthworks and soil removal activities to possible dust generation, creating potential pathways and ACM inhalation;
- Provide Wasterock Pty Ltd with a framework to confirm compliance with relevant policies and requirements;
- Provide the community with evidence of the management of the project in an environmentally acceptable manner.

The technical objectives of the management plan are to:

- Implement an air quality monitoring program that provides representative data capture for dust generation (metals/silica) and ACM concentrations present at the Site;
- Undertake soil monitoring during the screening process to determine the suitability of soil for deep cell landfill material;
- Validate and qualify imported soils onto Site which are to be soil amended. (ASS & Hydrocarbon impacted, Class I only). Ensure that once amended, soils are validated suitable for use within the capping layer;
- Continue the ground water monitoring program whilst excavation and remediation is in operation, to determine if the change in geological and environmental conditions have an effect on the localised groundwater;
- Ensure that any excavated screened soil material being reused on site, which could potentially contain ACM, is suitable to be accepted into the engineered cell;
- Employ safe practices to minimise generation of dust and in doing so, maintain safe ambient dust and ACM levels for personnel situated both on-site and off-site;
- Employ safe practices to minimise generation of noise and in doing so, maintain safe noise levels for personnel situated both on-site and off-site;
- Employ safe practices to minimise generation of odour and in doing so, maintain low odour levels for personnel situated both on-site and off-site;
- Specify the location of all ACM in Air Monitoring Stations (ACMAMS) and data records required to be obtained for each

- Specify the location and design of soil stockpiles under analysis (holding) prior to determining environmental content and concentrations for landfill;
- Stipulate regulatory context (regulators / guidelines / criteria) for ACM concentrations in air;
- Address Stakeholder and Community Consultation.
- Incorporate contingency plans in the event that any complaint is made during monitoring or if ACM concentrations detected approach or exceed relevant target action levels / stop work levels. This also applies for complaints with regards to noise and odour.
- Minimise the risk to human health, should additional ACM be located on-site;
- Assess the distance that deposition may extend to (some locations possibly beyond the Site boundaries). Provide solution and a rationale for the solutions.

The ESMP will be reviewed and periodically updated, if necessary, to reflect knowledge gained during the course of operations. Changes to the ESMP will be implemented in consultation with the relevant authorities and audited by the Contaminated Sites Auditors.

5 PROPOSED SCOPE OF WORKS

The Site's operation will incorporate several environmental activities, MDWES will undertake the following environmental points with regards to remediation and development of the Site:

5.1 Soil Monitoring Scope (Landfill)

- The project is the redevelopment and excavation of an uncontrolled historical landfill which is to be remediated and engineered for an industrial/commercial end use;
- Soil management and sample analysis for validatory purposes to determine concentration levels from soil excavated. The excavated soil (historical landfill) is to be processed and screened as part of the remediation. Field and laboratory analyses will determine the most suitable cell layer or requirements for disposal off site if environmentally unsuitable;
- Removal of timber, brick, concrete, ferrous and non ferrous metals for recycling;
- The placement of stable non-leaching remediated soils within a deep cell (2.0m to base depth). This will include asbestos soils;
- An approximate total of 1500m^3/day of historical landfill will be processed. Soil validation will include asbestos, metals and hydrocarbons analysis to determine suitability:
    - All remediated soil will be placed below the engineered barrier. The barrier will comprise an inert marker layer of crushed compacted construction/demolition material (CDM);
- Management of any asbestos pockets encountered during earth works. These specific areas of asbestos will require immediate water saturation and special attention. Removal will be in accordance with the Site management plan and DoH Guidelines;
- Brick, concrete and builders' waste recovered may be crushed and used as a barrier layer (The barrier is to comprise inert material) The barrier will be positioned at 1.5m below finished level and will extend up to 2.0 mbgl. The new engineered barrier layer will be a minimum of 0.5m thick;
- Soil sampling and validation will be undertaken by an MDWES Environmental Scientist. All results will be reported in accordance with the DER Contaminated Sites Management Series and in accordance with current industry best management practice guidelines;
- Laboratory sample analysis will be undertaken by a NATA accredited laboratory.

5.2 Soil Monitoring Scope (Soil Amendment)

As part of the remediation of the Site, soils are required to create the capping layer. This will be out sourced soil material from the Perth Metropolitan area. The depth of the capping layer will range from finished ground level to 1.5mbgl. These soils will comprise amended Acid Sulphate Soils (ASS) and Hydrocarbon Impacted Soils (HIS), processed through the Soil Acceptance and Amendment Facility (SAAF) located on site. These soils will be validated through laboratory analysis and field tests to ensure they are suitable and within the soil guidelines for a commercial/industrial end use.

- **Acid Sulfate Soils (ASS)** – ASS soils will be placed on a treatment pad. Lime amending techniques will be used to neutralise the acidic capacity of the soils, as per the Soil Amendment Management Plan. Amended soils will be validated and tested prior to use. Once validated suitable soils will be transferred to the engineered capping layer. It should be noted that soils may be accepted pre-treated with relevant paper work. This soil will still be validated before re-use.

- **<u>Hydrocarbon affected soils which meet current Class I - Waste Acceptance Criteria (WAC)</u>** – hydrocarbon impacted soils will be placed into a bunded treatment area and windrows will be formed. The soils will be turned/rotated regularly to ensure volatilisation of the hydrocarbon component. Soils will be validated and tested prior to use soils, then transferred to the engineered capping layer.
- Soil sampling and validation will be undertaken by a MDWES Environmental Scientist. All results will be reported in accordance with the DER Contaminated Sites Management Series and in accordance with current industry best management practice guidelines.
- Laboratory sample analysis will be undertaken by a NATA accredited laboratory to ensure validation.

5.3 Air Monitoring Scope

- Continuous daily air/dust monitoring for the duration of the remediation and engineering program. The air monitoring is to test for human health risks posed, in particular, to the residents of Adelaide Street along the southern boundary of the Site, but also to on-site workers. Daily air/dust monitoring is to include the following assessment.
    - Total Petroleum Hydrocarbons (TPH)
    - Monocyclic Aromatic Hydrocarbons (MAH's)
    - Asbestos fibres
    - Dust containing Heavy Metals
    - Dust Particulates (TSP, $PM_{2.5}$ & PM_{10})
- ACM, heavy metals, and dust particulates (see above) have the potential to be a nuisance and be generated as a consequence of the above activities through transportation and disturbance of landfill soil. Severity may be exacerbated by site characteristics associated within the area due to the possible uplift of finer particulates or fibres (random sizes smaller than 2.5 µm diameter). These finer particulates (PM10, PM2.5) or fibres have capacity to be inhaled (some potentially in the form of ACM fibres) by site personal and neighbouring residents. However, the majority of particulates are expected to be in the >10 µm or larger TSP range, that are either:
    - Not inhalable.
    - Won't become airborne.
    - Don't often constitute ACM fibres.

  ACM fibres, metalloids and hydrocarbons were identified as contaminants of concern and are assumed to be present within the materials being excavated – At present the levels and concentrations are yet unknown. However the identified CoPCs could be present at levels with capabilities of triggering long-term health effects (especially for workers operating within the Site boundaries). If inhaled by humans, ACM is a known cause of asbestosis, mesothelioma, and cancer of the lungs, oesophagus, stomach, colon and rectum (IARC, 2012).
    - Monitoring stations will be positioned around the Site and will be sampled twice daily (AM and PM) by a MDWES Environmental Scientist.
    - A site weather station will provide real time weather data;
    - Laboratory sample analysis will be undertaken by a NATA accredited laboratory.

See section 14 and 15 of this report for further information. In addition the MDWES AQMP provides a wider definition of the scope of works being undertaken as part of the air monitoring and management program.

5.4 Groundwater Monitoring Scope

- Continuation of the groundwater monitoring program within the established monitoring well network. To date four groundwater monitoring events have occurred. This will continue bi-annually over the remediation program on Site.
- As part of the remediation of the project temporary monitoring wells will be installed as the remediation progresses. The wells will extend to the base depth of the historical landfill (approximately 6.0mbgl) to the clay aquitard of the Guildford clay. This is to enable assessment of groundwater levels (perched/ponded water) and to allow for ground water sampling to be facilitated. Analytes will be in accordance with the CoPCs already identified.
- During excavation ponded or perched groundwater are anticipated and will collect at the base of the excavation due to the underlying Guildford Clay aquitard. Samples will be collected and analysed for CoPC identified to assess if there is a potential for environmental impact through lateral or vertical migration. To mitigate this all perched/ponded waters will be evacuated and pumped out to ensure no environmental impact occurs and will be classified prior to disposal.
- Groundwater monitoring will continue beyond the completion of works to validate any environmental impact from the remediation program. Observations, variations or fluctuations within the groundwater data set will be reported in accordance with the DER guidelines.
- It is proposed that Groundwater is to be used as part of the dust suppression on site. It is noted that slightly elevated aluminium and iron concentrations were recorded as part of the groundwater program. Groundwater will continue to be monitored and sampled as part of the remediation works to ensure that there is no impact or health risk to the site workers.
- The associated (attached) Works Approval Application document includes details of all four GMEs, along with the scope, methodology, duration and analytes.

5.5 Additional Environmental Scope

- Waste transfer notes for soils brought to site for soil amendment and those soils not suitable for use within the engineering of the landfill will be noted and reported as part of the document control process of reporting;
- Environmental Controls with regard to noise monitoring will continue throughout the project's time frame (4-5 years). Noise will be monitored regularly to ensure the Site is compliant with the 60dB noise limit for the Site.
- Environmental Controls with regard to odour will be monitored throughout the project's time frame (4-5 years).

5.6 Roles and Responsibilities of the Site Contractor

As part of this environmental assessment, responsibilities of the Site contractor (related to environmental issues) are documented below. This is in accordance with the Adelaide Street SMP (Ref: 6045.K09_090812_SMP). The Site contractor will be responsible for:

- The day to day management of the Site works;
- The application and establishment of all approvals required to carry out the remediation works including, but not limited to, importation of clean fill material to site for use within the capping layer;
- The establishment of a Category 62 'Solid Waste Depot', as a resource recovery facility and Class 12, and Class 67a for processes required for the remediation project;

- The design of all waste recovery and processing activities to meet regulatory authority requirements for dust and noise control and state sustainability objectives;
- The completion of the remediation and bulk earthworks, including sand (capping) to completion;
- The employment of suitable qualified environmental and geotechnical consultants to monitor the works.
- Reporting the ongoing status of the project and delivering a Final Report to certify the Site as *“remediated fit for designated use”*

6 SITE IDENTIFICATION & INFORMATION

Site identification details are summarised in Table F below. An updated DER Site Summary Form and the CoT for the Site is presented in Appendix A.

Table F: Site Identification

Site Name:	Adelaide Street Remediation (ASR).		
Site Location:	Lot 20 Adelaide Street, Hazelmere, Perth, WA.		
Certificate of Title:	Current Certificate of Title (CoT)		Vol: 2054 Folio: 299
Coordinates of Lot Boundaries ***(the Site is a unusual shape, see figure 1)*** **MGA94 Zone 50**	**Direction**	**Co-ordinates**	
	NW (corner)	Easting Northing	**0406595** **6467321**
	NE (corner)	Easting Northing	**0407034** **6467190**
	NE (Corner Mid)	Easting Northing	**0406939** **6467172**
	SE (corner)	Easting Northing	**0407015** **6466812**
	SW (corner)	Easting Northing	**0406476** **6467046**
	E (corner)	Easting Northing	**0407078** **6467020**
Site Area	The Site dimensions measure approximately 565m (L) and 300m (W) Approximately area 169,500m^2 (16.9ha.).		
Site Owner	Wasterock Pty Ltd.		
Operations	The Site is a closed landfill.		
Local Government	City of Swan.		
DER Classification	Contaminated – Remediation Required.		
Current Zoning	The study site is currently zoned Rural.		
Proposed Zoning	The study site is proposed to be zoned Commercial/Industrial – Post Remediation.		
Locality Map	See Figure 1.		

6.1 Environmental Site Setting

The Site is an irregular shaped plot of land that has remained redundant and non-operational as a landfill since c.1997. The Site has been allowed to vegetate and stabilise from its closure to the present date. Much of the Site is overgrown with a variety of persistent introduced flora and some juvenile and semi-mature trees. The Site could be described currently as waste land and undeveloped. The Site measures approximately 565m in length and 300m in width with a total combined area of approximately 16.9ha.

Within the non-land filled area of the Site along the western boundary, the surface appears to have a generally flat topography that ranges between approximately 26.69m Australian Height Datum (AHD) in the southwest corner, sloping gently upwards to approximately 27.24m AHD in the northwest corner. (c.1990 site survey). The original surface levels have been altered due to historic sand mining at the Site and its subsequent historical landfill (Parsons Brinkerhoff, 2006). The Site has been surveyed by the client (Figure 5).

In general, the surrounding environs of the Site are semi-rural. However, there are several neighboring operations and items of note which are discussed in the following sections of this report.

The Site is bound to the north by undeveloped land and an operational equestrian stable which includes an oval trotting track. Several stables were also noted and several annex/out buildings were observed. In addition several vehicles for horse transportation were noted. The grounds were not sealed. They were covered with rolled aggregate for vehicle access.

The east of the Site is bound by the Roe Highway (running north to south). In addition, on the south-east boundary of the Site, there is an operational sand quarry and landfilling operation.

To the south, Adelaide Street runs south-east to north-west, bounding the High Wycombe residential estate. Future operations on the subject Site may have the potential to impact on neighboring residents. Consideration will be applied during the conceptual site model of the Site and at the environmental design stage for monitoring.

Immediately to the west of the Site is an ice works and meat processing works. Furthermore, there are several undeveloped lots of land interspaced with small industrial/commercial premises surrounding the Site. At present it is perceived that these industrial/commercial operations have little impact or influence on the subject Site. However, future operations on the subject Site may have the potential to impact on those neighboring sites. Consideration will be applied during the conceptual site model of the Site and at the environmental design stage for monitoring.

7 ENVIRONMENTAL PERFORMANCE & ASSESSMENT LEVELS

MDWES will implement the environmental management plan set out within this document for the full duration of the earthworks and remediation of the Site. MDWES will maintain a watching brief and execute the environment monitoring program. The Information and data obtained during the monitoring program with be presented periodically to the Client. This information will also be relayed to the appropriate authorities and appointed Contaminated Sites Auditor ensuring environmental compliance throughout the project.

7.1 Reporting

The client has estimated that the operation to fully remediate the Site could take four to five years to complete. Therefore, as part of the environmental monitoring program, MDWES will periodically present reports based on the findings.

The periodical reports will be issued to the client and authorities over seeing the project for comment and consideration. <u>If there are any environmental non-conformances or breaches identified in these periodical reports, an interim report will be issued detailing the requirements and breaches of the management plan with recommendations and solutions</u>.

7.2 Frequency of Sampling and Reporting

MDWES will periodically present reports of the results taken on site as the project progresses. The following discusses each report.

- **<u>Monthly Environmental Site Report</u>** – This report will present information and results relating to Soil and Air (plus groundwater), bi-annually monitored for this period. The report will include non-conformances or environmental issues that have arisen on site. It will collate and provide information on what has occurred on site, sample frequencies and observations from the month inclusive of suggestions and conclusions.

The monthly Environmental Site Report will detail and include the following:

- **<u>Weekly Air Monitoring Report –</u>** The letter report will collate and report information and results from the daily air monitoring program for dust and ACM material. The results will be issued weekly to allow for the prompt review of site procedures and, if required, safety measures for any exceedances of ACM fibres or dust matter found. The report will detail a weather report and the laboratory data. Air monitoring filters would be sent to a NATA accredited laboratory for certificated analysis and reporting daily.
- **<u>Weekly Noise Monitoring Report -</u>** The letter report will collate and report information and results from the daily noise monitoring on site. The report will be issued weekly. A review of site procedures and required safety measures of any noise exceedances will also be discussed.
- **<u>Weekly Soil Monitoring Report -</u>** The report will collate and report information and results from the daily soil sampling program. The report will be issued weekly to review the soils that have been screened for use on site. These samples will be sent to a NATA accredited laboratory for certificated analysis and reporting.
- **<u>Bi-Annual Groundwater Monitoring Report –</u>** Continuation of the groundwater monitoring program will be presented in a bi-annual report that will collate and report information and results from the groundwater quality monitoring program. As part of the on-going groundwater program any fluctuations or changes within the groundwater will be compared against established data. These samples will be sent to a NATA accredited laboratory for certificated analysis and reporting.

If there are any breaches observed prior to any of the reports being presented a letter will be sent advising of the breach and requirements of the client to mitigate the issue.

7.3 Adopted Assessment Criteria

The information gathered during the environmental monitoring program will be compared against current assessment criteria. Table G below, summaries the adopted environmental assessment criteria. This will be used to assess environmental performance during the scope of works.

Table G: Environmental Performance Assessment Criteria.

Testing Media	Analytes	Comparable Assessment Criteria /Levels	Reference Document
Groundwater	**Chemical Properties** ▪ Metals ▪ TPH/TRH ▪ BTEX ▪ Phenols ▪ OC/OP	Fresh waters Domestic non-potable groundwater use. Short Term & Long term Irrigation. Drinking Water & Aesthetic Waste	Assessment Levels for soils, sediment and water (DER, 2010)
Soil Amendment	**Chemical Properties** ▪ Metals ▪ TPH/TRH ▪ BTEX ▪ Asbestos	Assessment Criteria - HIL (F) for Hydrocarbons & Metals Waste Acceptance Criteria (Accept Class I only) NEPM 2013 HILS for Metals CRC Care HSL for Volatiles Technical Report No.10. (also see air)	Assessment Levels for soils, sediment and water (DER, 2010) Bioremediation of Hydrocarbon-contaminated Soils in Western Australia (DER, 2004) NEPM 2013 (HILs) CRC Care Technical Report No.10
	Acid Sulfate Soils	SPOCAS or SCR analysis	Assessment Levels for Soils, Sediment and Water (DER, 2010)
	Asbestos	0.05% w/w (commercial)	Guideline for the Assessment, Remediation & Management of Asbestos Contaminated Sites WA (2009)
Remediation of Landfill Soils	Chemical Properties ▪ Metals ▪ TPH/TRH ▪ BTEX ▪ Asbestos	Assessment Criteria - HIL (F) for Hydrocarbons & Metals Waste Acceptance Criteria (Accept Class I only)	Assessment Levels for soils, sediment and water (DER, 2010) and Bioremediation of Hydrocarbon-contaminated Soils in Western Australia (DER, 2004)
	Asbestos	0.05% w/w (commercial)	Guideline for the Assessment, Remediation & Management of Asbestos Contaminated Sites WA (2009)
Air Quality (on Site)	Asbestos Fibres	0.1 fibres/mL	Guideline for the Assessment, Remediation & Management of Asbestos Contaminated Sites WA (2009)
	General Dust ▪ Silica	PM_{10} - 50 µg/m3 $PM_{2.5}$ - 25 µg/m3 TSP 24 hour exposure	NEPM
	Heavy Metals	Air Quality Assessment Criteria	Work Safe
	Volatile Organic Compounds (VOCs)	CRC Care HSL for Volatiles	NEPM (2011) Technical Report No.10.

Offsite Air Quality	Asbestos Fibres	0.01 fibres/mL	Guideline for the Assessment, Remediation & Management of Asbestos Contaminated Sites WA (2009)
	General Dust	10,000 µg/m3 (8hrs)	NEPM
Noise	Noise Levels	60 dB(A)	Environmental Protection (Noise) Regulation 1997 (EPA, 1997)

7.4 Regulatory Guidelines

Relevant legislations, guidelines and standards used or referred to in preparation of the ESMP and SMP documents are:

- Environmental Protection Regulations 1987.
- Environmental Protection (Noise) Regulations 1997.
- Environmental Protection (Controlled Waste) Regulations 2004.
- Guidance Statement for Remediation Hierarchy for Contaminated Land (Environmental Protection Authority, 2000).
- Risk Assessment in Contaminated Site Assessment and Management (DER, 2006).
- Development of Sampling and Analysis Programs (DER, 2001).
- Assessment Levels for Soil, Sediment and Water (DER, 2010).
- Bioremediation of Hydrocarbon-contaminated Soils in Western Australia (DER, 2004)
- Reporting of Site Assessments (DER, 2001).
- Community Consultation Guideline (DER, 2006).
- Landfill Waste Classifications and Waste Definitions 1996 (As Amended DER 2009).
- Draft - A Guideline for the Development and Implementation of a Dust Management Program (DER, 2008).
- Guidelines for the Assessment, Remediation and Management of Asbestos Contaminated Sites in Western Australia (DoH, 2009).
- Occupational Safety and Health Management and Contaminated Sites Work (Commission of Occupational Safety and Health, 2005).
- Australian Standard AS/NZS 4801-2001 Occupational health and safety management systems - Specification with guidance for use.
- Australian Standard AS 1319-1994 Safety signs for the occupational environment.
- Australian Standard AS 1940-2004 The storage and handling of flammable and combustible liquids.
- Australian Standard AS 3780-2008. The storage and handling of corrosive substances.
- CIRIA Guidelines C665 (UK) – Assessing Risk Posed by Hazardous Ground Gases to Buildings.
- CRC Care – Technical Report No.10 – Health Screening Levles for Pertoleum hydrocarbons in soil and groundwater.
- NEMP Guidelines, Schedule B1 (2013)– Investigation Levels for Soil and Groundwater.

8 RISK ASSESSMENT

8.1 Human Health Risk Assessment

This Health Risk Assessment (HAS) has been undertaken utilising the NEPM Health Risk Assessment Framework. The framework provides guidance on conducting HRA in relation to contaminated land. A key objective of the framework is to determine tolerable levels of contaminants in soil and groundwater that are protective of public health and ecosystems, with the focus on chronic risks.

It should be noted the NEPM HRA Framework was amended in May 2013, which saw a number of Schedule B Guidelines updated. There is a 12 month transition period for the implementation of the revised NEPM in Western Australia.

This risk assessment draws on the following Schedules for guidance:

- Schedule B4: Guideline on site-specific health risk assessments.
- Schedule B5: Guideline on ecological risk assessments.
- Schedule B7: Guideline on Community Engagement and Risk Communication.

8.2 Risk Assessment methodology

The Risk Assessment Framework seeks to identify site issues such as:

- Why is the assessment being done?
- Is a risk assessment the right type of decision making tool?
- Who and what are stakeholder objectives?
- What information is needed?
- What are the sources of contamination and the hazards?
- What exposure pathways should be investigated?
- What decisions need to be made and when?

With the above issues identified, a preliminary Conceptual Site Model (CSM) has been developed which assists in the collection and analysis of relevant site data. Uncertainties have been evaluated and the CSM revised. With a working CSM in place, more detailed toxicity and exposure information will be evaluated to further characterise risk and this knowledge will be used to keep the local community and stakeholders apprised of the risks associated with the Site and its management.

8.3 Tiered approach

There are three tiers to the risk characterisation process.

Tier I **<u>Screening risk assessment</u>**

Compares measured concentrations of contaminants at the Site against previously published investigation levels (including HILs and EILs). HILs are scientifically based, generic assessment criteria. Each HIL should embody a margin of safety such that there is no appreciable risk for exposures for the relevant scenarios, A – D.

Tier 2 **<u>Intermediate risk assessment</u>**

A Tier 2 assessment will be used when there is no Tier I criteria or concentrations exceed Tier I published values.

If the Site setting and exposure scenario significantly differ from the assumptions that underlie the Site assessment levels, it may be necessary to adjust the soil and water assessment levels and to develop modified generic assessment levels which more closely reflect the exposure scenario.

Tier 3 **Detailed (site-specific) risk assessment**

Carried out when Tier I screening risk assessment and/or Tier 2 intermediate risk assessment does not, or cannot, adequately assess the level of risks present at the Site. It involves developing site specific investigation or response levels for contaminants where generic assessment levels are not available or are not appropriate for the Site.

9 CONCEPTUAL SITE MODEL & RISK ASSESSMENT

A Conceptual Site Modal (CSM) and Risk assessment is required to assess the interconnections between the Contaminants of Potential Concern (CoPC), exposure pathways and potential receptors (source > pathway > receptor model). A conceptual site model of the Site is presented in Figure 6.

A conceptual site model (CSM) describes the possible pathways by which exposure to potential contamination may occur. For exposure to occur, a complete pathway must exist between the source of contamination and the receptor (Source-Pathway-Receptor) (i.e. the person or ecosystem components potentially affected or harm can be caused by the contamination).

A risk may only exist where a plausible SPR linkage is present, and where the quantity or concentration of a contaminant is sufficient to pose harm. Under the statutory definition, “contamination” may only strictly exist where contaminants pose a risk of harm to a receptor. Risk may be defined as a function of the magnitude and severity of any adverse effects arising from contamination. Where the exposure pathway is incomplete, exposure cannot occur, leaving no risk via that pathway.

An exposure pathway will typically consist of the following elements:

- A source of contamination (i.e. a leak or spill, particulates).
- A release mechanism (i.e. migration in soil, leaching to water, emission to air).
- Retention in the transport medium (i.e. soil, groundwater, surface water or air).
- An exposure point (i.e. where a person(s) come into contact with contaminated dust, soil or contaminated groundwater from a well or in a building overlying volatile contamination.
- An exposure route (i.e. inhalation, ingestion, absorption through the skin).

9.1 Contaminants of Potential Concern

As part of the CSM, consideration was given to Chemicals of Potential Concern (CoPC) which have been identified on site. This was discussed in section 2.6 and is based on historical environmental information. The DER Contaminated Sites Management Series: *Potentially contaminating activities, industries and land uses (2004)* provides guidance as to possible CoPC’s based on land-use. With reference the DER document, the following Table (H) details the potential contaminants.

Table H: DER defined potential CoPC for a Landfill

Industry, Activity & Land Use	Common Contaminants that might be encountered
Remediated Material	Dependent on Landfill Type and waste disposed the following could be encountered: • Polychlorinated Biphenyl’s • Alkanes • Sulfides • Metals • Organic Acids • Nutrients (i.e. nitrogen & phosphorus) • Total Petroleum Hydrocarbons/ Total Recoverable Hydrocarbons (TPH/TRH) • Polycyclic Aromatic Hydrocarbons (PAH) • Ammonia • Landfill Gasses (e.g.: methane) • Total Dissolved Solids (TDS) • Monocyclic Aromatic Hydrocarbons (MAH) (e.g.: benzene, toluene, ethyl benzene & xylene). • Asbestos • PCBs • PAHs in soil and groundwater • TDS, nutrients, organic acids and sulfides in groundwater

9.2 Identified Contaminants of Potential Concern

On the basis of the information detailed in Table H and the historical information obtained from site investigations, it is concluded that the CoPC's which will be monitored during the remediation works will be similar to those detailed in Section 2.6 for Air, Soil and Groundwater.

Soil

- Total Petroleum Hydrocarbons (TPH)
- Monocyclic Aromatic Hydrocarbons (MAH's)
- Asbestos
- Heavy Metals

Groundwater

- Dissolved and Total Metalloids: arsenic (As), barium (Ba), beryllium (Be), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), manganese (Mn), molybdenum (Mo), nickel (Ni), silver (Ag), selenium (Se), vanadium (V), zinc (Zn), and mercury (Hg).
- Benzene, toluene, ethyl benzene, xylene (BTEX).
- Polynuclear Aromatic Hydrocarbons (PAH).
- Monocyclic Aromatic Hydrocarbons (MAH).
- Phenolic compounds.
- Total Petroleum Hydrocarbons / Total Recoverable Hydrocarbons (TPH/TRH).
- Organochlorine and organophosphorous pesticides (OC/OP).

Air

- Total Petroleum Hydrocarbons (TPH)
- Monocyclic Aromatic Hydrocarbons (MAH's)
- Asbestos fibres
- Heavy Metals
- Dust Particulates (TSP, $PM_{2.5}$ & PM_{10})

Land Gases

Generally, land gases will be assessed post-remediation of the Site. As each of the remedatied areas (cells) are completed. Land gas monitoring wells will be established and screened into the deep remediated cell and an ongoing monitoring program will be undertaken. A sufficient time lapse will be given to allow the remediated cells to stabilise and to establish whether any land gases are being generated and the monitoring program will reflect this. The land gas well network will start in the west and will be developed through to the east of the site. This will allow for land gas assessment and data to be gather 6-9 months into the project to completion (4-5 years).

Through the remediation process organic material such as trees, mulch, and garden waste will be removed during screening process therefore reducing or removing a point source for land gas generation from organic matter. Land gas generation will assessed as part of the CSM, but is considered as low risk at this stage as the remediation and engineering of the material is considered to reduce the potential of land gas generation.

This is discussed in Section 18.2, the inclusion of volatile chemicals in the monitoring program will be considered, dependant on findings (including any complaints from local residents), as work progresses.

9.3 Site Risk Assessment

For the purpose of the Preliminary Risk Assessment, risk is expressed as a function of the nature of the source, the sensitivity of a receptor, and the magnitude or likelihood of any associated pathway(s) between the source and receptor.

The source, pathway(s) and receptor are each rated on a ten-point qualitative scale, with the overall level of risk being expressed as a multiple of those ratings. The product of the risk assessment is an overall risk rating. The risk assessment scores and overall risk rating matrix is given in Table I (Below):

Table I: Risk Assessment Matrix

Category	Individual Sources, Pathways and Receptors	Overall Risk Rating *(product of SxPxR)*
Negligible	0	0
Very Low	1	1-4
Very low to Low	1.5	5-7
Low	2	8-13
Low to Moderate	2.5	14-22
Moderate	3	23-35
Moderate to High	3.5	36-55
High	4	56-79
High to Very High	4.5	80-110
Very High	5	111-125

9.4 Site Risk Assessment – Sources

Possible sources of contamination have been identified or discounted as parts of the development of this ESMP. These are summarised on Table J below. The Site has been historically used as an inert landfill and is currently not in operation. Therefore, there are several aspects of this commercial operation which could present a potentially contaminative source.

Table J: Risk Assessment Criteria

Source	Media	Description	Comments	Rating
Known Landfill/ Made Ground (Inert)	Soil	General chemical quality of the Filled Ground.	Possible contaminants include Metals, non-metals, asbestos, organics, (OC/OP), TPH/TRH, PAH and BTEX	High to Very High (4.5)
Potential spills or leaks from drums or fuels stored within landfill	Soil	Potential elevated organic contaminant levels.	Possible contaminants include TPH/TRH BTEX and PAH, factory sludge's and/or farming liquids.	High to Very High (4.5)
Asbestos Containing Material	Soil	Potential cells of asbestos within Landfill	Asbestos & asbestos fibres	High to Very High (4.5)
Asbestos particulates	Air	During excavation the potential liberation of fibres	Asbestos fibres	High to Very High (4.5)
Dust particulates containing metals and silica	Air	During excavation the potential liberation of dust	Dust particulates $PM_{2.5}$ and PM_{10}	High to Very High (4.5)
Potential land gases (on site - engineered landfill)	Gas	Background levels of gases generated from engineered fill	Carbon dioxide depleted oxygen. Methane VOC (unlikely)	Low (2)
Potential odour during excavation.	Gas	Odour from excavated material	Possible sulphur odours	Low (2)

9.5 Potential Receptors

Potential receptors associated with the Site and its redevelopment, identified or otherwise discounted, are summarised on Table K.

Key receptors identified are those affecting human health, in particular the Site workers and the neighbouring residents of the Site. Environmentally, the groundwater should be considered. However, the aquitard on which the engineered remediated cells will be constructed is providing a barrier to the underlying ground water.

Table K: Possible Receptors of Contamination

Receptor	Description	Comments	Rating
Site workers	Persons involved in redevelopment.	Ground works involved during construction. (No imminent plans for development).	High (4)
End users	Occupants of the proposed development. (remediated)	Development is to be zoned commercial/industrial.	Low (2)
Soft landscaping	Areas of planting including lawns, shrubs, trees, etc.	No areas of soft landscaping are planned or it would be very limited.	Low (2)
Building materials	Buried concrete and plastics (underground services) laid in contact with contaminated soils.	The Site will be remediated and the upper soils will be certified clean and below guideline criteria	Low (2)
Adjacent land users	Properties within immediate vicinity of Site.	Residential and commercial properties have been identified.	High to Very High (4.5)
Groundwater	Medium to high Permeability (Bassendean Sand) beneath the Site. However the underlying Guildford Clay acts as an aquitard to the aquifer.	The Site is located over the Leederville Aquifer. But the Guildford Clay restricts potential migration	Low (2.0)
Surface water	Controlled waters within lakes, rivers, and ponds, etc., or coastal waters	Nearest water feature is over 2.0km and are up-gradient	Very Low (1)
Ecological receptors	Sensitive areas of ecological significance as defined under Desk Study	No sensitive areas were identified. However, the Site its self has laid fallow for some time and wildlife may habitat the area.	Low (2)

9.6 Potential Exposure Pathways

The possible exposure pathways are identified as natural and/or man-made pathways for the preferential migration of chemicals of concern in the liquid and/or gaseous state. Potential contaminant migration pathways for the chemicals of concern include:

- Trenches for underground utilities.
- Horizontal groundwater flow in the underlying aquifer.
- Vertical movement through the vadose zone via seasonally induced aquifer fluctuation.
- Vapour migration from a hydrocarbon source.
- Movement of soil-gas through volatilisation from potentially impacted groundwater.
- Dust and fibre particulates being liberated during excavation.

Potential exposure routes for the CoPC within the expected land use scenario include:

- Dermal contact.
- Ingestion.
- Inhalation.

Table L: Potential Exposure Pathways

	Sources						
Receptors	**Known Landfill/ Made Ground (4.5)**	**Potential spills or leaks from drums or fuels stored within landfill (4.5)**	**Asbestos Containing Material (4.5)**	**Dust particulates (4.5)**	**Dust particulates containing metals & silica (4.5)**	**Potential land gases (on Site Made Ground) (2.5)**	**Potential odour (on Site Made Ground) (2)**
Site Workers (4)	Ingestion, dermal contact inhalation (3)	Ingestion, dermal contact inhalation (4)	Ingestion, dermal contact inhalation (4.5)	Ingestion, dermal contact inhalation (5)	Ingestion, dermal contact inhalation (5)	Asphyxiation poisoning explosion (4.5)	Lateral migration, asphyxiation, Inhalation (4.5)
End Users (Remediated) (1)	Ingestion, dermal contact inhalation (1)	Ingestion, dermal contact inhalation (1)	Ingestion, dermal contact inhalation (1)	Negligible (0)	Negligible (0)	Asphyxiation poisoning explosion (1)	Negligible (0)
Soft Landscaping (2)	Plant uptake of contamination (1)	Negligible (0)	Negligible (0)	Negligible (0)	Negligible (0)	Negligible (0)	Negligible (0)
Building Materials (2)	Chemical attack (1)	Negligible (0)	Negligible (0)	Chemical attack (0)	Chemical attack (0)	Chemical attack (1)	Negligible (0)
Adjacent Land Users (4.5)	Ingestion, dermal contact inhalation (5)	Leaching, Lateral Migration (3)	Ingestion, dermal contact inhalation (4)	Ingestion, dermal contact inhalation (5)	Ingestion, dermal contact inhalation (4)	Lateral migration, asphyxiation, poisoning, explosion (1)	Lateral migration, asphyxiation, inhalation (4.5)
Groundwater (1.5)	Leaching, Vertical & lateral migration (3)	Leaching, Vertical & lateral migration (3)	Leaching, Vertical & lateral migration (1)	Leaching, Vertical & lateral migration (1)	Negligible (0)	Negligible (0)	Negligible (0)
Surface water (1)	Leaching, Vertical & lateral migration (1)	Leaching, Vertical & lateral migration (1)	Negligible (0)	Negligible (0)	Negligible (0)	Negligible (0)	Negligible (0)
Ecological Receptors (2)	Leaching, Lateral migration (3)	Leaching, Lateral migration (3)	Ingestion, dermal contact Inhalation (3)	Ingestion, dermal contact Inhalation (3)	Ingestion, dermal contact Inhalation (3)	Negligible (0)	Negligible (0)

9.7 CSM Conclusions

The conceptual site model identified several potential sources from the Site's historical land use as a landfill. Equally, several pathways were identified from potential leaks and migration from hydrocarbon sources through the soil matrix which could migrate into the groundwater. In addition, inhalation, ingestion and dermal contact from dust particulates and asbestos fibres have also been identified.

A numerical analysis has been adopted for the assessment of risk (see Table I), expressed as the multiple of likelihood and severity (*Source x Pathway x Receptor*). The categories have been calculated and rated and are presented in Table M with regard to risk levels. A summary of the numeric risk assessment is given in the following matrix:

Table M: Summary Conceptual Model and Environmental Risk Assessment

		Sources						
		Known Landfill/ Made Ground (4.5)	Potential spills or leaks from drums or fuels stored within landfill (4.5)	Asbestos Containing Material (4.5)	Dust particulates (4.5)	Dust particulates containing metals & silica (4.5)	Potential Land Gases (on Site Made Ground) (2.5)	Potential odour (on-Site Made Ground) (2)
Receptors	Site workers (4)	High	High	High to very high	High to very high	High	High	High
	End users (Remediated) (1)	Very low to low	Very low to low	Very low to low	Negligible	Negligible	Very Low	Negligible)
	Soft landscaping (2)	Low	Negligible	Low	Low	Negligible	Negligible	Negligible
	Building materials (2)	Low	Negligible	Negligible	Negligible	Negligible	Very low to low	Negligible
	Adjacent land users (4.5)	High to very high	High	High to very high	High to very high	High to very high	Low	High
	Groundwater (1.5)	Low to Moderate	Low to Moderate	Low to Moderate	Low to Moderate	Negligible	Negligible	Negligible
	Surface water (1)	Very low to low	Very low to low	Negligible	Negligible	Negligible	Negligible	Negligible
	Ecological receptors (2)	Moderate	Moderate	Moderate	Moderate	Moderate	Negligible	Negligible

Following this approach, it can therefore be seen that as a variety of potential risks may affect various targets from possible 'contamination', an overall designation of **high** qualitative risk has been assigned to the Site. This rating reflects the linkages between the contaminated material and the Site workers and off-site residents.

The detailed assessment has been made in for each contaminant with a source-pathway-receptor linkage. The aim of the ESMP and the sampling on-site is to reduce these risks from the model. The easiest way to limit the pathways to the receptor is to introduce mitigating and control measures to reduce the environmental impact.

A review of the conceptual site model and matrix suggests Tier I screening risk assessment will sufficiently characterise the Site. With the exception of exposure to airborne asbestos fibre, all likely risks at the Site are such that the risk to human health is considered acceptable as long as there is environmental management. Risks from exposure to airborne dust and fibre at the Site can be significantly reduced via active air management control measures.

It should be noted that upon the complete remediation of the Site, where the post monitoring is completed the CSM should be revisited. Once remediated, the revised risk assessment CSM will presume to have a considerably lower risk rating due to the sources of contamination being removed and operational works no longer a cause of dust generation. Assessing and reviewing this CSM would be beneficial to see if the remediation and engineering of the landfill has reduced the risk drivers and reduced the overall risk assessment of the Site which in all probability will at this stage.

10 COMMUNITY CONSULTATION

A Community Management Report has been prepared by Greg Rowe & Associates (GRA) (August 2012) on behalf of Wasterock Pty Ltd, entitled *Community Management Strategy for Remediation of Site*. The following sections highlight some of the points of the report. A fully copy of the Community Consultation Report is presented in appendix B.

The community consultation plan is in accordance with the DER's *Reporting of Site Assessments Guidelines 2001* and the *Contaminated Sites Management Series Community Consultation Guidelines 2006*.

10.1 Deciding Stakeholders

Stakeholders will be invited to participate in the community consultation process. They have been identified based on the nature of contamination and the Site's location. The following factors have guided the choice of stakeholders:

- Proximity of the Site to local residents in High Wycombe.
- Known contaminants on site (i.e. asbestos, hydrocarbons and heavy metals).
- Ground water flow direction (North West away from High Wycombe residents).
- Location of the Site on the Municipal boundary of the City of Swan and Shire of Kalamunda.

10.2 Stakeholders

The following is a list of stakeholders who should be informed as to the remediation work being undertaken on site and be invited to participate in community consultation:

- Residents south of Adelaide Street, north of Benson Way, in the residential suburb of High Wycombe.
- Residents north of Adelaide Street, south of the Great Eastern Highway Bypass, east of Stirling Crescent and west of Roe Highway in the suburb of Hazelmere.
- Residents on the eastern side of Roe Highway, north of Adelaide Street, west of Midland road and south of Talbot Road in the suburb of Hazelmere.
- Any resident groups/community associations within the above mentioned residential localities.
- The appointed contaminated sites (DER approved) auditor, Charlie Barber from Australian Environmental Auditors (AEA).
- City of Swan Technical Officers (Planning and Health Departments) and elected members (Ward Councilor/s and Mayor).
- Shire of Kalamunda Technical Officers (Planning and Health Departments) and elected members (Ward Councilor/s and Mayor).
- Technical Officers from the Health Department and Department of Planning.
- State Government Midland electorate MLA (Michelle Roberts).
- State Government Forrestfield electorate MLA (Nathan Morton).
- State Government East Metropolitan Region electorate MLC (Ms. Donna Evelyn).
- Department of Environment Regulation (DER).
- Department of Health (DoH).

10.3 Level of Community Involvement

Table N below has been adapted from the WA DER 2006 Community Involvement Framework. The matrix can be used to help guide the selection of the appropriate level of consultation.

Table N: Selecting the Level of Community Involvement

Assessment Questions	V. Low	V. Low to Low	Low	Low to Moderate	Moderate	Moderate to High	High	High to Very High	Very High
Perceptions of persons <u>external</u> to the proposal (the community)									
What is the level of existing controversy (current) surrounding this type of facility?									
How significant are the potential impacts to the community?									
What is the level of significance of this issue to the major stakeholders?									
What level of involvement does the community appear to desire?									
What level of involvement do key stakeholders appear to desire?									
What is the probable level of difficulty in solving the issue?									
Perceptions of persons <u>internal</u> to the proposal (the proponent)									
What is the required level of public input?									
What is the potential for the number of actively involved stakeholders to balloon?									
To what degree does the public appear to want to be involved?									
What is the potential for the public to influence the potential outcome?									
How significant are the possible benefits of involving the public?									
How serious are the ramifications of not involving the public?									
What is the possibility that the media will become interested?									
What is the likelihood that decision-makers will give full consideration to public input?									
What is the likelihood that adequate resources will be made available to support community involvement?									
What is the likely level of political controversy on this issue?									

On the basis that the level of community consultation required is **high** and no off-site receptors have been confirmed as being affected (to date), a community consultation plan has been developed and been issued by GRA.

10.4 Consultation Strategy

The community consultation will take place over several phases. The following detailed the stages of development. These notes are taken from the Community Consultation Plan by GRA.

The initial fact sheet or brochure will indicate what steps are anticipated in the remediation process, work periods, and further community consultation. The fact sheet or brochure should be accompanied with a comment form to encourage two-way communication, allow comments on the proposed remediation strategy and determine the extent of future community consultation.

At the same time, as the fact sheet is released, newspaper and online advertising on the City of Swan and Shire of Kalamunda websites will occur. Newspaper advertising will be brief and direct stakeholders to the City and Shire's website for further information. Online advertising will provide the same information as the fact sheet and allow stakeholders to make comments online that will be directed to Wasterock Pty Ltd for consideration and response. If required, MDWES will be consulted by the landowners with regards to environmental concerns and comments.

Feedback from stakeholders following initial consultation (i.e. fact sheet and advertising) will be used to assist and refine the remediation strategy. The consultation will also determine the next phase of consultation and may assist to determine points of contact within the community.

The next phase of consultation will involve either one relatively large public meeting or smaller meetings with specific stakeholder groups.

If a range of individuals with different issues respond to the fact sheet and advertisement, then one public meeting will likely be organised to allow all individuals to be involved. At the public meeting the preliminary investigations and proposed remediation strategy will be discussed. Specialised members from the project team will attend the public meeting, present on certain aspects if necessary and then be available to answer questions from stakeholders. The feedback from this meeting will be documented and used to help refine the remediation strategy as required.

If it becomes clear following initial consultation (i.e. fact sheet and advertising) that there are certain groups or resident associations with similar issues, smaller meetings with specific stakeholder groups will be considered. Again, these meetings will be attended by members of the project team who will address any issues raised by stakeholders. Feedback from these meetings will be documented and used to modify the remediation strategy. If required, MDWES will liaise with the DER and auditor to update the remediation strategy as required.

Following the public meeting or small stakeholder group specific meetings, a written and online update will be provided to summarise the results of the consultation sessions. Once the remediation works begin, periodic updates online and to points of contact within the community will be issued on a regular basis (e.g. every 3 months), highlighting the progress of remediation work and expected timeframes. During the remediation process, any complaints will be directed to the City of Swan and Shire of Kalamunda. All complaints will be forwarded to Wasterock Pty Ltd who will consult MDWES if environment related. MDWES will register the complaints with the DER and local authority and take any necessary action and respond to all complainants.

Once the remediation process is complete, a final notice will be issued to stakeholders and confirmation advertised online. At this stage, a review of the community consultation process will be undertaken. Community feedback will be requested when the final notice of completion is issued to stakeholders. Community feedback will also be requested at the online source.

10.5 Consultation Program

The Consultation Program has been prepared in accordance with the Contaminated Sites Management Series Community Consultation Guidelines 2006. Table O summarises the program set out by GWA.

Table O: Timetable of Community Consultation Program

<table>
<tr><th>Media</th><th>Process</th><th>Timeframe</th><th>Outcomes</th></tr>
<tr><td>Leaflet/Brochure</td><td>Initial fact sheet / brochure drop to selected stakeholders.

Requesting comment regarding remediation process.</td><td>Allow 3 weeks for stakeholders to respond (writing) to fact sheet / brochure.</td><td>The comments received may impact the Site Remediation Program (SPR) and future consultation.</td></tr>
<tr><td>Advertisement</td><td>Advertise in local newspaper and on-line of proposed remediation works and request comments on proposed strategy.</td><td>Allow 3 weeks. To run concurrently with fact sheet / brochure release.</td><td>The comments received may impact the Site Remediation Plan (SRP) and future consultation.</td></tr>
<tr><td>Governmental & Local Authorities meeting</td><td colspan="3">• SPR is finalised and lodged with the DER (if amendment is required).
• An allowance of 3 working weeks to amend SPR and lodge with DER.
• A 4 month allowance for the DER to assess and approve.</td></tr>
<tr><td>Public meeting</td><td>Public meeting or stakeholder specific meetings to present on issues and address stakeholder concerns</td><td>Public meeting or stakeholder specific meetings to occur 7 weeks following fact sheet / brochure release. This will allow approximately 4 weeks to review initial comments received and organise meetings.</td><td>Comments and concerns raised during the meetings may impact the SPR</td></tr>
<tr><td>Governmental & Local Authorities Meeting</td><td colspan="3">• Liaising with the DER regarding Community Consultation, SPR may be amended.
• An allowance of 3 working weeks to liaise with the DER and amend SPR if required.
• A 3-4 months allowance for the DER to assess and approve.</td></tr>
<tr><td>Periodic community meetings</td><td>SPR is agreed and remediation of the Site begins. Updates on progress and timeframes are provided online and to points of contracts in the community.</td><td>Every 3 Months</td><td>Community Is Informed</td></tr>
<tr><td>On-line</td><td>Complaints register is made available to the community for comment</td><td>Duration of project (3-4 Years)</td><td>Stakeholders are Informed</td></tr>
<tr><td>Advertisement & on-line advertisement</td><td>Remediation is complete. Final notice is issued to stakeholders and advertised.</td><td>1 week</td><td>Confirms to stakeholders the completion of remediation</td></tr>
<tr><td>Public meeting</td><td>Community Review, a request for comments on consultation undertaken. Sent with final notice.</td><td>Allow 3 weeks for stakeholders comments</td><td>Comments will be taken under consideration for future projects with community consultation.</td></tr>
</table>

Note: These are approximate time frames and could be subject to change depending on any ongoing matters.
Note[2]: The Auditor will be provided with information and data received as part of the auditing process.

11 ENVIRONMENTAL MANAGEMENT – SITE

A Site Management Plan (SMP) has been developed by Wasterock Pty Ltd which is presented in Appendix C. The SMP details the roles and responsibilities of the parties involved and what is to be undertaken for the duration of the Site remediation project.

The Wasterock SMP goes into more detail with regards to operational and regulatory procedures during the Sites operations. This includes, but is not limited to, responsibilities of managers, first aid procedures, occupational health management, site traffic management and site reporting procedures. For further information on site management, reference should be made to the Wasterock SMP in appendix C.

Within the SMP, reference is made to the environmental requirements. This ESMP by MDWES expands further on the environmental requirements and the required sampling program for the duration of the remediation project.

11.1 Mitigating Procedures

The following details the mitigation procedures for reducing the potential risks to site workers and off-site residents for the exposure to ACM and/or contaminated soils.

Due to the operations on-site it is recommended that "Red" and "Green" zones are set up to denote go or no-go areas for certain site workers.

Green areas will be areas were PPE will be standard site safety equipment that conforms to contractors Health and Safety requirements for site workers.

Those site workers required to work within the Site where the excavation and remediation is taking place (Red Zone) will require full PPE requirements, as set out within this document (Section 11.3).

Further environmental mitigation of impacts from soils will come through dust suppression techniques and good soil management, through sampling of air, soil and water for the duration of the project. This is further expanded in the following section.

11.2 Site Operation Hours

The Site will operate from Monday to Saturday each week. The Site will be closed on Sunday and public holidays. The following table P denotes the operational hours of the Site.

Table P: Operational Hours

Day	Opening Time	Closing Time
Monday to Friday	07:00 am	17:30pm
Saturday	08:00 am	16:00pm
Sunday	Closed	

11.3 Personal Protective Equipment (PPE)

To alleviate possible dust exposure to the Site workers and to mitigate taking any potential fibres off-site the following procedures should be in place.

All site workers entering the **Red Zone** working in and around the excavation should be competent, fitted and trained with the required PPE.

No site worker within the Red Zone should be without the following PPE below. The recommended PPE should be worn at all times and should consist of the following:

- Fitted ½ face mask to be worn (P2 face masks with P3 filters).
- Steel toes wellington boots
- Safety glasses
- Coverall (mechanics overall)
- Hard hat

Once the Site worker has completed their task or if there is a requirement to leave the excavation zone, then the worker would be required to remove any potential ACM fibres before leaving the area. This should be in the form of a wash centre which should consist the following:

- The Site boots worn by the Site workers should be rinsed down or a foot bath should be available before entering the red zone shower block.

- A zone should be set up (red) to allow the Site worker to remove PPE (excluding the mask).
- There should be a receptacle for disposing of spent PPE. The receptacle itself should be disposed of responsibly to a required facility. If reusable coveralls are being used, they should be washed down or laundered professionally to ensure no fibres are transferred.
- The Site worker then takes a shower to remove any fibres (amber) **(the face mask should remain on).**

- Once the shower has been completed, the Site worker can leave the shower area, pick up a towel and enter a Green zone. This area is free from contamination so the Site worker can put on clean civilian clothes/or correct clean site PPE.

NB: The zones (red/green) should flow and there should be no break with negligible chance of cross contamination within the decontamination zones and safety precautions in place for the Site worker. Each zone should be separate and sectioned off to reduce the risk of cross-contamination.

Workers should de-contaminate fully for breaks (toilet/lunch/smoking) under the procedures outlined above if moving in-and-out of the red and green zones.

11.4 Hydration and Breaks

As part of the Site operations it may be necessary for site workers to have breaks for hydration and sustenance.

Regardless of how site operations are planned with regards to staggered lunch breaks or ‘en mass’ crib breaks, any Site workers moving in and out of red/green zones should remove/replace all PPE and undertake the procedure out lined in section 11.3

With regards to hydration and taking on board liquids whilst working within the excavation areas, the following points could/should be adopted:

- An area away/remote from the excavation should be set up. This area should be enclosed, both fenced and shrouded or in a sea container and should be screened off and protected from dust or erroneous fibres.
- The drink packs should be hung up and not allowed to rest on the ground or bench.
- Drink dispensing tubes should be tucked away or capped so fibres or particulate matter do not get on the area where the mouth will touch.
- **All PPE is to remain on at all times.**

- The Site worker will use an antiseptic wipe to clean the end of the drinks tube and the chin just under the mask to ensure no ingestion of fibres.
- The drinks tube should then be fed under the mask allowing the Site worker to take onboard liquids (therefore, a minimum gap should be observed under the mask). The mask must not be pulled up to rest on the head as fibres may be transferred to the inside of the mask.

11.5 Perimeter Fencing

To alleviate probable dust exposure to the sensitive receptors adjacent to the Site (residents), and to abate noise during remediation, a bunded fence has been proposed along Adelaide Street. A soil bund is to be constructed approximately 2.0m in height with a 1.8m security fence, which will be shrouded. This will act as a block to winds and noise (proposed bund/fence is shown on figure 7)

The fence has been designed to reduce wind flow from the Site on to publicly accessible areas and the properties of neighbouring residents.

- A soil bund will be engineered along Adelaide Street. The bund will be matted and allowed to “grass in” for additional stability and will be esthetically pleasing.
- Upon the bund a fence/windscreen will be constructed with tied shade cloth or hessian on the 1.8m security fence.
- The gaps under the fence will be closed off (e.g. sandbags or similar) to reduce particulates and fibres from being released off site.
- Any rips that occur will be tended to and repaired at the earliest convenience.
- The remainder of the Site will be fenced and secured from the general public. The fence will be shrouded and sandbagged to reduce windblown particulates dispersing off site.

These steps will reduce the risk to human health by enclosing airborne particles that may contain ACM fibres within the Site boundary.

There is a proposed internal compound which will separate the offices, car park and workers changing area. These areas will require the construction of shade or hessian cloth tied to fencing with no gaps, to reduce dust-blown material from getting under the fencing from the ***red*** into the ***green*** zones. (Final design of the compound is still being considered and proposed however, these principles still apply to the design of green zone site compound).

It should be noted that within the southern portion of the Site there is a batter/bund which is part of the old landfill. This bund is approximately 5-7 metres in height and runs east to west along through the site. During the remediation works this batter/bund will remain in place as an additional barrier. This barrier will assist visual amenity, noise and wastewater control. As the remediation works move east this barrier will be removed and remediated as required.

11.6 Dust Suppression – excavation

Management of potential ACM concentrations will also incorporate surface stabilisation and dust suppression in the form of water carts with ‘DustX’ or similar. This will be made available for the entire earthworks phase. Dust suppression will be the key to reducing airborne particulates and therefore potential migration.

MDWES has already conducted a study and issued a report on groundwater abstraction through production bores (see MDWES report – Groundwater abstraction for Dust Suppression and Surface Compaction, Oct 2012). The Groundwater Abstraction report is presented in Appendix E. A total of three (3) production bores at a maximum of 15L/sec which is a total of 821.3m^3/day is allowable for abstracted water from the deep aquifer. The use of the production bore water should apply to the following principles.

- Major traffic routes into and around the Site will be paved with either bitumen or crushed concrete to minimise noise and dust generation. Dust suppression and/or cleaning will be required on a regular basis to keep dust to a minimum.
- The landfill excavated area will be thoroughly wetted down every day and periodically with water carts and misting machines.
- Exposed construction areas subject to vehicle and machine movements (Red Zone) will have regular dust suppression. An increased program may be required, particularly in the hotter summer months (November to January) due to drying conditions.
- Before the Site is closed (Sunday and evenings) the last 'dampening down' of the day will occur when excavating has ceased and the workers are out of the excavation. There should also be a concentrated spray/dose of 'Dust-X'. This should be sufficient to limit the liberation of soil particles and any ACM material whilst the Site is closed.
- The excavation face of the landfill will be dampened down periodically with a sprinkler system as the excavation progresses. If required a direct jet/sprinkler system will be used to provide water to a direct spot.

These processes are aimed at mitigating the effects of windblown, dry, loose surface sand and any other material from potentially becoming airborne to transport possible ACM fibres.

11.7 Dust Suppression – machines

The excavated landfill material will require screening to sort and sieve into the desired sizing. This has the potential to generate dust. However, the triple deck screening machine proposed for use will be fitted with a misting system to dampen down the landfill material as it is being crushed, processed and sorted.

The Site excavators and loading machines will also be periodically washed down and cleaned to reduce transposable dust and dust generation.

Site traffic movement in the Red zone should be limited to a maximum of 10km/h or less to limit dust generation.

11.8 Vehicle Wash down

A wheel vehicle wash down bay should be in place on site to reduce and remove soils which have the potential to generate dust. The wheel wash would be on the exit of the Site. Once a truck has unloaded, it should enter the wash down station before leaving site (the wash down is to be located at the exit before entering the public highway or from the site boundary).

A wash down bay should also be considered for vehicles moving from the red zone to the green zone (if a break down occurs, or the vehicle needs to leave the area) this is to remove debris and dust so not to transfer any potentially contaminative soils.

The wash down should collect the waters from vehicles it should then be disposed of in accordance with licenses and guidelines for asbestos and contamination. A geo protection mat or similar should be used to gather any erroneous fibres from the wash down. This mat can be disposed of as waste. The mat will reduce the potential for fibres to become airborne when the wash is not in use or if it dries out. The wheel wash water should be changed on a regular basis therefore reducing the particulate matter and dirt from the waters being transferred.

11.9 Loading & unloading of Soils

Consideration and measures should be in place when loading and unloading the soils into dump trucks. Precautions, such as not to spill or over load the truck and bucket should be practised.

- The loading of soils should involve careful placement and movement of soils from the excavation should be considerate. Buckets should not be over loaded.
- During loading, if dry, soils should be dampened to reduce the likelihood of any fine particles becoming airborne.

11.10 Machine operators and Drivers

Machine operators and truck drivers should minimise the need to get in and out of their cabs. If communication is required between site workers and machine operators, then a 2-way radio system should be adopted to reduce the risk of exposure.

The machines used to operate and excavate in the Red Zone should remain within this area. If the machines need to change or breakdown occurs, then the vehicles should be washed down and cleaned of all debris before leaving the Red Zone.

- The soils should be sufficiently dampened.
- The truck should deploy its cover before moving (if applicable), so that soils are not windblown during transit.
- If truck cover deployment is required in the red zone, the cover should be deployed by a site operative with the relevant PPE on.

  (If the truck driver is not agreeable to this rule, then the truck driver will have to follow the strict PPE guidelines/rules on site. Which will require the driver to wear said PPE to comply with Site policy).
- All machines with a cab operating at the Site will have appropriate filtration systems for air-conditioning systems which will meet asbestos filtration requirements (HEPA) for vehicles.

11.11 Discovery

In the event that soils are identified with ACM or contamination (oil, hydrocarbon) present during earthworks, consultation with the client and MDWES may follow and the requirement for additional soil sampling will be assessed and any risks identified, before the soils are processed or re- used.

Contaminated soil may be kept on site, but should be placed into a covered skip or enclosed. Soils must also be dampened down to reduce airborne particulate from being liberated from the surface if exposed.

12 ENVIRONMENTAL MANAGEMENT – Soil Management

12.1 Objective

The objective of the soil management is to manage excavation works in order to prevent environmental impact and prevent human exposure to contaminated soils whilst being processed. The main purpose of the environmental soil monitoring is to verify that impact and exposure is not occurring from a contamination source. A copy of the Soil Amendment Operational plan is presented in Appendix F

12.2 Overview

Soil management on site will be within two distinct areas. Those soils that have been excavated and processed and which will be repacked as part of the remediation, and those soils brought to site for soil amendment. Soils brought on-site for soil amendment will have to be environmentally assessed to determine their suitability and placement, either within the deep cell or as capping material.

12.3 Excavation Procedures

The historical landfill will be excavated and remediated from west to east within the Site. Sands located along the western boundary of the site have been reported as not being part of the landfill. These sands were not extracted as part of the mining and have remained part of the local natural geology (Bassendean Sands). These soils could be considered clean soils however validation of the sands is required before being removed from site. The removal of the sands subsequently creates the void or cell to begin the process and acceptance of remediated soil material.

The process will progress through the landfill site from west to east, systematically sorting and mining the material. The sorted soil material will then be converted and engineered into re-packaged remediated soils (see 12.5). See figure 8

- Soils excavated at the face of the landfill will be fed into a three deck sieve/sorter and will be sorted into it desired sized material.
- During the excavation process, large over-sized material, unsuitable material such as trees and recyclable material such as steel will be picked out and placed to one side.
- The excavated landfill material will pass through a "grizzly", which grinds up the material into varying sizes see below. Due to the nature of the action dust suppression using on site "misters" will be used to keep down any dust particles.

The Site proposes to complete the following tasks on soil and materials currently onsite:

- The sorting of the current fill into:
  - 'Fines', mechanically screened at 30mm then down to 5mm,
  - 'Medium', mechanically screened at 150mm, and,
  - 'Large", picked and screened at 150mm and larger.
- All excavated soils will be re-packaged to provide the material for the deep cell (<2.0mbgl)
- 'Medium' materials will also be placed into a deep cell with fines material.

All soils from the landfill will be processed and repackaged and will used within the deep remediated cell.

The 'Large' materials extracted are to be crushed and used within a barrier layer only if clean. If the larger crushed materials are "dirty' (contaminated) then they will be placed within the deeper cell. Figure 9 attached shows the life cycle of the soils and the process flow chart.

12.4 Soil Tracking

The contractor will have a soil tracking form (STF) which will be used to manage and monitor the movement and placement of all material being brought into or moved on-site. The STF will:

- Record and document the internal transfer of each soil load, denoting approximate volumes being moved and notations of the origin and destination.
- Monitor movement of materials being brought onto the Site for the SAAF area. It will record each soil load denoting approximate volumes being moved and notating the destination. They will be placed:
  - In a sorting area if the load is mixed or requires treatment (SAAF),
  - In a holding area if treatment or validation sampling is needed before movement or use.
  - To the appropriate area as designated by the Site plan, if validated prior to delivery to site and noted as clean by visual assessment on arrival.

If double handling is required, both the initial and final locations will be noted.

- Provide record of any accidental placement of contaminated material on natural or remediated ground. This includes soil movement as well as chemical or waste spills on site. The corrective action undertaken is to be reported in an Environmental Incident Report form.

The following actions are to be used to effectively manage the movement of material across and into the Site:

- The Site will be classified using a grid format system. The grids will be given relative numbers with the numbers relating to origin and destination of the material being stated on the STF when soil is excavated or moved or brought onto site.
- An initial site induction will be mandatory for all personnel involved with the movement and relocation of the waste. They will be informed of the Site/location of waste and transport routes to be used, as well as the grid system and how this applies to different types of material.
- The boundary of the old landfill (as mapped out in the Site classification plan) will be identified at regular 10m intervals by survey pegs, this will ensure clean and remediated ground is not inadvertently covered with waste by nominating specific areas as yet to be processed areas.

Each incoming truck load of soil (ASS and Class I) will checked by the Site manager or his representative to classify material prior to deposition of material at the Site. A laboratory analysis will be required for each individual source of off-site soil. Only soil from off-site locations with a 'clean' laboratory analysis will be accepted.

Specific unloading instructions are described below:

- Once the material has been classified as clean soil material or soils needing further processing, it will be moved to the appropriate area as designated by the Site Classification Plan. Origin, destination, classification and amount of material being imported should be noted on the STF.
- Trucks are to use an internal track which is to be wide enough to allow the safe passing of vehicles, the track is to be clearly defined with signage where required and kept damp to prevent nuisance dust.
- A speed limit of 30 km/h will apply to all traffic on tracks or roads and 10 km/h for machinery operating off track to reduce dust.

12.5 Engineered Landfill Construction

The proposed remediation follows the construction of the landfill. It comprises the following makeup and is detailed on Table Q below. A detailed schematic of engineered landfill is shown in figure 10.

MDWES will liaise with the client and ensure that validated soils which are assigned to the desired and correct layer.

Table Q: Engineering Remediation & Construction

Depth (m)	Key	Description
G.L – 1.5		Capping Layer – Soil amended from imported soils (ASS + Class I). Only soils brought to site will be used for the capping layer. All soils will be verified and validated and ensured fit for use before being used
1.5 – 2.0		**Marker layer/barrier (Crushed CD Waste)**
3.0 – to depth		Deep cells (stable & Non-Leaching Waste-Excavated landfill material)

12.6 Sampling of soils

A total of 1.7million m^3 of landfill soils are proposed to be processed, sorted and sieved, then repacked as remediated soils.

A proposed total of 1500m^3/day will be processed and the soils will be sorted into stockpiles. All soils processed will be re-used within the deep cell as denoted in Table R.

In addition, soils brought on-site for soil amendment (SAAF) will require laboratory validation to show that the soils are suitable for the topsoil capping layer and end use. All soils brought to site will have the correct documentation and laboratory results showing concentrations. Once soils have been amended (ASS or HI impacted only), these soils will be validated though field screening and laboratory analysis to ensure that they are suitable for use as a capping layer.

12.7 Soil Amendment – ASS Soils

It is intended that Acid Sulfate Soils (ASS) will be brought to site for treatment and are to be used within the capping layer on site (GL to 1.0mbgl). The soils will be delivered to the transfer station for designation to the treatment pad (See soil amendment report in Appendix F).

The soils provided from the offsite source will be accompanied with approved full laboratory documentation to validate and certify concentration levels of the ASS.

The soils will then be transferred to the soil treatment pad located on the eastern boundary of the Site (Cell 6). The ASS soils will be lime dosed and treated to ensure neutralisation of soils. The soils will be tested and validated before use within the capping layer.

12.8 Soil Amendment – Class I waste Soils (Hydrocarbon Impacted)

Class I imported soils, hydrocarbon impacted will be brought to site for treatment and, once treated, are to be used within the capping layer on site (GL to 1.5mbgl). The soils will be delivered to the transfer station, before being tipped on to the treatment pad (Soil Amendment Management Plan in Appendix F).

The soils provided from the offsite source will be accompanied with approved full laboratory documentation to validate and certify that the soils are class I and possibly hydrocarbon impacted.

The soils will then be sorted and transferred to the soil treatment pad located on the eastern boundary of the Site (Cell 6). The soils will be placed into windrows and allowed to volatilise through solar energy gain. The break down of the longer heavy hydrocarbons chains will occur until concentrations have sufficiently reduced (below assessment criteria). The soils will then be used within the capping later of the engineered landfill.

The Class I soils will be tested to ensure that there are no hydrocarbon impacted soils being placed within the capping layer. Treated soils will have to comply and be within DER guideline limit values for environmental use within the capping layer.

12.9 Stockpiling Processed Spoil

If required, because soils are being analysed or waiting on validation, soils will be stockpiled until confirmation and results have been assessed. Soils should be placed immediately within a designated static “Load Zone” which is an area where all soils would be loaded in to before being reused on site within the deep cell. The load zone will be a bunded area possibly a limestone pad.

Soils within the stockpile zone should be suppressed (water, ‘DustX’) for approximately 10mins or until visually very wet. The soils should then be covered and pinned down with a tarpaulin (if possible) to reduce the risks of any errant dry fibres or particles becoming airborne.

All material being excavated will be assessed for visual and olfactory contamination. The material will be relocated to areas as specified on the Site classification map based on this initial assessment.

The stockpile base is to be sampled for validation purposes and remain open with appropriate fencing where required. This is until the "base” is validated via field/laboratory analysis and geotechnical assessment as suitable to receive backfill. A visual/photographic log will be maintained.

All stockpiles will be assigned a number or reference. Each excavation and the resulting stockpiled material should be given a specific label and grid notation to further facilitate the soil tracking process.

12.10 Exporting Soils from site

The location of material that is odorous or aesthetically unappealing will be recorded and documented. Such material will be stockpiled in designated areas as depicted in the Site classification plan, so that classification can be performed and remediation or disposal plan determined. If classified as needing disposal, transportation off-site will be arranged.

Stockpiles of material designated for off-site disposal, as determined by the Contractor or his representative, will be classified in accordance with Landfill Waste Classifications and Waste Definitions (2009)

Material being loaded into trucks for off-site disposal will have to be verified and confirmed by the Contractor or his representative as the material specified on the disposal forms, prior to removal from site.

All contaminated material is to be removed from site in a damp condition to reduce the potential for dust generation and adverse air quality, as per the requirements of the Air Quality Management Plan (AQMP). In addition, the truck should “pull on” cover the soils with its rolled tarp.

All truckloads are to be within legal weight limits when removed from site. Trucks are to be road worthy and operated in accordance with transport regulations.

Roadways are to be kept clean and clear of soil and debris. The Contractor will continuously monitor the road condition at the entrance/exit to the work site and sweep/wash as deemed necessary.

13 ENVIRONMENTAL MANAGEMENT – Resource Recovery

13.1 Objective

The use of the Site's resources to remediate the Site itself will minimise any requirement to transport waste to appropriate waste facilities off-site, or to transport large quantities of sand to site. Although there may be a requirement for off-site disposal for this project, if a resource can be reused and does not have an environmental impact, then Site re-use should be paramount as it is the only cost-effective mechanism for sustainable remediation of the site.

13.2 Overview

Achieving cost effective and environmentally sustainable waste management by:

- Maximising resource recovery and re-use from old landfill waste and incoming recyclables.
- Maximising recycling; particularly of concrete brick, steel and sand.
- Minimising waste generation and offsite disposal.
- Safe management and disposal of all unsuitable and non-recyclables.

13.3 Actions

Identify and categorise all wastes produced across the Site and designate specific storage areas, for each category of recovered resource or waste produced. Ensure appropriate maintenance of these designated areas to prevent unnecessary environmental harm due to exposure to potentially hazardous substances and cross contamination.

The following resource recovery initiatives will be implemented:

- Identify and implement appropriate waste reduction strategies.
- Ensure appropriate re-use, storing, recycling and/or disposal of the following materials:
    - Concrete, brick, sand ferrous and non ferrous metals.
    - Waste oil will be collected for transport and disposal off-site at a suitable facility.
    - Batteries will be collected and transported off-site for disposal at a suitable facility.
    - Tires will be stockpiled for disposal to a suitable facility.
- Perform risk assessments on all storage, transport and disposal of all waste produced.

13.4 Monitoring and Reporting

Monitoring and reporting will include:

- The following resource recovery initiatives will be measured and reported:
    - Resource recovery and re-use from old landfill wastes.
    - On-site soil amendment / remediation of various waste streams.
    - Waste disposal, including the off-site facilities receiving site generated wastes.
    - Resource recovery from incoming industrial waste.
- During site works, the Site Manager will report at quarterly intervals to the Project Manager on the results of the resource recovery monitoring program and other relevant waste management issues.

14 ENVIRONMENTAL MANAGEMENT – ASBESTOS

14.1 Objective

Asbestos has been identified and discussed within each of the environmental management sections of this ESMP and the MDWES AQMP report (March 2014). However, it is felt that a dedicated section for Asbestos discussion is required due to the high risk nature of the material. The objective of the asbestos management is to ensure that any asbestos excavated from the landfill is identified and dealt with in accordance with Department of Health (DoH) current guidelines and standards.

The contractor has a responsibility to ensure that no harm will come to either the Site workers or the neighbouring residents who could potentially be at risk from airborne fibres. The asbestos monitoring is incorporated within the air management plan. In addition, asbestos monitoring within soil is also discussed within the soils management plan.

14.2 Overview

The historical landfill is a known landfill which has accepted 'inert' construction and demolition waste. Although no known asbestos waste has been deposited, this means that some asbestos could be considered present, although the extent and volume cannot be currently quantified. Therefore, the asbestos has to be managed and handled ad hoc, upon discovery, so no further environmental impact occurs. Management of all materials on-site is being classified as potentially containing asbestos or impacted with asbestos. Therefore, management is required to prevent any incidents of unsafe contact with asbestos during site work activities.

14.3 Asbestos Management

Strategies for the prevention of asbestos contact and containment of asbestos material will include:

- Assume the entire/portions of the historical landfill area to be potentially impacted with asbestos.
- All asbestos and asbestos impacted soils are to be placed on-site as deep fill to limit exposure opportunities and eliminate impact of offsite disposal.
- Daily checking of excavation areas by Project Manager to confirm presence/absence of asbestos so as to ensure adequate asbestos controls are being initiated.
- All workers will undergo a site induction, which informs them of the dangers of asbestos, how to recognise asbestos products and the procedures to follow should asbestos be uncovered.
- Conduct asbestos fibre monitoring within the boundary of the Site. The monitoring should be in accordance with the approved dust monitoring procedures established for the Site works.
- Prevent dust emissions by constant wetting of the work area.
- Where asbestos is visibly encountered during remedial activities, the asbestos must be managed by wet down and dust-free excavation, handling and placement as deep fill within the engineered landfill.
- The work area, being the excavation (recovery) area of the old landfill, will be cordoned off and declared as an exclusion (red) zone at all times. This will be achieved by constructing a physical boundary surrounding the work area with physical barriers and coloured warning tape defining the restricted entry status of the work area. The barriers will be at least 10m away from the location of any other active excavations, with warning signs placed at the boundary of the exclusion zone.
- All site personnel must inform the Project Manager immediately if works are not being undertaken according to the management plan and which may consequently have a likelihood of leading to an asbestos exposure incident at the Site.
- The Project Manager will maintain records of any contamination incidents or discovery of any other contaminants, as well as the containment and remediation procedures employed.

15 ENVIRONMENTAL MANAGEMENT – AIR MONITORING

15.1 Objective

The objective of the air quality monitoring is to manage excavation works in order to prevent off-site human exposure to potential dust (TSP PM10, PM2.5), dust containing metals, silica and Asbestos Containing Material (ACM) fibres. On-site exposure will also be alleviated with dust control measures and PPE. The main purpose of the monitoring is to verify that on-site or off-site personnel are not being exposed to elevated levels of contaminates. Although there are no off-site measures, air monitoring along the boundary, coupled with dust control measures, will mitigate any risk posed from fibre or dust deposition off-site. This section should be read in conjunction with the MDWES AQMP (March 2014) Appendix G, which expands upon some of the principles and summaries presented in the following sections.

Dust (as nuisance dust (PM10, PM2.5, metals and silica) and asbestos fibres. These potential contaminants may be present in air if contaminated soils are exposed to drier moisture levels and strong prevailing winds. To validate exposure levels monitoring will be undertaken in two capacities on Site:

- Boundary Monitoring – is established to assess exposure levels and to mitigate any posed risk from asbestos fibres or dust deposition off-site.
- On-site Monitoring - to ensure personnel (on-site) are not being exposed to potential elevated concentrations of dusts and asbestos fibres.

Concentrations will comply with the relevant standards for management (WA EP Act, 1986) and relevant guidelines concerning contaminant concentrations in air, adopted by the WA DEC (2011) and WA DoH (NOHSC/Safe Work Australia, 1995). This measure will reduce the risk to human health for both onsite and offsite receptors from potential airborne concentrations of contaminants.

- Protect life and well being of human and other forms of life, from possible exposure to ACM and other airborne contaminants.
- Comply with relevant statutory environmental requirements – DEC (2011), NOHSC / Safe Work Australia (1995), WA EP Act (1986).
- Provide strategies and contingencies aimed at reducing environmental exposure during earthworks and soil removal activities to possible poor air quality.

MDWES has compiled a comprehensive Air Monitoring Program Operational Report which should be read in conjunction with this report. This report is presented in appendix G.

15.2 Overview

Dust (TSP, PM10, PM2.5 metals, silica) and ACM fibres generally become airborne if soils or material containing them become exposed to drier moisture levels and strong winds, liberating them from the surface. Dust and ACM fibre concentrations will be monitored at six separate locations within the Site boundaries for assessment of off-site exposure levels. In addition, whilst the excavation and remediation progresses, three remote monitoring stations will be positioned in close proximity to the excavation face to assess localised impact.

15.3 Rationale for Monitoring Positions

The positions for the Air Monitoring Stations (AMS) have been determined to provide overall coverage of the Site. See table R below. Consideration has been made to Site workers within the excavation, office-based site workers and neighbouring residents (primarily residents on Adelaide Street). A Tapered Element Oscillating Microbalance (TEOM) located near the south western corner of the Site will provide real-time high quality gravimetric data on fugitive Site emissions. At the same location, a real-time nephelometer will allow for the determination of a calibration factor by comparison of gravimetric and nephelometric data. See figure 11 for monitoring station locations.

Table R: Air Quality Monitoring Program

Location	ID	Analyte				Rationale
		Dust	Asbestos	Silica	Metals	
Boundary Monitoring Stations						
Primary – South West Corner	AMS1					These positions will be on the southern boundary fence to assess any off site migration of particulate matter and/or asbestos fibres that may potentially impact the residents on Adelaide St.
Southern Boundary	AMS2					
Southern Boundary	AMS3					
North East Corner	AMS4					These positions located on the boundary fence to assess any off site migration of particulate matter and asbestos fibres.
Northern Boundary	AMS5					
North West Corner	AMS6					
On-site Monitoring Stations						
Static Station Excavation - Justified*	AMS7					Downwind close to the excavations to assess any windblown matter/site workers potential exposure.
Static Station Excavation – Justified*	AMS8					
Static Station Excavation – Justified*	AMS9					
Crib Room	AMS10					Potential Risks if the hygiene process has not been adhered to.
Personal Monitor 1 (PM1)	AMS11					Exposure to site worker from landfill material.
Personal Monitor 2 (PM2)	AMS12					
Personal Monitor 3 (PM3) - Vehicles#	AMS13					
Personal Monitor 4 (PM4) - Vehicles#	AMS14					
Weather Monitoring Station – Green Zone	WMS1	Meteorological conditions				Provide on-site weather data to verify monitoring locations.

NB: *Sample locations will be positioned and evaluated, dependent on predicted daily (am and pm) wind directions obtained from BOM website each morning.

15.4 Responsibilities

For the full duration of the earthworks, the AQMP Manager or MDWES Environmental Scientist will attend site to maintain and record ACM and dust monitoring equipment daily. (Roles and responsibilities are presented in Table S below) Dust and ACM fibre monitoring will cover a 12 hour period split into two shifts AM and PM. Monitoring will be initiated at the start of work each day until midday (6 hour period). The filters will be changed out and the second shift of monitoring will commence from 1pm until the close of work each day (6 hour period). Upon completion of the monitoring period, the samples obtained that day will be processed and sent for analysis.

The MDWES Environmental Scientist will recover the pumps and filters from the individual dust/ACM Air Monitoring Stations (AMS see figure 11). The stations should be placed down wind and provide good converge of the Site. A station will also be positioned up wind to assess background concentrations for comparison (see figure 11 for location plan).

Meteorological data will be captured continuously (data logger) for the duration of monitoring program from the onsite weather station and local weather station data (BOM). Meteorological data will be obtained from the Commonwealth Bureau of Meteorology site (www.bom.gov.au) and compared with the ACM results in the event of exceedances by comparison with relevant ACM criteria. Consideration will be given for an alert or alarm system, which will be triggered during high or extreme weather conditions, such as high wind speeds, high temperatures and high rain fall, so on and so forth.

The MDWES Environmental Scientist will be responsible for maintaining an air monitoring log with laboratory documentation and Chain of Custody (CoCs) records, together with daily observations including temperature, wind speed/direction and rainfall totals. Some of this data may be analytical or remotely sensed (yet to be determined).

- Ensure field equipment and instruments are operating correctly and are calibrated as per manufacturer and operational requirements.
- Review daily wind and weather forecast as to determine static sampling locations within the excavation zone for that day.
- Ensure MDWES personnel are sufficiently experienced to undertake appointed field tasks and are adequately supported in their role.
- Ensure sample and data collection tasks conform to any relevant guidance documents or standards and are performed as per documented MDWES operating procedures.
- Ensure quality control and assurance measures are appropriately managed and met.
- Analyse field and laboratory data on an on-going basis to determine daily fugitive emissions from the Site and provide predictive trend analysis.
- Liaise with Operations Site Manager to ensure they are fully apprised of fugitive emission concentrations and potential impacts on receptors.
- Liaise with major stakeholders to ensure transparency of the AQMP is maintained.
- Manage all mandatory reporting requirements relating to Works Approval and Licensing Conditions are met.

Table S: Roles and Responsibilities for Air Monitoring Program

Parameter Measured	Sampling Site / Locations	Task	Timing *	Completed by Whom	Analysis
Dust PM10 PM2.5	AMS1,3,4,5,6	Review Data	Daily	AQMP Manager or Environmental Scientist	Review real-time data.
	AMS1,3,4,5,6	Sample collection	Daily for one month	AQMP Manager or Environmental Scientist	NATA accredited analysis of sample within 5 working days.
	AMS3,4,5,6	Sample collection	Once per month (over 3 days)	AQMP Manager or Environmental Scientist	NATA accredited analysis of sample within 5 working days.
Dust TSP, PM10	AMS1	Sample collection	Two, once per week	AQMP Manager or Environmental Scientist	NATA accredited analysis of sample within 2 working days.
	NA	Determine calibration factor for TES 7200's	To suite above sampling	AQMP Manager	Comparison of concurrent nephelometeric and gravimetric data to produce Site specific calibration factor for nephelometers.

Silica Dust	AMS1	Sample collection	Daily	AQMP Manager or Environmental Scientist	NATA accredited analysis within 1 working days
Metals	AMS1	Sample collection	Two, once per Week	AQMP Manager or Environmental Scientist	NATA accredited analysis within 5 working days
Asbestos	AMS1-3	Sample collection	Daily	AQMP Manager or Environmental Scientist	NATA accredited analysis of sample within 24 hours.
	AMS7-9	Sample collection	Twice Daily am: 07:00-12:30 pm:12:30-17:30	AQMP Manager or Environmental Scientist	NATA accredited analysis of sample within 24 hours.
	AMS 10	Sample collection	Daily Mon - Sat	AQMP Manager or Environmental Scientist	NATA accredited analysis of sample within 24 hours.
	AMS 11-12	Sample collection	Twice weekly for one month then schedule reviewed subject to historical results	AQMP Manager or Environmental Scientist	NATA accredited analysis of sample within 24 hours.
	AMS 13-14	Sample collection	Daily for 2 weeks then monthly for 6 months. Schedule to be reassessed after subject to historical results	AQMP Manager or Environmental Scientist	NATA accredited analysis of sample within 24 hours.
Weather	NA	Review BoM and Site data	Daily (am)	AQMP Manager	Forecast likely conditions for sample locations.
	WMS-1	Collect data	Daily	AQMP Manager or Environmental Scientist	Review data, check robustness, check for gaps.
CoPC	MDWES office or Site office	Collate data	Daily	Environmental Scientist	Check QA/QC of data, check robustness, data gaps, and check against assessment criteria.
Reporting	MDWES office or Site office	Report	Weekly Report for the previous week's results	AQMP Manager	Ensure compliance with Works Approval and Licensing Conditions.
Manage Air Quality Issues	MDWES office or Site office	Variable	As required	AQMP Manager	NA

A general description will be included for each fixed monitoring station or place where sampling occurs (GPS location will also be provided). This description will accompany the logged records for each air monitoring location and relevant daily meteorological data.

The earthworks are expected to commence in mid 2014 and are anticipated to take 4 to 5 years to complete.

15.5 Area of Excavation

Air quality will be filtered within mobile cabins with Highly Efficient Particle Arrester (HEPA) filtration for dust/ACM, to ensure that occupational standards comply within the breathing zone for excavator and vehicle operators.

Site workers on foot exposure to dust and fibre will be required to wear the specified PPE. Site workers within the red zone will wear respiratory protection (P2 mask with a P3 respirator as per AS/NZS 1705: 2009, disposable coveralls (appropriate for working with asbestos fibre), safety glasses, hats and dedicated steel capped boots. Personal monitoring of all Site workers will be undertaken as per Table F to quantity potential exposure to fibres.

Downwind of the excavation area, it is assumed that air quality could be impacted for public or off-site exposure. This area will also be monitored near the Site boundaries, with designated stations to ensure compliance with standards that apply to the protection of human health from dust/ACM inhalation.

15.6 Stations for Public Exposure Monitoring (on-site boundaries)

Boundary monitoring stations, as will be located outside of the excavation area with six (6) Air Quality Monitoring Stations positioned around the Site boundary. These monitoring stations will assess daily ambient air quality concentrations with three monitoring stations on the northern boundary line and three along the southern boundary line. The air quality station on the south western corner (AMS1) will be the primary monitoring station and consists of a TEOM, nephelometer, and three sampling pumps for ‘fibre’, ‘TSP, metals’ and ‘silica’. Stations AMS3 to AMS6 house nephelometers. Station AMS2 houses one sample pump. The objective of the boundary monitoring station placement is to characterise the airborne concentration of identified CoPCs and potential migration off Site. The data will be used to validate that the occupants of Adelaide Street are not being exposed to elevated concentrations of airborne contaminants.

Air monitoring stations will be located in accordance with the guidelines outlined in AS 3580.1.1:2007:

- Avoid sites with restricted air flow such as near buildings and trees. The minimum clear sky angle for the sampling inlet should be 120 degrees.
- Avoid sites that may cause physical and chemical interference (motor vehicle emissions).
- Avoid sites that may adsorb and desorbs contaminants such as trees. Stations should be located at least 20 m from trees and leafy vegetation.
- Locate the monitoring inlet near human breathing zones, 1 to 2 meters above ground level.

15.7 Dust (PM10 & PM2.5)

Monitoring for dust as, PM_{10} and $PM_{2.5}$ will be completed on a daily basis at five monitoring locations on the Site boundary for the duration of on-site earthworks. MDWES has allowed for a 12 hour work day Monday to Friday and an 8 hour day on Saturday (see figure 11).

Dust is made up of a wide range of particles varying in size, shape and density. These characteristics determine the transport fate of the particles. Typically, particles smaller than 100 □µ in diameter are called Total Suspended Particulates (TSP). In the context of earthworks, TSP are generally considered from a nuisance perspective as only particles smaller than 10 □m aerodynamic equivalent diameter (AED) are likely to have adverse health impacts. Consequently, PM10 is usually used to measure environmental concentrations of dust. A smaller subset of PM10 is PM2.5 which is typically used to measure occupational concentrations of dust.

Dust concentrations at the Site will be measured using two methods: gravimetric and nephelometry. Both will give real-time PM10 and PM2.5 dust concentrations across the Site and on boundaries.

Five nephelometers: TES 7200 (QA-Lite) will be used on Site; the instrument has a heated inlet to prevent artefacts from moisture vapour over reporting mass and can collect concurrent filter samples for gravimetric analysis.

Monitoring station AMS1 consists of one TEOM and one QA-Lite. Comparison of both gravimetric samples will ensure gravimetric values for the TEOM and filter method are similar. Comparison of the gravimetric values to the non-gravimetric data will allow development of an accurate calibration factor which can be input into the QA-Lite at AMS1 and other boundary monitoring stations. The monitoring schedule allows for one full month of daily calibration factor development at AMS1. Thereafter, a weekly calibration factor will be derived for the duration of earthworks. Additional daily reviews of real-time TEOM and QA-Lite data from AMS1 will be undertaken to examine any potential variations between the two methods.

15.8 Asbestos Contained Material (ACM) Fibres

Asbestos fibre concentrations will be measured in accordance with the National Occupational Health and Safety Commission’s Membrane Filter Method (NOHSC: 3003, 2005) the method for estimating airborne asbestos fibres. Asbestos sample locations and frequency are outlined in Section 7.4.

Static monitors will be set up at the four AMS’s (4) boundary, three (3) excavation face static monitors and a crib room monitor (1). GPS locations of the sampling location will be taken when a monitor is relocated. Personal Monitors (including vehicle monitors) will be worn by the workers on-site. Filters will be worn within the workers ‘breathing zone’. They will be attached via a piece of flexible tubing to a personal sampling pump on the workers’ waist.

Analysis of fibres will be carried out daily by a NATA Accredited laboratory, in accordance with (NOHSC: 3003, 2005). The filter will be treated to become transparent and then observed using a phase contrast microscopic and calibrated eyepiece. Fibres are sized and counted as per defined geometric criteria. Results will be expressed as fibres/mL, calculated from the number of fibres observed on the known filter area and the volume of air sampled.

As analysis does not identify the type of fibres present on the filter, fibre counts will be interpreted as representing asbestos fibre counts. If the initial fibre count exceeds the assessment criteria outlined in Section 10, the filter will be immediately sent to a NATA Accredited laboratory for electron microscope analysis to identify and speciate the fibres present on the filter.

15.9 Respirable Dust (Silica)

Silica is viewed as a low risk CoCP, given that the crusher (which operates for only a few hours per day), is likely to be the main source of silica dust and dust suppression is not likely to prevent any significant emission of this contaminant into the Site airshed.

Silica dust concentrations will be measured in accordance with *NIOSH Method 7500 – Silica, Crystalline, by XRD (filter re-deposition) (*NIOSH, 2004). It is noted that the above method is a para-occupational method. However, given the perceived low risk to off-site receptors and the relative high cost associated with a dichotomous sampler using an x-ray fluorescence spectrometer, the method is considered appropriate for determining silica concentration at the Site boundary.

One silica dust static monitor will situated at the AMS1 monitoring station. Sampling will be completed daily, Monday to Saturday, for the duration of remediation. Sampling time will be representative of the site workers daily shift (7:00-17:30).

15.10 Metals

Metal concentrations will be measured in accordance with *NIOSH Method 7300 – Elements by ICP*. The metals of interest are based on the CoPCs identified as part of the initial assessment. The metals being assessed for this project comprise Arsenic (As), Barium (Ba), Cadmium (Cd), Chromium (Cr), Copper (Cu), Manganese (Mn), Nickel (Ni), Lead (Pb), Mercury (Hg) and Zinc (Zn).

It is noted that as with Silica, the stated method is para-occupational. Nevertheless given the expected low airborne concentration (based on sampling experience), the method is considered appropriate for determining metalloid concentrations at the Site boundary.

Two (TSP) samples will be collected at AMS1; one on Tuesdays and one on Wednesdays. After gravimetric analysis has been undertaken, the filters will be analysed for As, Ba, Cd, Cr, Cu, Mn, Ni, Pb and Zn (Tuesday's sample) and Hg (Wednesday's sample). Sampling times will be representative of the site workers daily shift. Sampling will be completed weekly (Wednesdays) for the duration of remediation.

15.11 Personal Filtering (on-site)

Although discussed in the Site Management (section 11). P2 dust masks with P3 respirators will be worn by workers at the Site to protect their 'breathing zone' from harmful ACM concentrations in air (if present). HEPA filtration will be fitted to air conditioning within vehicle cabins. This will be maintained throughout the course of the earthworks.

Personal monitoring devices will be worn by the Site workers within the excavation zone, with monitoring results to be recorded.

15.12 Method of Sampling and Analysis

Air monitoring will be measured in accordance with the following methodologies.

Table T: Air Contaminant and Methodology

Contaminant	Methodology
Dust (PM10 & PM2.5)	AS/NZS3580.9.11-2008 Methods for sampling and analysis for ambient air – Determination of Suspended Particulate Matter PM10, PM2.5 Beta Attenuation Monitors.
Asbestos Fibre	NOHSC:3003(2005) - National Occupational Health and Safety Commissions Membrane Filter Method
Respirable Dust (Silica)	AS/NZS2985-2009 Workplace Atmospheres – Method for Sampling and Gravimetric Determination of Respirable Dust NIOSH Method 7500: Silica, Crystalline, By XRD (filter re-deposition)
Metals	NIOSH Method 7300 – Elements by ICP

15.13 Air Quality Assessment Criteria

For the purposes of the AQMP, assessment criteria will be based on Safe Work Australia *Workplace Exposure Standards for Atmospheric Contaminants in the Workplace* and the National Environmental Protection (Ambient Air Quality) Measure (NEPM). The occupational exposure standard for asbestos fibres, silica and metalloid as dust within the machinery cabin and for personnel working within the excavation area (wearing PPE), are based on the NOHSC/Safe Work Australia Standards (1995). Contaminant concentrations are based on an 8 hour Time Weighted Average (TWA). Workers that are operating vehicles or mobile plant will be protected with HEPA filtering within the air conditioning systems. Workers operating on foot will be equipped with recommended PPE at all times, whilst within the boundaries of the Site where shallow soils are being disturbed. Table K details the trigger proposed action if concentrations exceed CoPC trigger actions, dependent upon the nature of the CoCP.

Table U: Assessment Criteria

Contaminant	Unit	Safe Work Australia *(TWA)*	NEPM *(24 hours)*	WHO *(24 hours)*	Action
Dust					
TSP	µg/m³			120	Increase dust suppression
PM 10	µg/m³		50*		Increase dust suppression, review wind speeds associated with exceedance and consider setting maximum wind speed threshold for reduced sorting throughput.
PM 2.5	µg/m³		25*		Increase dust suppression, reduce sorting and crushing throughput until concentration is below 20 µg/m³
Asbestos					
Asbestos Fibre (Mixed Fibres)	fibre/mL	0.1#			Stop sorting, investigate site conditions that were likely to have contributed to the exceedance and take appropriate action; Includes report to major stakeholders. Concurrently undertake SEM scanning of sample to determine asbestos fibre content. If asbestos fibre count exceeds trigger value undertake steps to reduce fugitive emissions.
Silica					
Crystalline Silica	mg/m³	0.1			Investigate dust suppression at crusher and increase dust suppression control measures as required.
Metals					
Arsenic	mg/m³	0.05			Investigate potential sources of analyte and take appropriate action
Barium	mg/m³	0.5			As per above
Cadmium	mg/m³	0.01			As per above
Chromium	mg/m³	0.5 #			As per above
Copper	mg/m³	1			As per above
Manganese	mg/m³	1			As per above
Nickel	mg/m³	1			As per above
Lead	mg/m³	0.15	0.0005		As per above
Zinc	mg/m³	10			As per above
Mercury	mg/m³	0.025			As per above

NB:

- * No current Safe Work Australia Standards for Dust as PM10 and PM2.5, therefore assessment criteria will be based on the daily Ambient Air NEPM Guidelines. Note 2.5 guideline is an advisory standard.
- # In the event concentrations exceed the assessment criteria further analysis will be conducted to speciated contaminates.
- In the event contaminates exceed in excess of the assessment criteria works may have be stopped and reassessment of work practices will be required.

15.14 Sample Recovery

All gravimetric, fibre, silica and metalloid samples will be recovered as per Table S and sent to a NATA accredited laboratory.

Dust monitoring data will be reviewed daily and results logged to ensure action trigger values are not exceeded, as per Table U. Results from all monitoring locations will be maintained on a daily logging record for reference and proof of air quality standards compliance, at the request of regulators and relevant stakeholders.

For full details of the proposed air quality assessment and monitoring program refer to the Air Quality Management Plan – Version 3 (MDWES, 2014), included within Appendix G.

15.15 Weather Conditions

MDWES will monitor onsite weather conditions with an onsite weather station to record wind speed, humidity, rainfall and barometric pressure. In addition to recording local weather systems, the regional weather will also be used and collected. This will be collected from the BOM website.

The average prevailing wind direction at the Site is considered representative of the annual climate in Perth. Average wind direction at Perth Airport is from the east-north-east at 9:00 am and switches to the west-south-west at about 3:00 pm (BOM, 2012). This average is taken over a 60 year duration (from 1944 – 2004) with the average maximum wind speed evolving from the east at approximately 9:00 am and also from the west-south-west at approximately 3:00pm, both in excess of 30 km/h. Wind is anticipated to be the most significant weather influence at the Site and surrounds, by:

- Initiating possible ACM detections.
- Influencing the direction of ACM dispersion.
- Determining locations of deposition.

Daily wind roses will be used to demonstrate the direction of approaching winds and resultant ACM dispersal (if present) direction in relation to the respective downstream Site boundaries from any sources. Furthermore, a wind vane on-site would provide a current representation of wind direction.

- Wind Speed and direction will be recorded at each location and presented in the daily report.
- Daily weather conditions (i.e.: atmospheric pressure, rainfall etc.) will also be reported.

15.16 Climate

It is likely, given local temperature, relative humidity, rainfall, wind conditions and surface geology, that soil moisture content at the Site will be low. This is likely to increase the potential for airborne dust formation, with the potential for dust generation highest between October and May. Therefore, extras consideration should be given to the dust monitoring program and dust control measures during this time.

15.17 Contingency Measures

Exceedence of action trigger values will generally be related to insufficient dust suppression of the following: access tracks, excavation zone, remediated land (cover) that has insufficient vegetation cover, the crusher, or a combination of these elements. Dust issues will be exacerbated by strong winds and high temperatures. It is likely that the Site will need to develop a procedure that slows or ceases earthworks and / or increases dust suppression activities based on weather patterns which includes wind speeds etc. The adoption of wind speeds as a control measure is likely to develop, as working characteristics of the Site unfold over time. Contingences for all the COPCs are presented in full within the MDWES AQMP report in Appendix G.

16 ENVIRONMENTAL MANAGEMENT – WATER

During site works, groundwater will be monitored on a bi-annual basis to ensure no impact is caused above background concentrations. The results will be added to the background information collected from groundwater monitoring events already reported by MDWES.

The earthworks and engineering of the landfill may cause mobilisation due to the nature of the work. It is noted that the groundwater level is considerably lower than the finish level of the remediated site and in addition, there is a clay aquitard on which the landfill sits. Therefore, this restricts vertical groundwater migration. It is anticipate that there is will a negligible impact on the underlying aquifer.

In the event that concentrations are noted above assessment criteria, another groundwater sampling event will be arrange for the following month and for the subsequent three (3) months, to confirm the results and to note any fluctuations or stabilisation.

The Site operator will maintain the six groundwater wells currently located onsite. In the event that a monitoring well is damaged and rendered unusable it will be replaced immediately.

During the excavation program on site, a snapshot groundwater sample may be taken from within the Site through a temporary monitoring station. Due to the organic nature of the Site and constant excavation and construction, the monitoring point will probably be a one off sample. It is also proposed that during one of the bi-annual monitoring rounds a set of temporary wells are set up to assess the groundwater quality.

Extensive sampling was completed prior to commencement of site-works to ensure adequate background information was available. A summary of groundwater results has been included within section 2.4. For the full detailed sampling program and results refer to the Annual Groundwater Summary Report – (MDWES, 2103).

16.1 Interim Peached Groundwater Monitoring

During the remediation of the project it is recommended that semi permanent groundwater/perched water monitoring wells are constructed. These wells should be positions in close proximity to the face of the excavation. The rationales behind these wells are to assess localised water quality and any impacts results from the earthworks. The well installations will allow for groundwater quality assessment and allow for sampling.

16.2 Perched or leached Groundwater on site

The Site has been dormant for a considerable period of time. During this time, much rainfall has percolated and permutated through the landfill. Considering the nature of the fill, pockets of perched water which may have accumulated should be taken into account. Furthermore, the Site is underlain by a clay aquitard which has the potential to collected ponded waters within sink hole areas.

Consideration should therefore be given during excavation to the possibility that waters maybe encountered and accumulate at the base of the excavation. These waters should be pumped to a treatment pond or pump to a tanker to be disposed of at a licensed facility for potentially contaminated waters. Assessment or analysis should be undertaken on these waters for the duration of the project to determine if any potential environmental impact is occurring. Also the analysis would assist in the determining the disposal criteria.

17 ENVIRONMENTAL MANAGEMENT – NOISE & VIBRATION

The SMP by the client details noise abatement measures to be put in place by the contractors. This is detailed within section 3.9 of this management plan. The following provide environmental management for noise and vibration.

17.1 Objective

Minimisation and generation of noise emissions during the Site works, to prevent any potential noise impact to neighbouring parties from exposure to noise emission.

The earthmoving activities associated with the excavation of contaminated waste have the potential to create a social disturbance as a result of the generation of nuisance noise. Noise will be generated from vibrating machinery, the lateral movement of trucks, the operation of front end loaders and vehicle reversing alarms. In particular, earthmoving equipment have the potential to cause ‘nuisance noise’, especially if large numbers of machinery used are in poor operating condition (i.e. noisy mufflers).

Although the machinery used will be in good condition, the potential for nuisance noise is considered moderate to high due to the presence of neighbouring residences. Similarly, although there are no truck movements proposed along Adelaide Street, noise management measures will be employed to ensure that nuisance noise does not arise from the truck deliveries of waste soils for soil amendment.

17.2 Target

Noise levels from site activities are not to **exceed 60 dB (A)** at offsite locations (Environmental Protection (Noise) Regulation 1997).

17.3 Action

The following proposals should be considered and implemented to abate noise. The proposals should be applicable for the duration of project.

Table V: Potential Noise Sources & Control Measures

Sources of Noise	Control Measures
Site Operation	Maximum operational hours will 07:00am to 17:30 Mon to Fri and 08:00 to 16:00 Saturday. The Site will not be open on Sundays or public holidays
Machinery and Site Plant	Site equipment will be maintained to ensure low noise emissions. In addition, any plant hired will also be low noise emitting.
Site Plant Movement	Plant speeds on site will be kept to 30km/hr on tracks and 10km/hr elsewhere.
Site Boundary	A 2m earth bund with 1.8m perimeter fencing is to be created on Adelaide Terrace, which will shield some/most noise emitted from site.
Waste Transfer Station	The waste transfer station will be set into the ground along the northern boundary of the Site. This is the furthest point away from the residents on Adelaide Street.

17.4 Noise & Vibration Monitoring

Noise monitoring will be conducted daily around the Site (AM or PM). In particular monitoring will be targeted along Adelaide Street at 50m intervals for 1 minute with the highest reading recorded at each location. Monitoring will be taken at the same southern boundary locations each day to ensure continuity and allow comparison between results. Noise monitoring will be conducted around the site as the project progresses.

17.5 Noise Compliance

If a breach is identified or a noise complaint is received, then this would represent an incident, non compliance and failure to comply with the management plan.

Should a failure to comply occur, the following steps will be taken

- Site activities will be investigated to determine the cause of the problem. The time and duration of the noise emission will be compared to the Site monitoring program to ascertain any correlation. The investigation will also assess the activities taking place on site at that time causing the disturbance.
- Control measures will be reviewed to prevent recurrences and, where necessary, additional control and mitigation measures will be investigated and installed.
- A permanent noise monitoring program will be considered if complaints persist.

18 ENVIRONMENTAL MANAGEMENT - POST CONSTRUCTION

18.1 Groundwater Monitoring (Post Construction)

The groundwater monitoring program will continue for a further year from the completion of the of the remediation project to validate and check whether there has been any residual environmental impact.

Groundwater levels and concentrations will be assessed on the ‘pre-construction’, ‘during’ and ‘post-construction’ results. The groundwater monitoring program should be in line with previous investigations so that results can be compared ‘like-for-like’. Only if there is a significant shift in the results will there be a need for a continued program beyond what is proposed for groundwater monitoring. If there is a identified impact then further monitoring may/will be required and/or an investigation to find the source to qualify and quantify the results.

18.2 Soil Vapour Monitoring

A land gas monitoring program will be implemented during the remediation of the Site. As each cell is completed west to east, (see figure 7) land gas monitoring wells will be installed and screened into the engineered deep cell. This monitoring program is to ascertain if any gas generation is being created which could emanate from the Site. It should be noted that the soils being used during remediation are expected to be inert and largely non-gas generating. Therefore, organic matter or organic waste will be screened as part of the remediation process and all such matter will be removed at the screening stage.

The inclusion of volatile chemicals in the monitoring program will be considered, dependent on findings (including any complaints from local residents), as work progresses. It is anticipated that the ‘first cell’ (see figure 7) will be completed 6-9 months into the remediation program.

A Sample Analysis Plan (SAP) will be designed and developed to investigate the deep engineered cell as the project progresses.   .

A suitable land gas monitoring regime will be designed, utilising the CIRIA guidance C665 and UK Environment Agency LFTGNO2 and LFTN07, to provide significant guidance.

REFERENCES

ANZECC (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.* Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ).

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ENVIRONMENTAL SERVICES

FIGURES

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info@environmentalservices.com.au

MDW ENVIRONMENTAL SERVICES

Client:

WASTEROCK PTY LTD

Project:

Hazelmere Remediation and Regeneration Project

Location:

Lot 20 Adelaide Street, Hazelmere

Drawing Title:

SITE AND REGIONAL VIEW

Notes:

Site Location

Drawn by:	Scale:	
Dale A.	Scale Not Used	North
Date: 10/09/2013		

Project No:	Figure No:	Rev:
E2012 - 031	1	v1

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Client:

WASTEROCK PTY LTD

Project:

Hazelmere Remediation and Regeneration Project

Location:

Lot 20 Adelaide Street, Hazelmere

Drawing Title:

Previous Borehole & Test Locations

Notes:

TP = Test Pit Location (PB, 2007)

Drawn by: Dale A	Scale: 0 50 m	North
Date: 10/09/2013		

Project No:	Figure No:	Rev:
E2012 - 031	2	v1

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Client:

WASTEROCK PTY LTD

Project:

Hazelmere Remediation and Regeneration Project

Location:

Lot 20 Adelaide Street, Hazelmere

Drawing Title:

Groundwater Monitoring Well Locations

Notes:

MW= Groundwater Monitoring Well

Drawn by: Dale A

Date: 10/09/2013

Scale: 0 50 m

North

Project No:	Figure No:	Rev:
E2012 - 031	3	v1

MDW ENVIRONMENTAL SERVICES

0 20 40 60 80m
SCALE 1:4000
ORIGINAL PLAN SIZE: A4

DATE: 20.06.2013

22 ELMSFIELD ROAD, MIDVALE WA 6056
PH: (08) 9250 6960 FAX: (08) 9250 8269
www.environmentalservices.com.au

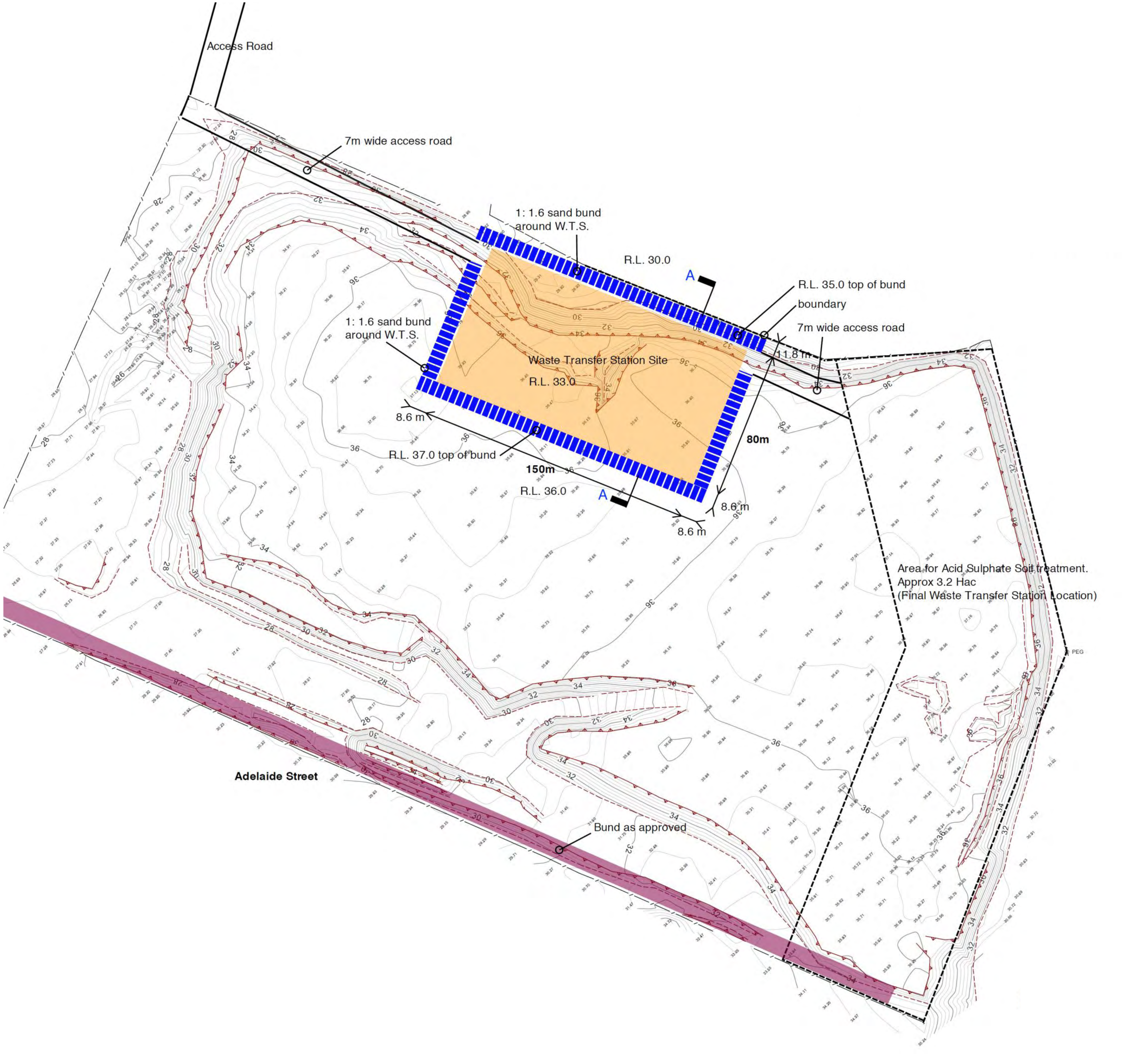
LEGEND:

MW1 - BORE LOCATIONS

NORTH

DEPTH OF GROUNDWATER AND DIRECTION FLOW

LOT 20 ADELAIDE STREET
HAZELMERE



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Client:

WASTEROCK PTY LTD

Project:

Hazelmere Remediation and Regeneration Project

Lot 20 Adelaide Srt

Lot 20 Adelaide Street

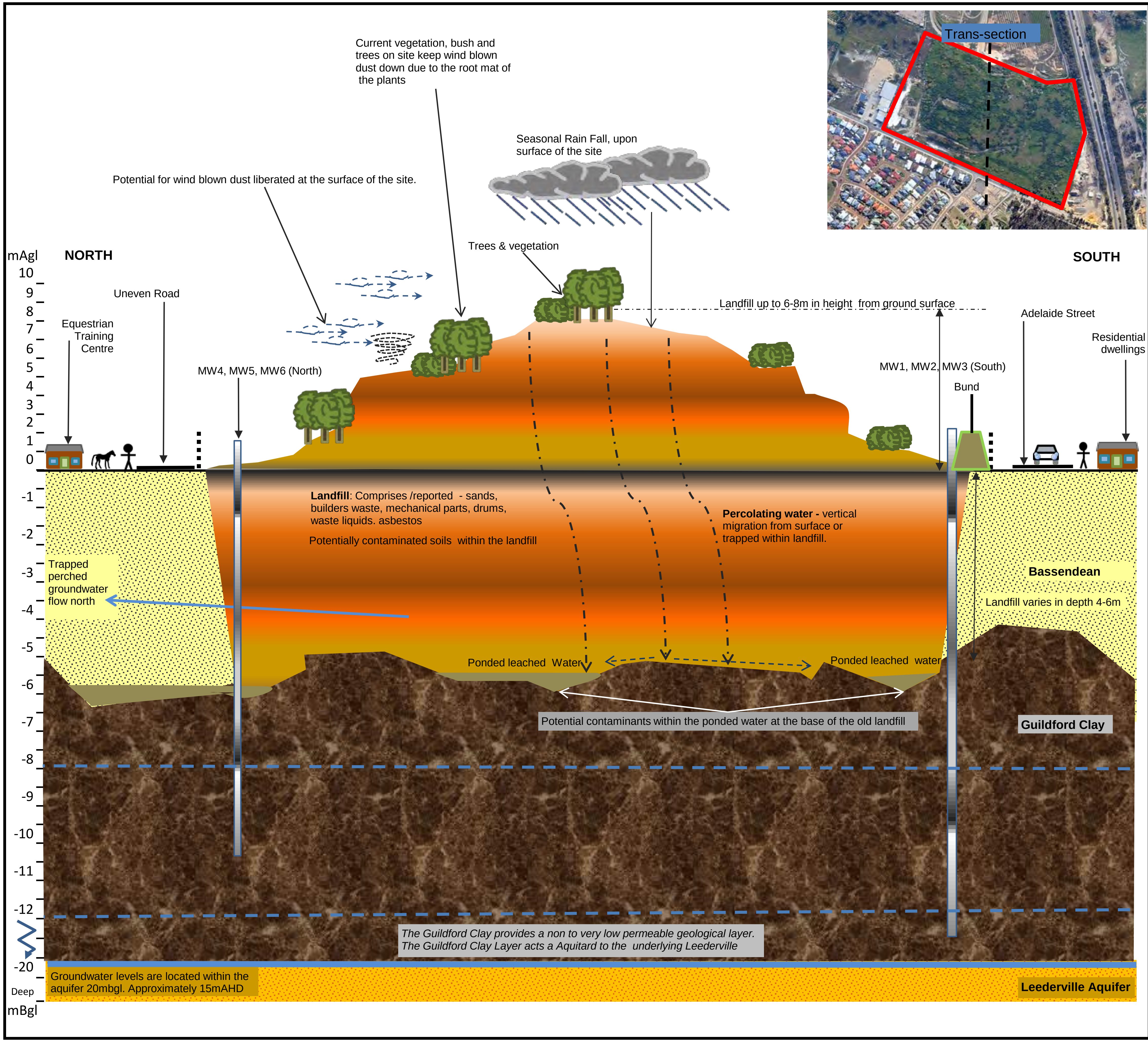
Drawing Title:

Survey of Site

Notes:

Drawn by:	Scale: 0 100 m	North
Date:		

Project No:	Figure No:	Rev:
E2012 - 031	5	v1



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Client:

WASTEROCK PTY LTD

Project:

Hazelmere Remediation and Regeneration Project

20 Adelaide Street, Hazelmere, WA

Drawing Title:

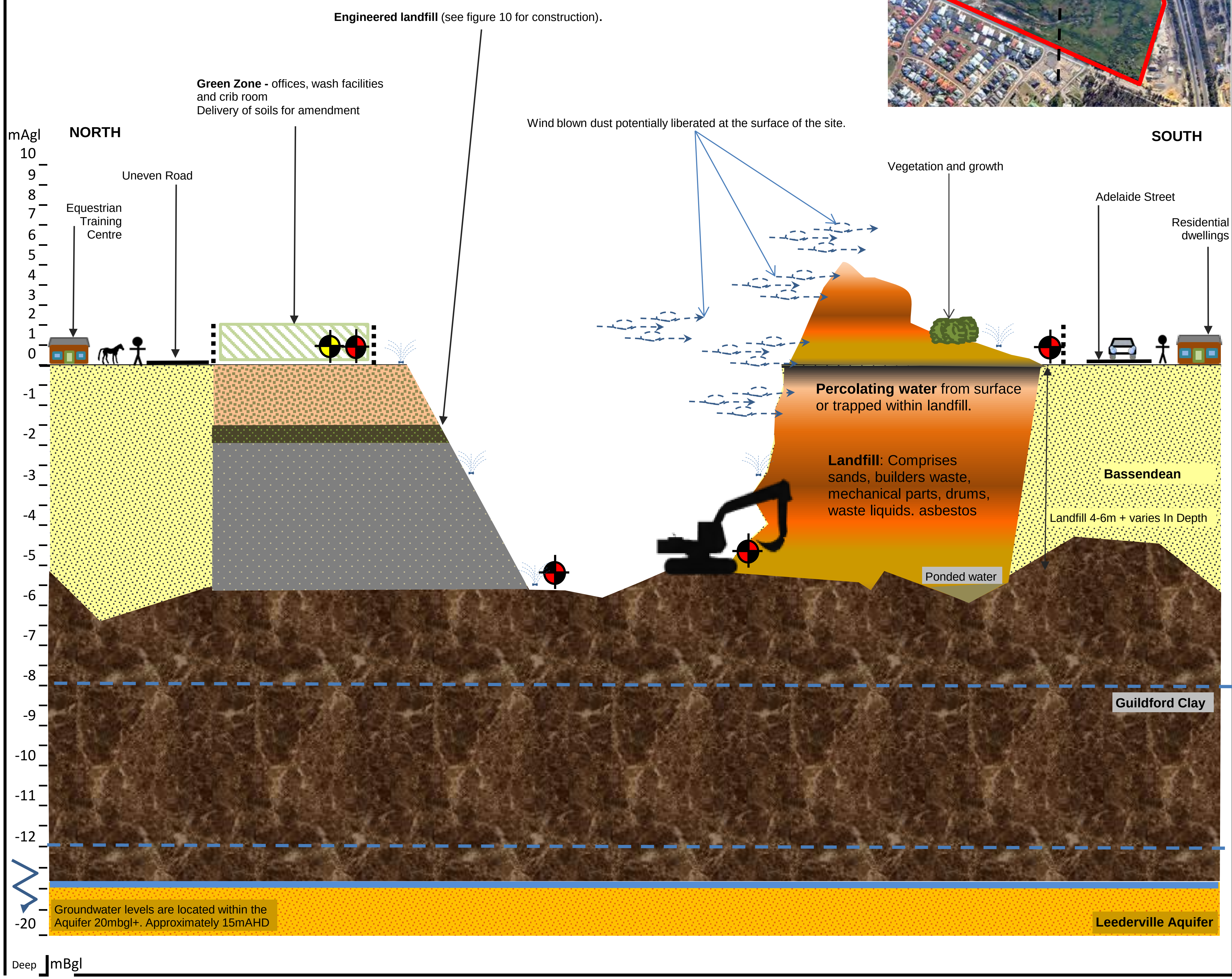
Conceptual Site Model (Current)

Key:

- Bassendean Sand (4.5 to 6.5mbgl) *Brinkerhoff.*
- Guildford Clay (aquitard) documented up to 20mbgl.
- Leederville Aquifer (depth extensive)
- Historical landfill material.
- Ponded/leached waters at the base of the landfill possible hydrocarbon (DNAPL), metals, organics.
- Workers / Residents
- Animals
- Site Boundary
- Groundwater level
- Construction of Site bund - 2m high earth bund with a 1.8m fence with shroud
- Recorded groundwater depths by MDWES high and low - Due to the variation of depth of wells recorded groundwater depths and orientation of the CSM only the indioctive levels are presented.
- Groundwater level (aquifer)

Drawn by: MB	Scale: Not to Scale	North
Date: 18/10/2013		

Project No:	Figure No:	Rev:
E2012 - 031	6a	v1



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Client:

WASTEROCK Pty Ltd

Project:

Hazelmere Remediation and Regeneration Project

20 Adelaide Street, Hazelmere Perth, WA

Drawing Title:

Conceptual Site Model
(Remediation)

Key:

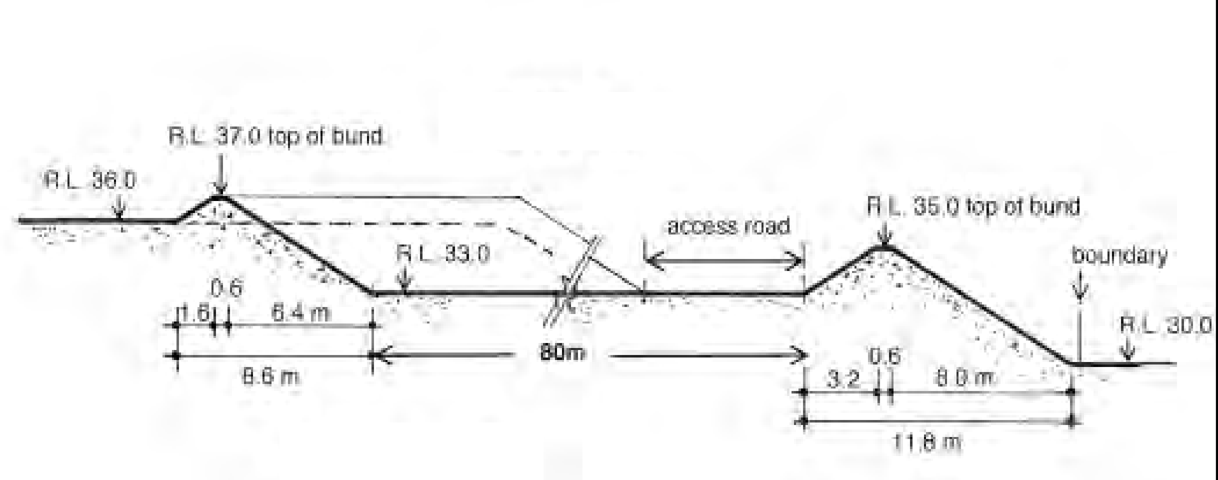
- Bassendean Sand (4.5 to 6.5mbgl) *Brinkerhoff.*
- Guildford Clay (Aquitard) Documented up to 20mbgl.
- Leederville Aquifer (depth extensive)
- Historical landfill material.
- Ponded/leached waters at the base of the landfill possible hydrocarbon (DNAPL), metals, organics.
- Workers / Residents
- Animals
- Site Boundary
- Excavator/On Site plant
- Air monitoring station *(See Figure 11 for all locations)*
- Weather Station
- Sprinkler system for dust suppression
- Groundwater level (aquifer)
- Indicatice groundwater levels

Drawn by: MB	Scale: Not to Scale	North
Date: 18/10/2013		

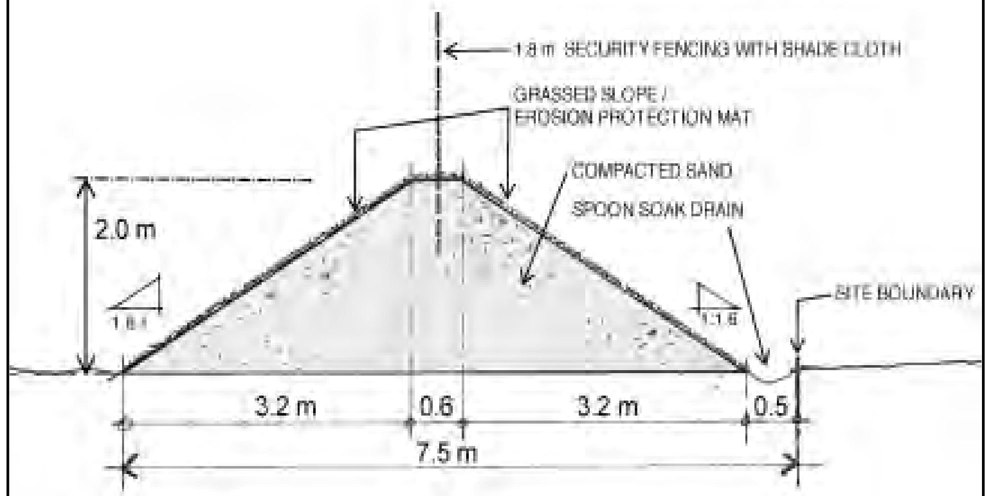
Project No:	Figure No:	Rev:
E2012 - 031	6b	v1

NB: The remainder of the site is to be enclosed by fencing / security fencing around the perimeter.

Cross Section A - Detailed View



Cross Section B - Detailed View



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Client:

WASTEROCK PTY LTD

Project:

Hazelmere Remediation and Regeneration Project

Location:

Lot 20 Adelaide Street, Hazelmere

Drawing Title:

Site Setup and Bund Details

Notes:

- Proposed waste transfer area
- Bund
- Maintenance area
- Proposed soil acceptance and treatment facility
- Approved sand bund to Adelaide Street frontage to prevent access and screen the site (see detail)
- Approved vehicle access track connecting site to Talbot Road
- Water supply (polypipe) from bore(s) to water tanks
- Location of groundwater extraction bore(s)
- Contours
- Existing shed to be relocated to works area
- Indicative excavation cells for remediation works to progress west to east
- Vehicle wash down bay
- 2 x 60,000L water tanks
- 97.18 Lot dimensions
- 31.0 Contour labels
- 36.12 Spot heights

• All images supplied by Rowe Group.

Drawn by: Dale A	Scale: Scale not Used	North
Date: 18/09/2013		

Project No:	Figure No:	Rev:
E2012 - 031	7	v1

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Client:

WASTEROCK PTY LTD

Project:

Hazelmere Remediation and Regeneration Project

Location:

Lot 20 Adelaide Terrace, Hazelmere

Drawing Title:

PROPOSED SITE LAYOUT AND REMEDIATION PLAN

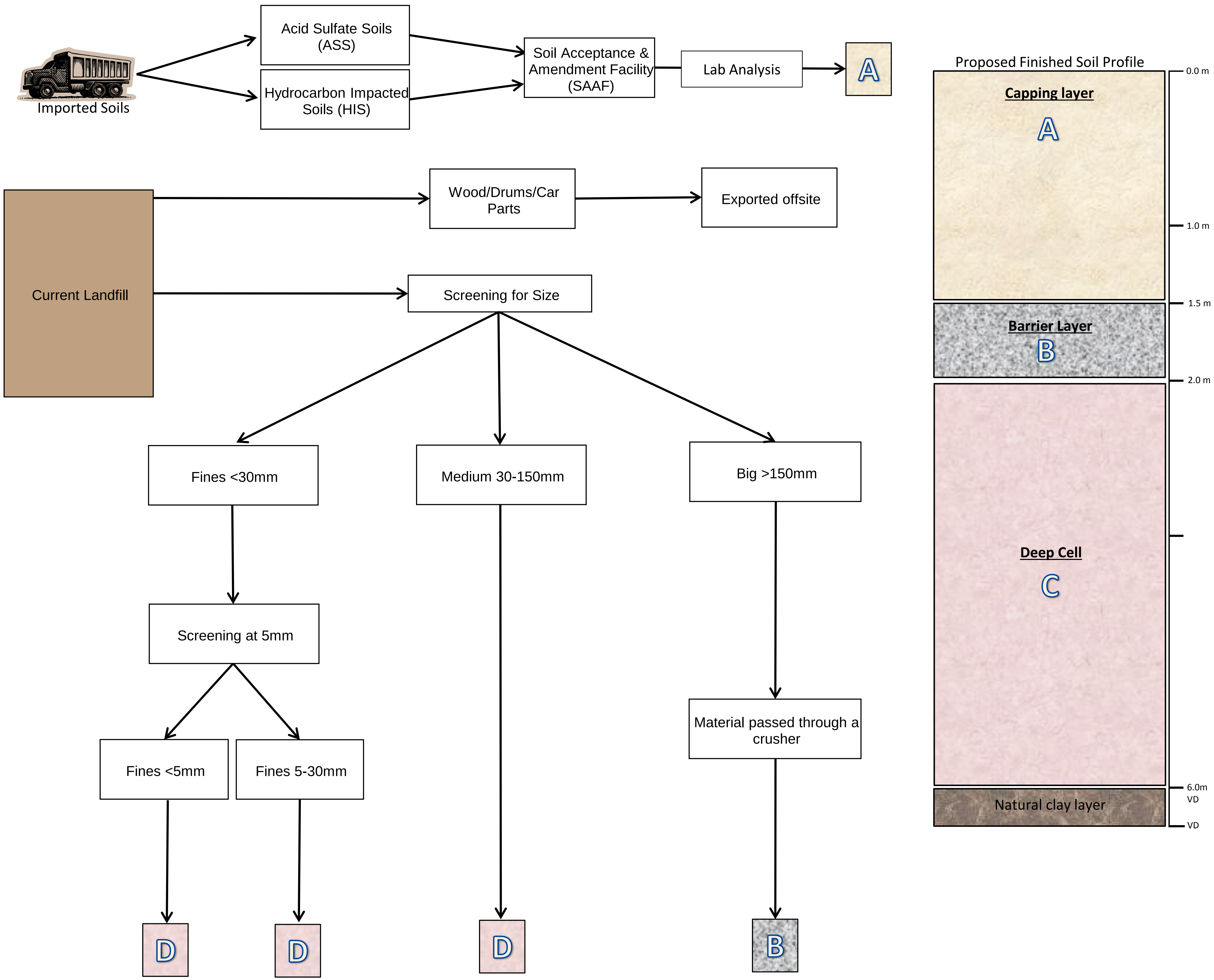
Notes:

Flow of Excavation

Notes:
Once the red zones have been remdiated then the they will become green zones. The green zones will be excavated and remdiated once the red zones have been cleared.

Drawn by:	Scale:	North
Date: 20/10/2013	Scale not used	

Project No:	Figure No:	Rev:
E2012 - 036	8	v1



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Client:
WASTEROCK PTY LTD

Project:
Hazelmere Remediation and Regeneration Project

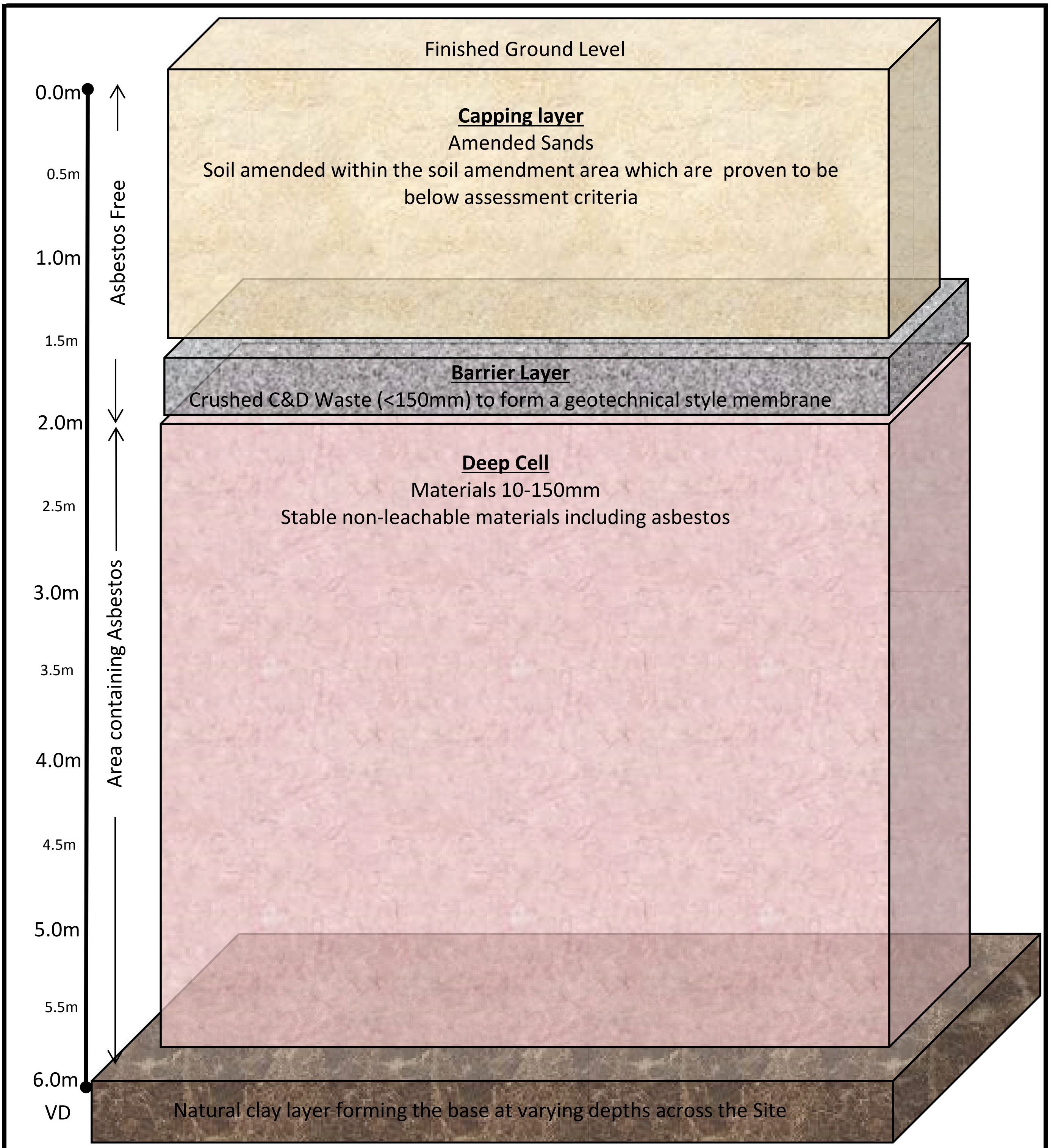
Location:
Lot 20 Adelaide street, Hazelmere

Drawing Title:
SOIL LIFELINE

Notes:
- Depths indicated are below proposed finished ground level.
- VD = Varying depths dependent on natural levels and the volume of Deep Fill.
- AF/FA = Asbestos Fine and Friable Asbestos laboratory analysis.

Drawn by:	Scale:	
Dale A	Not to Scale	
Date: 13/09/2013		

Project No:	Figure No:	Rev:
E2012-031	9	v2



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Client: WASTEROCK PTY LTD

Project: Hazelmere Remiditation & Regeneration Project

Location: Lot 20 Adelaide Street, Hazelmere

Drawing Title: Proposed Engineered Construction Diagram for Remediation

Notes:

- Depths indicated are below proposed finished ground level.
- VD = Varying depths dependent on natural levels and the volume of Deep Fill.

Drawn By:	Date:	Scale:		Project Number:	Figure No:	Rev:
DA	11/09/2013	No Scale Used		E2012 - 031	10	v2

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Client:

WASTEROCK PTY LTD

Project:

Hazelmere Remediation and Regeneration Project

Lot 20 Adelaide Street, Hazelmere

Drawing Title:

Air Quality Monitoring Station Locations

Notes:

- AMS = Air Monitoring Stations
- Movable monitoring Stations, to follow the excavation , dust generation at the face.
- Personal Monitoring (PM) pumps
- Crib room inside green zone compound. To ensure decontamination is happening.
- Site Compound (Greenzone)
- Red Zone Areas Also includes the Remediation of the historical landfill.
- Changing Room and Shower Block

Dust	(QA lite (TES 2200 / Hi Vol /TEOM)
Asbestos	(SKCPCXR8 / XR5000)
Silica	(SKCPCXR8)
Metals	(SKCPCXR8)
Weather Station	

Wind Direction

Excavation Zone (example)

Drawn by:	Scale:	
MB	0 50 m	North
Date: 10/09/2013		

Project No:	Figure No:	Rev:
E2012 - 031	**11**	v1

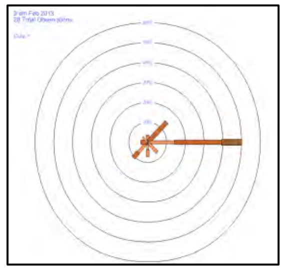
MORNING

Historical Data			
Average Wind Direction			
Month	**2011**	**2012**	**2013**
January	E	E	E
February	E	E	E
December	E	E	-

Wind Roses: 2013

January

February



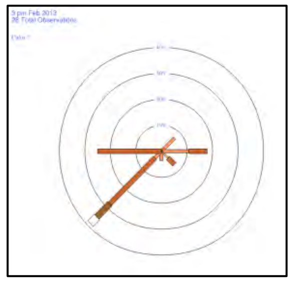
AFTERNOON

Historical Data			
Average Wind Direction			
Month	**2011**	**2012**	**2013**
January	SW	SW	SW
February	SW	SW	SW
December	SW	SW	-

Wind Roses: 2013

January

February



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Client:

WASTEROCK PTY LTD

Project:

Hazelmere Remediation and Regeneration Project

Location:

Lot 20, Adelaide St, Hazelmere, WA

Drawing Title:

Air QUALITY MANAGEMENT PLAN SUMMER WIND VARIATIONS ACROSS SITE

Notes:

- Air Quality Monitoring Stations
- Personal Monitors
- Static Monitoring Stations
- Excavation Area
- Wind Direction

Drawn by: FT

Date: 7/10/2013

Scale: 0 100 m

North

Project No: E2012-031

Figure No: 12

Rev: v1

MORNING

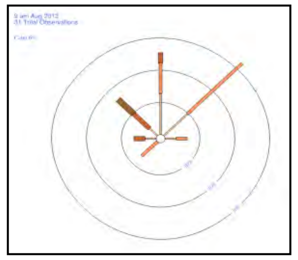
Historical Data			
Average Wind Direction			
Month	**2011**	**2012**	**2013**
June	N/NE	N/NE	N/NE
July	NE	NE	N
August	N/NE	N/NE	N/NE

Wind Roses: 2013

June

July

August

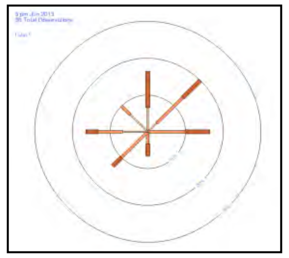


AFTERNOON

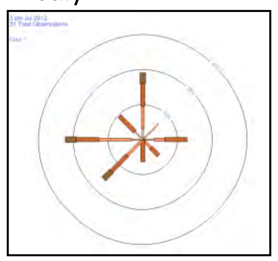
Historical Data			
Average Wind Direction			
Month	**2011**	**2012**	**2013**
June	N/W	NE	NE
July	E	NE/N	N/W
August	W/SW	W	W

Wind Roses: 2013

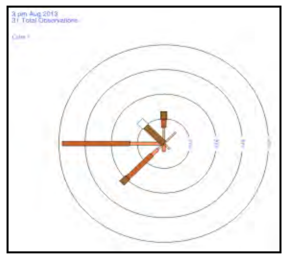
June



July



August



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Client:

WASTEROCK PTY LTD

Project:

Hazelmere Remediation and Regeneration Project

Location:

Lot 20, Adelaide St, Hazelmere, WA

Drawing Title:

AIR QUALITY MANAGEMENT PLAN WINTER WIND VARIATIONS ACROSS SITE

Notes:

- Air Quality Monitoring Stations
- Personal Monitors
- Static Monitoring Stations
- Excavation Area
- Wind Direction

Drawn by: FT

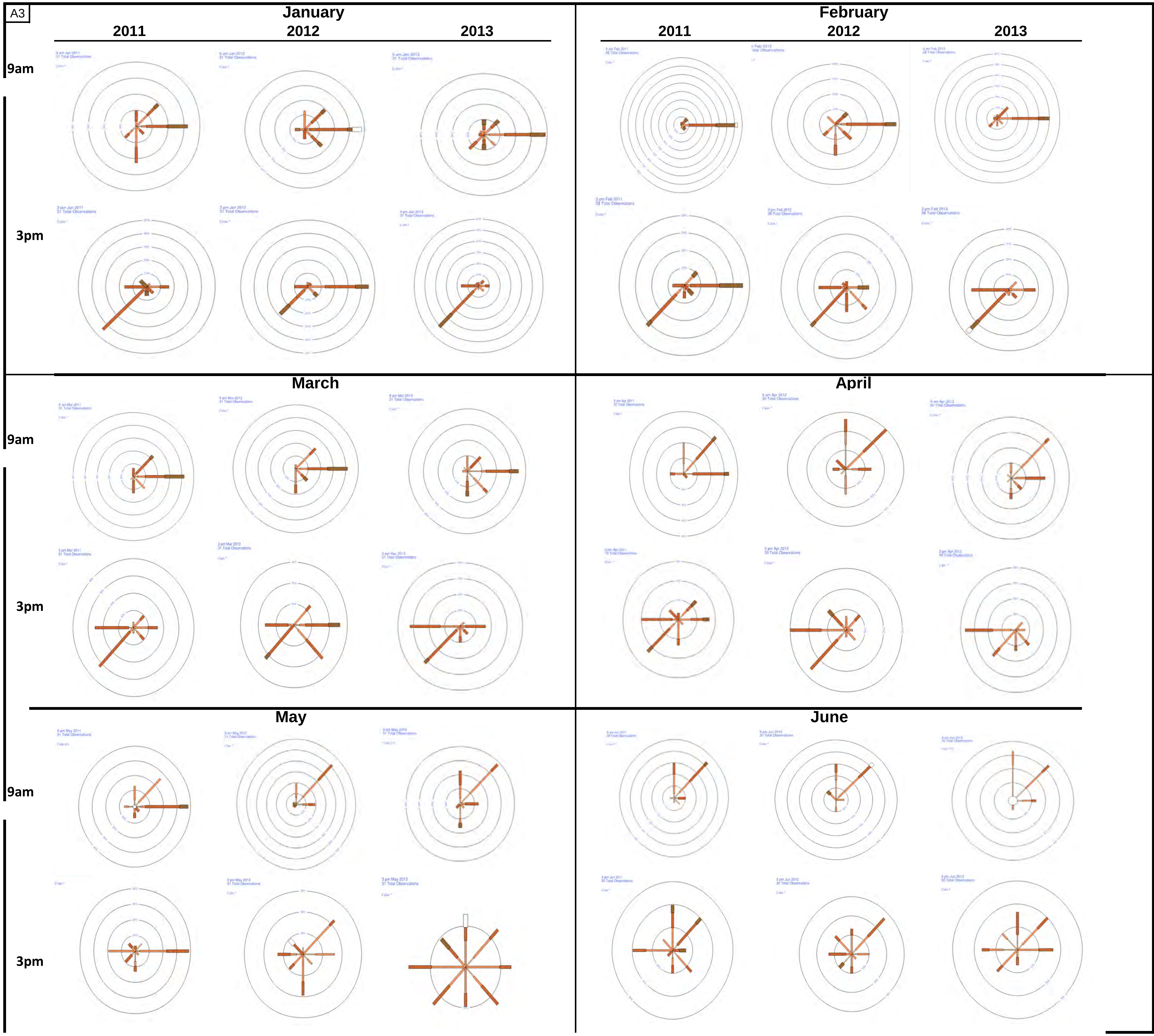
Date: 7/10/2013

Scale: 0 – 100 m

North

Project No:	Figure No:	Rev:
E2012-031	13	v1

A3



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Client:

WASTE ROCK PTY LTD

Project:

Hazelmere Remediation and Regeneration Project

Location:

Lot 20 Adelaide Street, Hazelmere

Drawing Title:

Monthly Wind Roses - January - June

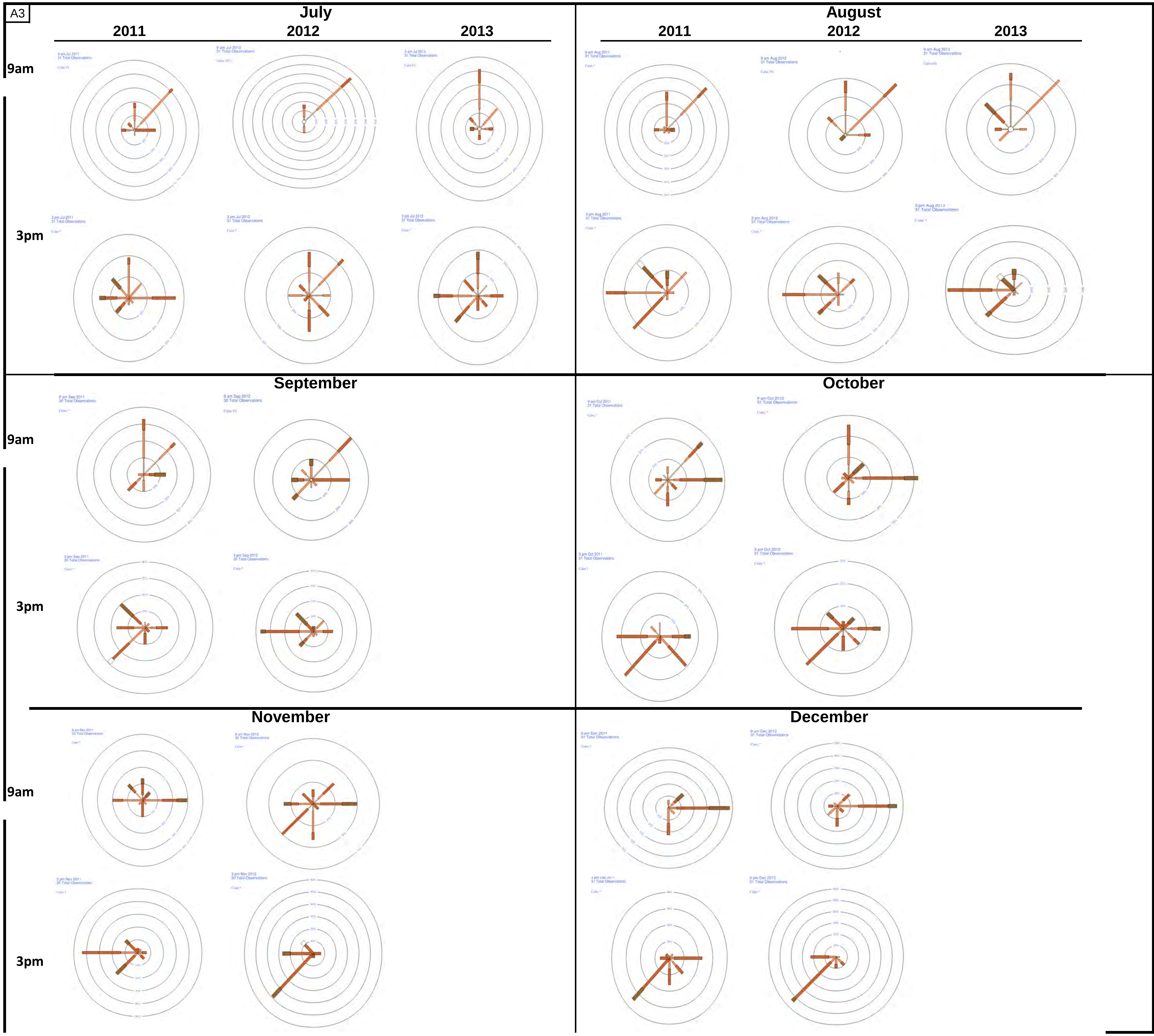
Notes:

- Wind Reses sourced from Bureau of Meteorology

Drawn by:	Scale:	
FT	0 100 m	North
Date: 7/10/2013		

Project No:	Figure No:	Rev:
E2012- 031	14	v1

A3



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Client:

WASTEROCK PTY LTD

Project:

Hazelmere Remediation and Regeneration Project

Location:

Lot 20 Adelaide Street, Hazelmere

Drawing Title:

Monthly Wind Roses - July - December

Notes:

- Wind Reses sourced from Bureau of Meteorology

Drawn by:	Scale:	
FT	0 100 m	North
Date: 7/10/2013		

Project No:	Figure No:	Rev:
E2012- 031	15	v1

TABLES

Table 1a

Assessment Criteria (Soil)

Analyte / Assessment Criteria	Units	LOR	EIL	HIL-F
Total Metals				
Arsenic	mg/kg	5	20	500
Beryllium	mg/kg	1	-	100
Molybdenum	mg/kg	2	40	5100
Nickel	mg/kg	2	60	3000
Silver	mg/kg	2	-	-
Selenium	mg/kg	2	-	-
Cadmium	mg/kg	0.1	3.0	100
Lead	mg/kg	5	600	1500
Barium	mg/kg	10	300	190000
Chromium	mg/kg	2	400	600000
Cobalt	mg/kg	2	50	500
Copper	mg/kg	5	100	5000
Manganese	mg/kg	5	500	7500
Tin	mg/kg	-	50	610000
Vanadium	mg/kg	5	50	7200
Zinc	mg/kg	5	200	35000
Mercury	mg/kg	0.1	1.0	75
Trivalent Chromium	mg/kg	2	400	600000
Hexavalent Chromium	mg/kg	0.5	1	500
Polychlorinated Biphenyls (PCB)				
Total Polychlorinated biphenyls	mg/kg	0.1	1.0	50
Other Inorganics				
Boron	mg/kg	0.5	-	15000
Cyanides (complexed)	mg/kg	0.5	50	2500
Cyanides (free)	mg/kg	0.5	10	1250
Phosphorus	mg/kg	1	2,000	-
Sulfur	mg/kg	0.5	600	-
Sulfate	mg/kg	0.5	2,000	-
Organochlorine Pesticides (OC)				
alpha-BHC	mg/kg	0.05	0.5	-
Hexachlorobenzene (HCB)	mg/kg	0.05	0.5	-
beta-BHC	mg/kg	0.05	0.5	-
gamma-BHC	mg/kg	0.05	0.5	-
delta-BHC	mg/kg	0.05	0.5	-
Heptachlor	mg/kg	0.05	-	50
Aldrin	mg/kg	0.05	0.5	-
Heptachlor epoxide	mg/kg	0.05	0.5	-
Total Chlordane (sum)	mg/kg	0.05	0.5	250
trans-Chlordane	mg/kg	0.05	0.5	-
alpha-Endosulfan	mg/kg	0.05	0.5	-
cis-Chlordane	mg/kg	0.05	0.5	-
Dieldrin	mg/kg	0.05	0.2	-
4.4`-DDE	mg/kg	0.05	0.5	-
Endrin	mg/kg	0.05	0.5	-
beta-Endosulfan	mg/kg	0.05	0.5	-
Endosulfan (sum)	mg/kg	0.05	0.5	-
4.4`-DDD	mg/kg	0.05	0.5	-
Endrin aldehyde	mg/kg	0.05	0.5	-
Endosulfan sulfate	mg/kg	0.05	0.5	-
4.4`-DDT	mg/kg	0.2	0.5	-
Endrin ketone	mg/kg	0.05	0.5	-
Methoxychlor	mg/kg	0.2	0.5	-
Sum of Aldrin + Dieldrin	mg/kg	0.05	-	50
Sum of DDD + DDE + DDT	mg/kg	0.05	1	1000
Organophosphorus Pesticides (OP)				
Dichlorvos	mg/kg	0.05	1	-
Demeton-S-methyl	mg/kg	0.05	1	-
Monocrotophos	mg/kg	0.2	1	-
Dimethoate	mg/kg	0.05	1	-
Diazinon	mg/kg	0.05	1	-
Chlorpyrifos-methyl	mg/kg	0.05	1	-
Parathion-methyl	mg/kg	0.2	1	-
Malathion	mg/kg	0.05	1	-
Fenthion	mg/kg	0.05	1	-
Chlorpyrifos	mg/kg	0.05	1	-
Parathion	mg/kg	0.2	1	-
Pirimphos-ethyl	mg/kg	0.05	1	-
Chlorfenvinphos	mg/kg	0.05	1	-
Bromophos-ethyl	mg/kg	0.05	1	-
Fenamiphos	mg/kg	0.05	1	-
Prothiofos	mg/kg	0.05	1	-
Ethion	mg/kg	0.05	1	-
Carbophenothion	mg/kg	0.05	1	-
Azinphos Methyl	mg/kg	0.05	1	-
Phenolic Compounds				
Phenol	mg/kg	0.5	-	42500
2-Chlorophenol	mg/kg	0.5		
2-Methylphenol	mg/kg	0.5	-	31000
3-Methylphenol	mg/kg	1	-	31000
4-Methylphenol	mg/kg	1	-	3100
2-Nitrophenol	mg/kg	0.5		
2.4-Dimethylphenol	mg/kg	0.5		
2.4-Dichlorophenol	mg/kg	0.5		
2.6-Dichlorophenol	mg/kg	0.5		
4-Chloro-3-Methylphenol	mg/kg	0.5		
2.4.6-Trichlorophenol	mg/kg	0.5		
2.4.5-Trichlorophenol	mg/kg	0.5		
Pentachlorophenol	mg/kg	2		
Polynuclear Aromatic Hydrocarbons (PAH)				
Naphthalene	mg/kg	1	5	190
Acenaphthylene	mg/kg	1		
Acenaphthene	mg/kg	1		
Fluorene	mg/kg	1		
Phenanthrene	mg/kg	1	10	-
Anthracene	mg/kg	1	10	170000
Fluoranthene	mg/kg	1	10	22000
Pyrene	mg/kg	1	10	17000
Benz(a)Anthracene	mg/kg	1		
Chrysene	mg/kg	1		
Benzo(b)Fluoranthene	mg/kg	1		
Benzo(k)Fluoranthene	mg/kg	1		
Benzo(a)Pyrene	mg/kg	0.5	1	5
Indeno(1.2.3.cd)Pyrene	mg/kg	1		
Dibenz(a.h)Anthracene	mg/kg	1		
Benzo(g.h.i)perylene	mg/kg	1		
Sum of PAH	mg/kg	0.5	-	100
Benzo(a)pyrene TEQ (WHO)	mg/kg	0.5		

Table 1a

Assessment Criteria (Soil)

MDW ENVIRONMENTAL SERVICES

BTEX				
Benzene	mg/kg	0.2	1	5.6
Toluene	mg/kg	5	3	5200
Ethylbenzene	mg/kg	5	5	230
meta- & para-Xylene	mg/kg	5		
ortho-Xylene	mg/kg	5		
Sum of BTEX	mg/kg	0.2		
Total Xylenes	mg/kg	0.5	5	2600
Naphthalene	mg/kg	1		
Total Petroleum Hydrocarbons				
C6 - C9 Fraction	mg/kg	10	100	-
C10 - C14 Fraction	mg/kg	50	500	-
C15 - C28 Fraction	mg/kg	100	1,000	-
C29 - C36 Fraction	mg/kg	100		
C10 - C36 Fraction (sum)	mg/kg	50		
Total Recoverable Hydrocarbons				
C6 - C10 Fraction	mg/kg	10		
C6 - C10 Fraction minus BTEX	mg/kg	10		
>C10 - C16 Fraction	mg/kg	50		
>C16 - C34 Fraction	mg/kg	100		
>C34 - C40 Fraction	mg/kg	100		
>C10 - C40 Fraction (sum)	mg/kg	50		

Chemical	Health-based investigation levels (mg/kg)			
	Residential[1] A	Residential[1] B	Recreational[1] C	Commercial/ industrial[1] D
Metals and Inorganics				
Arsenic[2]	100	500	300	3 000
Beryllium	60	90	90	500
Boron	4500	40 000	20 000	300 000
Cadmium	20	150	90	900
Chromium (VI)	100	500	300	3600
Cobalt	100	600	300	4000
Copper	6000	30 000	17 000	240 000
Lead[3]	300	1200	600	1 500
Manganese	3800	14 000	19 000	60 000
Mercury (inorganic)[5]	40	120	80	730
Methyl mercury[4]	10	30	13	180
Nickel	400	1200	1200	6 000
Selenium	200	1400	700	10 000
Zinc	7400	60 000	30 000	400 000
Cyanide (free)	250	300	240	1 500
Polycyclic Aromatic Hydrocarbons (PAHs)				
Carcinogenic PAHs (as BaP TEQ)[6]	3	4	3	40
Total PAHs[7]	300	400	300	4000
Phenols				
Phenol	3000	45 000	40 000	240 000
Pentachlorophenol	100	130	120	660
Cresols	400	4 700	4 000	25 000
Organochlorine Pesticides				
DDT+DDE+DDD	240	600	400	3600
Aldrin and dieldrin	6	10	10	45
Chlordane	50	90	70	530
Endosulfan	270	400	340	2000
Endrin	10	20	20	100
Heptachlor	6	10	10	50
HCB	10	15	10	80
Methoxychlor	300	500	400	2500
Mirex	10	20	20	100
Toxaphene	20	30	30	160

Chemical	Residential[1] A	Residential[1] B	Recreational[1] C	Commercial/ industrial[1] D
Herbicides				
2,4,5-T	600	900	800	5000
2,4-D	900	1600	1300	9000
MCPA	600	900	800	5000
	Health-based investigation levels (mg/kg)			
Chemical	**Residential[1] A**	**Residential[1] B**	**Recreational[1] C**	**Commercial/ industrial[1] D**
MCPB	600	900	800	5000
Mecoprop	600	900	800	5000
Picloram	4500	6600	5700	35000
Other Pesticides				
Atrazine	320	470	400	2500
Chlorpyrifos	160	340	250	2000
Bifenthrin	600	840	730	4500
Other Organics				
PCBs[8]	1	1	1	7
PBDE Flame Retardants (Br1–Br9)	1	2	2	10

Notes:

(1) Generic land uses are described in detail in Schedule B7 Section 3

HIL A – Residential with garden/accessible soil (home grown produce <10% fruit and vegetable intake (no poultry), also includes childcare centres, preschools and primary schools.

HIL B – Residential with minimal opportunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise buildings and apartments.

HIL C – Public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and footpaths. This does not include undeveloped public open space where the potential for exposure is lower and where a site-specific assessment may be more appropriate.

HIL D – Commercial/industrial, includes premises such as shops, offices, factories and industrial sites.

(2) Arsenic: HIL assumes 70% oral bioavailability. Site-specific bioavailability may be important and should be considered where appropriate (refer Schedule B7).

(3) Lead: HIL is based on blood lead models (IEUBK for HILs A, B and C and adult lead model for HIL D where 50% oral bioavailability has been considered. Site-specific bioavailability may be important and should be considered where appropriate.

(4) Methyl mercury: assessment of methyl mercury should only occur where there is evidence of its potential source. It may be associated with inorganic mercury and anaerobic microorganism activity in aquatic environments. In addition the reliability and quality of sampling/analysis should be considered.

(5) Elemental mercury: HIL does not address elemental mercury. A site-specific assessment should be considered if elemental mercury is present, or suspected to be present,

(6) Carcinogenic PAHs: HIL is based on the 8 carcinogenic PAHs and their TEFs (potency relative to B(a)P) adopted by CCME 2008 (refer Schedule B7). The B(a)P TEQ is calculated by multiplying the concentration of each carcinogenic PAH in the sample by its B(a)P TEF, given below, and summing these products.

MDW ENVIRONMENTAL SERVICES

Table 2

Assessment Criteria (Soil) Volatiles

SOIL VAPOUR HEALTH SCREENING LEVELS (MG/m3)

CRC Care Technical report no.10

Chemical (f)	HSL - A (low Density Residential) and HSL -B (High Density Residential) (d)				
	0 >1m	1m to <2m	2m to <4m	4m to <8m	8m+
Sand (g)					
Toluene	1300	3800	7300	15000	89000
Ethyl benzene	330	1100	2200	4300	8700
Xylenes	220	750	1500	3000	6100
Naphthalene	0.78	3	6.1	12	25
Benzene	0.99	2.9	5.7	11	22
C6-C10	180	640	1300	2600	5300
>c10-C16	130	560	1200	2400	4800
Silt (g)					
Toluene	1400	14000	7300	15000	29000
Ethyl benzene	380	4200	2200	4300	8700
Xylenes	260	2900	1500	3000	6100
Naphthalene	0.9	12	6.1	12	25
Benzene	1.1	11	5.7	11	22
C6-C10	210	2600	1300	2600	5300
>c10-C16	160	2300	1200	2400	4800
Clay (g)					
Toluene	1600	23000	53000	110000	NL
Ethyl benzene	420	6800	16000	35000	NL
Xylenes	280	4800	11000	24000	50000
Naphthalene	1	18	44	94	200
Benzene	1.2	17	41	88	180
C6-C10	230	4200	9900	21000	44000
>c10-C16	180	3800	NL	NL	NL

Notes:

The figures in the above table may be multiplied by a factor to account for biodegradation of vapour. A factor of 10 may apply for source depths from 2m to <4 or a factor of 100 for source depths of 4m and deeper. To apply the attenuation factor for vapour degradation a number of conditions must be satisfied. Firstly, the maximum length of the shorter side of the concrete slab and surrounding pavement common exceed 15m, as this would prevent oxygen penetrating the centre of the slab. Secondly, measurements of oxygen in the subsurface is required to determine the potential for biodegradation to occur.

NL - denotes no level present as HSL exceeds concentration of pure gas.

(d) - HSLs for vapour intrusion into high density residential buildings are based on occupation of the ground floor. If residents occupy ground floor apartments, HSL-B should be used. If the ground floor consists of commercial properties of is the building contains a communal basement car park, commercial use HSL-D) may be applied instead.

e) - The maximum possible soil vapour concentration has been calculated based on the vapour pressures of the pure chemicals. Where soil vapour HSLs exceed these values a soil-vapour source concentration for a petroleum mixture could not exceed a level that would results in the maximum allowable vapour risk for a given scenario. For these scenarios no HSL is present for these chemicals. These are denoted as not limiting 'NL'.

(f) - Chemicals in TPH >16 fraction have physical properties which make this TPH fraction non-volatile, and therefore are not of concern for vapour intrusion.

(g) - For Soil assessment (texture Classification) undertkaen in accord with AS 1726 the classification of SAND, SILT and CLAY may be applied as coarse, fine with liquid less than 50%, and fine with liquid greater than 50% respecitviely, as the underlying properties use to devlop the HSLs may reasonably be selected to be similar. Where ther eis uncertainty, laboraoty analyiss should be carried out.

Table 3

Assessment Criteria (A

Analyte / Assessment Criteria	Unit	Safe Work Australia (TWA)	NEPM (24 hours)
Dust			
PM 10	µg/m³	-	50*
PM 2.5	µg/m³	-	25* *(Advisory Standard)*
Asbestos			
Asbestos Fiber (Mixed Fibers)	fiber/mL	0.1#	-
Silica			
Crystalline Silica	mg/m³	0.1	-
Metals			
Arsenic	mg/m³	0.05	-
Barium	mg/m³	0.5	-
Cadmium	mg/m³	0.01	-
Chromium	mg/m³	0.5 #	-
Copper	mg/m³	1	-
Manganese	mg/m³	1	-
Nickel	mg/m³	1	-
Lead	mg/m³	0.15	-
Zinc	mg/m³	10	-
Mercury	mg/m³	0.025	-

NB:

* No current Safe Work Australia Standards for Dust as PM0 and PM2.5, therefore assessment criteria will be based on the daily Ambient Air NEPM Guidelines.

In the event concentrations exceed the assessment criteria further analysis will be conducted to speciate contaminates.

In the event contaminates exceed in excess of the assessment criteria works may have be stopped and reassessment of work practices will be required.

Table 4

Assessment Criteria (Water)

Analyte / Assessment Criteria	Units	LOR	Freshwater Ecosystems	ADWG HV	ADWG AV	DoH	Short-term Irrigation	Long-term Irrigation
pH Value	pH Unit	0.01	6.5-8.5		6.5-8.5			6.0-8.5
Electrical Conductivity	µS/cm	1	1500					
Total Dissolved Solids	mg/L	10						
Suspended Solids	mg/L	5						
Turbidity	NTU	0.1						
Total Alkalinity as CaCO3	mg/L	1						
Acidity as CaCO3	mg/L	1						
BOD	mg/L	2						
COD	mg/L	5						
Sulfate as SO4	mg/L	1		500	250	5000		
Sulfide	mg/L	0.1	0.001					
Alkalinity : Sulfate	ratio							
Chloride	mg/L	1				2500		
Sulfate : Chloride	ratio							
Dissolved Metals								
Aluminium	mg/L	0.01	0.055		0.2	2	20	5
Arsenic	mg/L	0.001	0.013	0.007		0.07	2	0.1
Cadmium	mg/L	0.0001	0.0002	0.002		0.02	0.05	0.01
Chromium	mg/L	0.001					1	0.1
Manganese	mg/L	0.001	1.9	0.5	0.1	5	10	0.2
Nickel	mg/L	0.001	0.011	0.02		0.2	2	0.2
Selenium	mg/L	0.01	0.005	0.01		0.1	0.05	0.02
Zinc	mg/L	0.005	0.008		3	30	5	2
Iron	mg/L	0.05	0.3		0.3	3	10	0.2
Ferrous Iron	mg/L	0.05						
Hexavalent Chromium	mg/L	0.01	0.001	0.05		0.5		
Total Metals								
Aluminium	mg/L	0.01	0.055		0.2	2	20	5
Arsenic	mg/L	0.001	0.013	0.007		0.07	2	0.1
Cadmium	mg/L	0.0001	0.0002	0.002		0.02	0.05	0.01
Chromium	mg/L	0.001					1	0.1
Copper	mg/L	0.001	0.0014	2	1	20	5	0.2
Lead	mg/L	0.001	0.0034	0.01		0.1	5	2
Manganese	mg/L	0.001	1.9	0.5	0.1	5	10	0.2
Molybdenum	mg/L	0.001		0.05		0.5	0.05	0.01
Nickel	mg/L	0.001	0.011	0.02		0.2	2	0.2
Selenium	mg/L	0.01	0.005	0.01		0.1	0.05	0.02
Silver	mg/L	0.001	0.00005	0.1		1		
Zinc	mg/L	0.005	0.008		3	30	5	2
Iron	mg/L	0.05	0.3		0.3	3	10	0.2
Nutrients								
Ammonia as N	mg/L	0.01	0.9					
Nitrite as N	mg/L	0.01		3		30		
Nitrate as N	mg/L	0.01		50		500		
Total Kjeldahl Nitrogen as N	mg/L	0.1						
Total Nitrogen as N	mg/L	0.1	1.0 [1]					5
Total Phosphorus as P	mg/L	0.01	0.1 [1]					0.05
Reactive Phosphorus as P	mg/L	0.01						
Organochlorine Pesticides (OC)								
alpha-BHC	µg/L	0.5						
Hexachlorobenzene (HCB)	µg/L	0.5						
beta-BHC	µg/L	0.5						
gamma-BHC	µg/L	0.5						
delta-BHC	µg/L	0.5						
Heptachlor	µg/L	0.5	0.01					
Aldrin	µg/L	0.5						
Heptachlor epoxide	µg/L	0.5						
trans-Chlordane	µg/L	0.5	0.03 [2]					
alpha-Endosulfan	µg/L	0.5	0.03 [3]					
cis-Chlordane	µg/L	0.5	0.03 [2]					
Dieldrin	µg/L	0.5						
4.4`-DDE	µg/L	0.5						
Endrin	µg/L	0.5	0.01					
beta-Endosulfan	µg/L	0.5	0.03 [3]					
4.4`-DDD	µg/L	0.5						
Endrin aldehyde	µg/L	0.5						
Endosulfan sulfate	µg/L	0.5						
4.4`-DDT	µg/L	2	0.006					
Endrin ketone	µg/L	0.5						
Methoxychlor	µg/L	2						
Total Chlordane (sum)	µg/L	0.5						
Sum of DDD + DDE + DDT	µg/L	0.5						
Sum of Aldrin + Dieldrin	µg/L	0.5						

Table 4

Assessment Criteria (Water)

Organophosphorus Pesticides (OP)								
Dichlorvos	µg/L	0.5						
Demeton-S-methyl	µg/L	0.5						
Monocrotophos	µg/L	2						
Dimethoate	µg/L	0.5	0.15					
Diazinon	µg/L	0.5	0.01					
Chlorpyrifos-methyl	µg/L	0.5						
Parathion-methyl	µg/L	2						
Malathion	µg/L	0.5	0.05					
Fenthion	µg/L	0.5						
Chlorpyrifos	µg/L	0.5	0.01					
Parathion	µg/L	2	0.004					
Pirimphos-ethyl	µg/L	0.5						
Chlorfenvinphos	µg/L	0.5						
Bromophos-ethyl	µg/L	0.5						
Fenamiphos	µg/L	0.5						
Prothiofos	µg/L	0.5						
Ethion	µg/L	0.5						
Carbophenothion	µg/L	0.5						
Azinphos Methyl	µg/L	0.5	0.02					
Monocyclic Aromatic Hydrocarbons								
Styrene	µg/L	5		30	4	4		
Isopropylbenzene	µg/L	5						
n-Propylbenzene	µg/L	5						
1.3.5-Trimethylbenzene	µg/L	5						
sec-Butylbenzene	µg/L	5						
1.2.4-Trimethylbenzene	µg/L	5						
tert-Butylbenzene	µg/L	5						
p-Isopropyltoluene	µg/L	5						
n-Butylbenzene	µg/L	5						
Oxygenated Compounds								
Vinyl Acetate	µg/L	50						
2-Butanone (MEK)	µg/L	50						
4-Methyl-2-pentanone (MIBK)	µg/L	50						
2-Hexanone (MBK)	µg/L	50						
Sulfonated Compounds								
Carbon disulfide	µg/L	5						
Fumigants								
2.2-Dichloropropane	µg/L	5						
1.2-Dichloropropane	µg/L	5						
cis-1.3-Dichloropropylene	µg/L	5						
trans-1.3-Dichloropropylene	µg/L	5						
1.2-Dibromoethane (EDB)	µg/L	5						
Halogenated Aliphatic Compounds								
Dichlorodifluoromethane	µg/L	50						
Chloromethane	µg/L	50						
Vinyl chloride	µg/L	50						
Bromomethane	µg/L	50						
Chloroethane	µg/L	50						
Trichlorofluoromethane	µg/L	50						
1.1-Dichloroethene	µg/L	5		30		300		
Iodomethane	µg/L	5						
trans-1.2-Dichloroethene	µg/L	5						
1.1-Dichloroethane	µg/L	5						
cis-1.2-Dichloroethene	µg/L	5						
1.1.1-Trichloroethane	µg/L	5						
1.1-Dichloropropylene	µg/L	5						
Carbon Tetrachloride	µg/L	5		3		30		
1.2-Dichloroethane	µg/L	5		3		30		
Trichloroethene	µg/L	5						
Dibromomethane	µg/L	5						
1.1.2-Trichloroethane	µg/L	5	6500					
1.3-Dichloropropane	µg/L	5						
Tetrachloroethene	µg/L	5		50		500		
1.1.1.2-Tetrachloroethane	µg/L	5						
trans-1.4-Dichloro-2-butene	µg/L	5						
cis-1.4-Dichloro-2-butene	µg/L	5						
1.1.2.2-Tetrachloroethane	µg/L	5						
1.2.3-Trichloropropane	µg/L	5						
Pentachloroethane	µg/L	5						
1.2-Dibromo-3-chloropropane	µg/L	5						
Hexachlorobutadiene	µg/L	5		0.7		7		
Halogenated Aromatic Compounds								
Chlorobenzene	µg/L	5		300	10	10		
Bromobenzene	µg/L	5						
2-Chlorotoluene	µg/L	5						
4-Chlorotoluene	µg/L	5						
1.3-Dichlorobenzene	µg/L	5	260		20	20		
1.4-Dichlorobenzene	µg/L	5	60	40	3	3		
1.2-Dichlorobenzene	µg/L	5	160	1500	1	1		
1.2.4-Trichlorobenzene	µg/L	5	170			5		
1.2.3-Trichlorobenzene	µg/L	5	3	30	5	5		

Table 4

Assessment Criteria (Water)

Trihalomethanes								
Chloroform	µg/L	5						
Bromodichloromethane	µg/L	5						
Dibromochloromethane	µg/L	5						
Bromoform	µg/L	5						
Phenolic Compounds								
Phenol	µg/L	1	320					
2-Chlorophenol	µg/L	1	340	300	0.1	3000		
2-Methylphenol	µg/L	1						
3- & 4-Methylphenol	µg/L	2						
2-Nitrophenol	µg/L	1						
2.4-Dimethylphenol	µg/L	1						
2.4-Dichlorophenol	µg/L	1	120	200	0.3	2000		
2.6-Dichlorophenol	µg/L	1						
4-Chloro-3-Methylphenol	µg/L	1						
2.4.6-Trichlorophenol	µg/L	1	3	20	2			
2.4.5-Trichlorophenol	µg/L	1						
Pentachlorophenol	µg/L	2	3.6					
Polynuclear Aromatic Hydrocarbons								
Naphthalene	µg/L	1	16					
Acenaphthylene	µg/L	1						
Acenaphthene	µg/L	1						
Fluorene	µg/L	1						
Phenanthrene	µg/L	1						
Anthracene	µg/L	1						
Fluoranthene	µg/L	1						
Pyrene	µg/L	1						
Benz(a)anthracene	µg/L	1						
Chrysene	µg/L	1						
Benzo(b)fluoranthene	µg/L	1						
Benzo(k)fluoranthene	µg/L	1						
Benzo(a)pyrene	µg/L	0.5		0.01		0.1		
Indeno(1.2.3.cd)pyrene	µg/L	1						
Dibenz(a.h)anthracene	µg/L	1						
Benzo(g.h.i)perylene	µg/L	1						
Sum of polycyclic aromatic hydrocarbons	µg/L	0.5						
Benzo(a)pyrene TEQ (WHO)	µg/L	0.5						
BTEXN								
Benzene	µg/L	1	950	1		10		
Toluene	µg/L	2		800	25	25		
Ethylbenzene	µg/L	2		300	3	3		
meta- & para-Xylene	µg/L	2	200	600	20	20		
ortho-Xylene	µg/L	2	350	600	20	20		
Total Xylenes	µg/L	2		600	20	20		
Sum of BTEX	µg/L	1						
Naphthalene	µg/L	5	16					
Total Petroleum Hydrocarbons								
C6 - C9 Fraction	µg/L	20						
C10 - C14 Fraction	µg/L	50						
C15 - C28 Fraction	µg/L	100						
C29 - C36 Fraction	µg/L	50						
C10 - C36 Fraction (sum)	µg/L	50	600					
Total Recoverable Hydrocarbons								
C6 - C10 Fraction	µg/L	20						
C6 - C10 Fraction minus BTEX	µg/L	20						
>C10 - C16 Fraction	µg/L	100						
>C16 - C34 Fraction	µg/L	100						
>C34 - C40 Fraction	µg/L	100						
>C10 - C40 Fraction (sum)	µg/L	100	600					

Appendix A – Site Summary form and Certificate of Title (CoT)

Department of Environment and Conservation

Site Summary Form – Contaminated Site Assessment

For completion by the person(s) submitting a report(s) to be assessed by the Department of Environment and Conservation (DEC) as per the information requirements of the DEC *Reporting on Site Assessments (2001)* guideline. Completing this form enables DEC to maintain accurate records for the site.

Please note: A completed site summary form must accompany each report submitted to DEC for assessment. Each box must be filled out appropriately. Please do not write "refer to report" in any section. Copies of all relevant/current Certificates of Title must accompany this form.

Site location details:

Site name (e.g. where site may be known by a common/ business name): Lot 20, Adelaide Street

Lot no. 20 **House no.** **Street** Adelaide Street

Suburb Hazelmere **State** WA **Postcode** 6055

Crown Reserve (if applicable): n/a

Certificate(s) of Title (or equivalent):

Volume/Folio:

- 49/110
- 284/142
- 376/9
- 490/78
- 507/158
- 524/12
- 575/198
- 609/123
- 636/107
- 720/159
- 823/134
- 856/58
- 1015/105
- 1094/824
- 1103/577
- 377/113A
- 1697/970
- 2054/299

Where the subject site comprises of multiple certificates of title, please list all certificates: Yes...................................

Where substances have migrated beyond the cadastral boundaries of the subject site, please provide the addresses, relevant Certificates of Title documentation and owners details for all offsite properties impacted (includes soil and/or groundwater), as an attachment to this form.

Is a hard copy of Certificate of Title and associated sketch for all listed sites attached? (Y/N) y

WAPC reference no. (where applicable): unknown

Current Owner/Occupier details:

Site owner (Name and address): Wasterock Pty Ltd

Site owner company ACN/ABN:

Site occupier (name and address): Un occupied as present

Site occupier company ACN/ABN:

Site status (at time of reporting):

Proposed land use (e.g. high density residential/child care facility): Remediation of a Historical Landfill for Commercial / Industrial Land Use.

Identified substances and relevant media (e.g. benzene in soil and groundwater, xylene in soil only):
Soil –Asbestos, Heavy Metals, potential TPH, TRH and MAH
G/W – Metals and TPH

Asbestos (Y/N)	Y	**Health Risk Assessment** (Y/N)	Y	**Community health concerns identified** (Y/N)	Y	**Radiological issues** (Y/N)	N
Air quality issues (Y/N)	Y	**Past/present landfill** (Y/N)	Y	**Potential human exposure to identified substances > DEC's Health Investigation Levels or equivalent** (Y/N)	Y	**Other human health issues** (Y/N)	N

Specify other health issues……

Where 'yes' is recorded for at least one of the above categories, please submit two copies of the report(s) (relevant documentation) to DEC for referral to the Department of Health (or Radiological Council, in the case of radiological issues)

Are site activities licensed under the *Environmental Protection Act 1986?* (Y/N): N

Where laboratory analysis has been undertaken, is the laboratory NATA accredited for all analytes and analytical methodologies used? (Y/N) (If not, why not?): Y

Community Consultation: (as per the DEC's *Community Consultation (December 2006)* guideline)

Community consultation program commenced/proposed (Y/N): Proposed (Y)

Are consultation program details (e.g. community consultation plan) provided in attached report (Y/N): Y

History of Investigation:

Have previous site investigations been undertaken? (Y/N - if yes, please provide details below) Y

Report title, date and author:

- FOI 1233/05 by Department of Environment & Conservation (DEC) – Freedom of Information – Lot 20, Adelaide Street, Hazelmere (October 2005);
- 2145245A:PR2_16644.RevA by Parsons Brinckerhoff – Site Investigation (SI) – Hazelmere, WA (July 2006) (see figure 1);
- V392/2007 grw4469 by Knight Frank – Valuation Report – Lot 20 Adelaide Street, Hazelmere, WA (July 2007);
- 476300-0kjcv070709a by Burgess Rawson – Valuation Report – Lot 20 Adelaide Street, Hazelmere, WA (July 2007);
- 60150301 by AECOM – District Storm water Management Strategy – Hazelmere Enterprise Area (June 2010);
- Drilling Logs by Banister Drilling & Irrigation for 20 Adelaide Street, WA. (May 2012);
- E2012-031 (GME) – MDWES – Groundwater Monitoring Event #1 – Adelaide Street Hazelmere (May 2012);
- NTEC Environmental Technology – Groundwater Modeling for the Wasterock Hazelland Landfill Site in Hazelland. (September 2012).
- E2012-031 (GME) – MDWES – Groundwater Monitoring Event #2 – Adelaide Street Hazelmere (August 2012);
- E2012-031 (GWAMP) – MDWES – Groundwater Abstraction for Dust Suppression & Surface Compaction v2 – Adelaide Street Hazelmere (October 2012);
- E2012-031 (GME) – MDWES – Groundwater Monitoring Event #3 – Adelaide Street Hazelmere (January 2013);
- E2013-031 – (SAMP) - MDWES – Soil Amendment Management Plan – Lot 20 Adelaide Street, Hazelmere (March 2013).
- E2012-031 (GME) – MDWES – Groundwater Monitoring Event #4 – Adelaide Street Hazelmere (June 2013);
- E2012-031 (AQMP) – MDWES – Air Quality Management Plan (AQMP) v2 – Adelaide Street Hazelmere, (October 2013).
- E2012-031 (GMES) – MDWES – Annual Groundwater Monitoring Event Summary Report (GMES) v2 – Adelaide Street Hazelmere, (October 2013).
- GRA 7729 by Greg Rowe & Assoc. – Community Management Strategy for Remediation of Former Landfill Site: Lot 20 Adelaide Street, Hazelmere. (March 2014);
- 6045.k.09_09082_SMP by Waste Rock Pty Ltd – Site Remediation Works Agreement and Site Management Plan (Final) – Lot 20 Adelaide Street. (March 2014);

Declaration:

The information contained in this site summary form is a true representation of the information contained in the attached report(s)/document(s).

Full name (print)	Greg Watts
Position held	Principal

Signature	G. J. Watts	**Date**	25/11/13

Please ensure that a hardcopy of the current Certificate(s) of Title and associated sketch accompanies the site summary form. DEC cannot proceed with the assessment of the report if this information is not provided.

DEC Registrar Only

Registrar name:		**Signature:**			
CoT verified (Y/N)		**Owner details verified** (Y/N)		**Complete form** (Y/N)	

Awaiting Classification (Y/N)	
Awaiting Re-Classification (Y/N)	
Incomplete Form (Y/N)	

LWQB Assessment Officer:	
Comments/Actions:	
Date of data entry:	

Samuel Neil Talbot
6040 acres
Helena River Location 20 a

Victoria

by the Grace of God of the United Kingdom of Great Britain and Ireland Queen, Defender of the Faith &c &c &c To all to whom these presents shall come Greeting. Know ye that We of Our especial Grace, certain knowledge, and mere motion, have given and granted, and by these presents for Us, Our Heirs and Successors, in consideration of certain Location Duties performed by Samuel Neil Talbot of Perth in the Colony of Western Australia Gentleman to the satisfaction of our [illegible] our Colony of Western Australia **Give and Grant** unto the said Samuel Neil Talbot All that piece or parcel of land situate and being on the Helena River in the District of Perthshire in our said Colony [illegible] (6040) Six Thousand and forty acres (more or less) known as Location 20 a. Bounded on the North by [illegible] 4000 acres No 16 of Sir James Stirling on the Swan River that is to say by a S.E. line about 37½ chains in length from East Corner of P. A. Lautour's 100 acres (No 7) where a stake is placed in a notched Cross in the ground (+) to a mahogany post [illegible] mark in the Ground (⌐) the latter stake being situated 2 yards N.W. from a Banksia tree marked on its North face ✚ the North Boundary then [illegible] east about 167 chains 27 links to left bank of the Helena and touches the North side of a double stand white Gum tree growing about [illegible] River and marked on its East side ▲ and on its South side ▲. Bounded on the North West by a N.W. line about 24 chains 4 links in length [illegible] of P. A. Lautour's Land aforesaid to the South Corner of the same, where a stake is placed in the Centre of a notched Cross (+) then S.E. [illegible] to a mahogany Post in a notched Angle in the ground (>) then S.W. 15 chains 60 links to another mahogany Post in a notch (⌐) then N.W. [illegible] chains [illegible] to the East Corner of James Drummond's 100 acres No 17 where a mahogany post is placed in a Cross in the ground (+) [illegible] Drummond's Land aforesaid 15 chains 60 links S.W. to a red gum Post in a notched angle close to a red Gum tree (⌐) and N.W. [illegible] chains [illegible] links to east Corner of W. Everett's Land (100 acres) No 15 where a squared Mahogany Post is found in the centre of a Cross in the Ground (+) [illegible] Everett's Land S.W. 15 chains 60 links to a mahogany stake in a Cross (+) and S.W. the distance of 9 chains 24 links on the [illegible] of the Helena passing through W. Everett's lower Boundary mark on that River, which is the Centre of the stem of a large Gum tree growing [illegible] from the River's left Bank and marked with 2 notches vertical on the land side of the stem, and one Notch on its river side. The N.W. Boundary finally extends S.W. 10 chains to the Helena's right Bank, and does not include any portion of that River's bed. Bounded on the S.E. by the left Bank of Helena, extending from the East end of the North Boundary as above described, to Centre of the Junction with that River of a small Creek on its left [illegible] about 9¾ miles (in a direct line) from the River's mouth, said Junction being known by a small Red Gum Tree 8 links S.W. [illegible] marked ▮ on its South side ▲ on its west side ▼ on its north side and ◆ on its east side. Bounded on the East by a line extending 101 chains [illegible] links due South from Junction of said Creek last named and on the South by a line extending S.W. 56 chains 45 links from left Bank of the Helena River about 20 chains above its Junction with the Swan, said line passing through the Centre of the stem of a banksia tree close to it, [illegible] marked with a notch on its upper and lower sides and two notches vertical on its land side, and terminating at a distance [illegible] at a Mahogany Post placed in a Trench cut thus ✕ in the ground. The South Boundary then extends due S.E. until it meets a due West line 153 chains [illegible] links in length from South end of the East Boundary. **Together** with all Profits, Commodities, Hereditaments and Appurtenances whatsoever thereunto belonging or appertaining **To Have and To Hold** the said Piece or Parcel of Land and all and singular the Premises hereby granted with their Appurtenances unto the said Samuel Neil Talbot his Heirs and Assigns for ever; he or they yielding and paying for the same to Us, Our Heirs and Successors, One Peppercorn of Yearly Rent on the Twenty fifth day of March in each Year, if so soon thereafter as the same shall be lawfully demanded. Provided nevertheless, that it shall at all times be lawful for Us, our Heirs and Successors, or for any person or persons acting in that behalf by Our or their authority to resume and enter upon any portion or any part of the said Lands which it may at any time by Us, Our Heirs or Successors be deemed necessary to resume for making Roads, Canals, Bridges, Towing Paths or other works of public Utility or Convenience, and such Lands so resumed to hold to Us, Our Heirs and Successors, as of our and their former Estate, without making to the said Samuel Neil Talbot his Heirs or Assigns any Compensation in respect thereof; so nevertheless, that the quantity so to be resumed shall not exceed one twentieth part in the whole of the Lands aforesaid, and that no such resumption be made of any lands on which any Buildings may have been erected, or which may be in use as Gardens or otherwise for the more convenient occupation of any such Buildings. And provided also that it shall be lawful at all times for Us, Our Heirs and Successors or for any person or persons acting in that behalf by Our or their authority to cut and take away any such indigenous Timber and to search and dig for and take away any Stones or other Materials which may be required for making or keeping in Repair any Roads, Bridges, Canals, Towing Paths or other works of public Convenience and Utility. And We do hereby save and reserve to Us, Our Heirs and Successors, all mines of Gold, Silver, and other precious Metals in or under the said Lands with full liberty at all times to search and dig for, and carry away the same; and for that purpose to enter upon the said Lands or any part thereof.

In Witness whereof We have caused Our Trusty and well beloved Sir James Stirling Knight Our Governor and Commander in Chief of Our said Colony to affix hereto the Public Seal of the said Colony

[illegible] this Second Day of August, One Thousand Eight [illegible] and Thirty eight in presence of the Executive Council

L.S.

[illegible] J. Stirling Govr

Apps 150/92 Receipt 326, 823/93 94

R 260/91

Sch. 2.
38 V. 13.

CANCELLED

CULLED

Plan No. 668 & 699
" No. 824
No. 2576 669

REGISTER BOOK. 110

Vol. XLIX. Fol. 110
49 4

WESTERN AUSTRALIA.

Certificate of Title under "The Transfer of Land Act, 1874."

Robert Bruce Robertson Glasgow of Mount Greenan in the County of Ayr in Scotland Esquire

CT 0049 0110 F

is now the sole proprietor

of an estate in fee simple in possession subject to the encumbrances if any notified on the back of these presents

in ALL THAT land those parcels of land situate in the Swan District

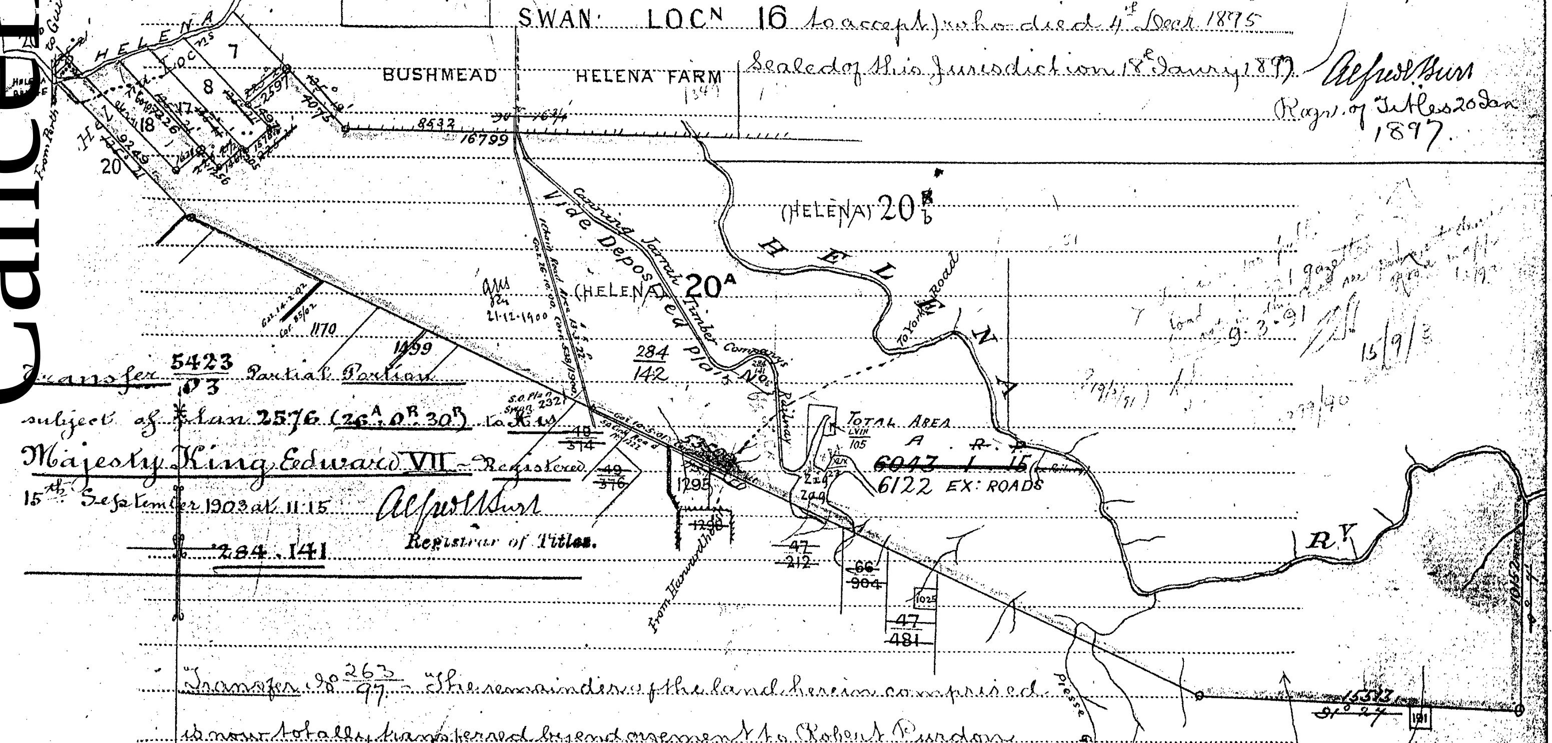
containing ~~Six thousand and forty three acres one rood and fifteen perches~~ together six thousand one hundred and twenty two acres exclusive of Roads DOM 23.1.93

or thereabouts being Helena Locations 18 and 20a as delineated in the diagram hereunder & colored green

Transfer 151/93 Plans 668.669 This Certificate is partially cancelled 81.2.25 a r p of the within land having been transferred to the Canning Jarrah Timber Co. Ltd. Instrument produced at noon 25 January 1893 and registered same time See Vol XLIX f 123 — ICH Alfred Burt Reg

Transfer 463/94 Plan 824 This Certificate is further partially cancelled 2.0.36 a r p of the within land having been transferred to Thomas Statham Instrument produced at 12.15 on 12 April 1894 and registered same time See Vol LVIII f 105 — Alfred Burt Reg

56 Cert 140 Sec 187. Applon 23/97 Edward Talbot Day Tincept of Hinton Charterhouse Somersetshire Esquire and Colin George Campbell of the India Office appointed on 16 Nov 1876 by the office of the commissariot of Ayrshire Scotland as executors of the will of Robert Bruce Robertson Glasgow (the other executor John Campbell Robertson Glasgow having declined) who died 4th Decr 1875 Sealed of this Jurisdiction 18th Jany 1897 Alfred Burt Regr of Titles 20 Jan 1897.



Transfer 5423/03 Partial Portion subject of Plan 2576 (26A 0R 30P) to His Majesty King Edward VII — Registered 15th September 1903 at 11.15 Alfred Burt Registrar of Titles. 284.141

Transfer No. 263/97 The remainder of the land herein comprised is now totally transferred by endorsement to Robert Purdon Robertson Glasgow of Mont Greenan in the County of Ayr in Scotland Instrument registered 19th day of January 1897 @ 2.45 o'c pm. Alfred Burt Reg

Dated the twenty third day of January One thousand eight hundred and ninety three

Transfer No. 273/97 The remainder of the land herein comprised is now totally transferred by endorsement to James Morrison of Perth Station Agent Instrument registered 20th day of January 1897. @ 12.30 o'c pm. Alfred Burt Reg

I C H James
Commissioner of Land Titles.

Cancelled

ENCUMBRANCES REFERRED TO.

Cancelled

CT 0049 0110 B

VOL 49 FOL 110

10240 . Application 848/1903 Vol 19 Fol 110

INDEXED

REGISTER BOOK.

Vol. 284 Fol. 142

WESTERN AUSTRALIA.

Certificate of Title

under "The Transfer of Land Act, 1893."

Sch. 5, 50 V., 14.

CT 0284 0142 F

James Morrison of Perth Stallion Agent

is now the sole proprietor of an estate in fee simple in possession subject to the easements and encumbrances notified hereunder, in All those pieces of land delineated and coloured green on the map hereon, containing in the aggregate five thousand nine hundred and seventy one acres or thereabouts, being portion of each of Helena Locations 18 and 20a

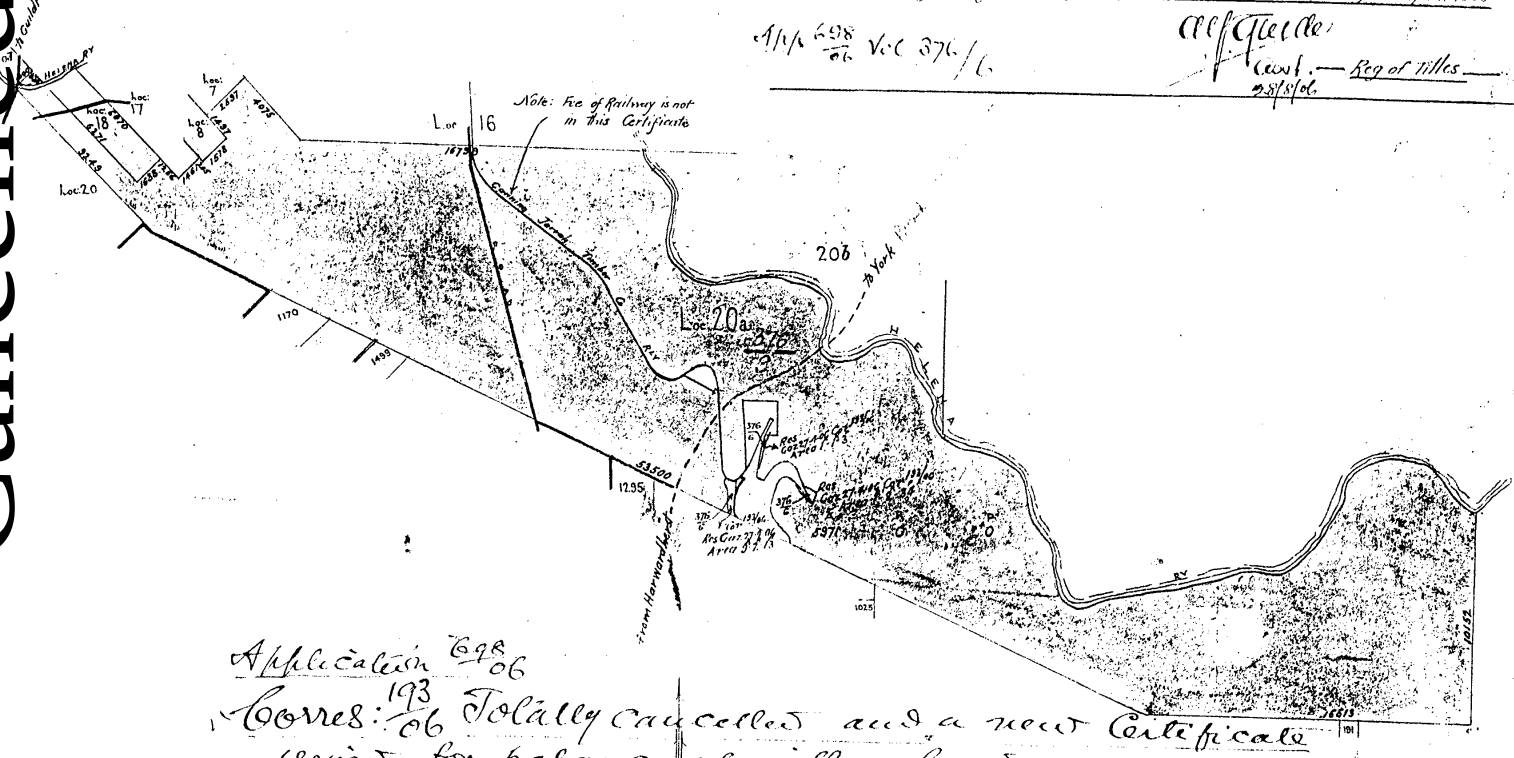
Cor. 77/06 Corr. dated 27.4.06 Area 12 A 2 R 10 P

Portion of the land herein comprised is Resumed for the purpose of Upper Darling Range Railway by proclamation dated 25th day of April 1906

App 698/06 Vol 376/6

A. Gale Asst. Reg of Titles 28/8/06

Cancelled



Application 698/06

Corres: 193/06 Totally cancelled and a new Certificate issued for balance of within land

376 . 9.

A. Gale Asst. Registrar of Titles

28 . 8 . 06

Scale 60 Chains to an inch

Dated the fifteenth day of September, One thousand nine hundred and three.

Registrar of Titles.

EASEMENTS AND ENCUMBRANCES REFERRED TO

Cancelled

CT 0284 0142 B

254 142

5554/of Cov. 193/1906 Vol. 284, Fol. 142

8486/09

REGISTER BOOK.

Vol. 376 Fol. 9

Diag 3219

INDEXED

WESTERN AUSTRALIA.

CANCELLED

ORIGINAL

Certificate of Title

under "The Transfer of Land Act, 1893."

Sch. 5, 56 V., 14.

CT 0376 0009 F

James Morrison of Perth Station Agent

is now the sole proprietor

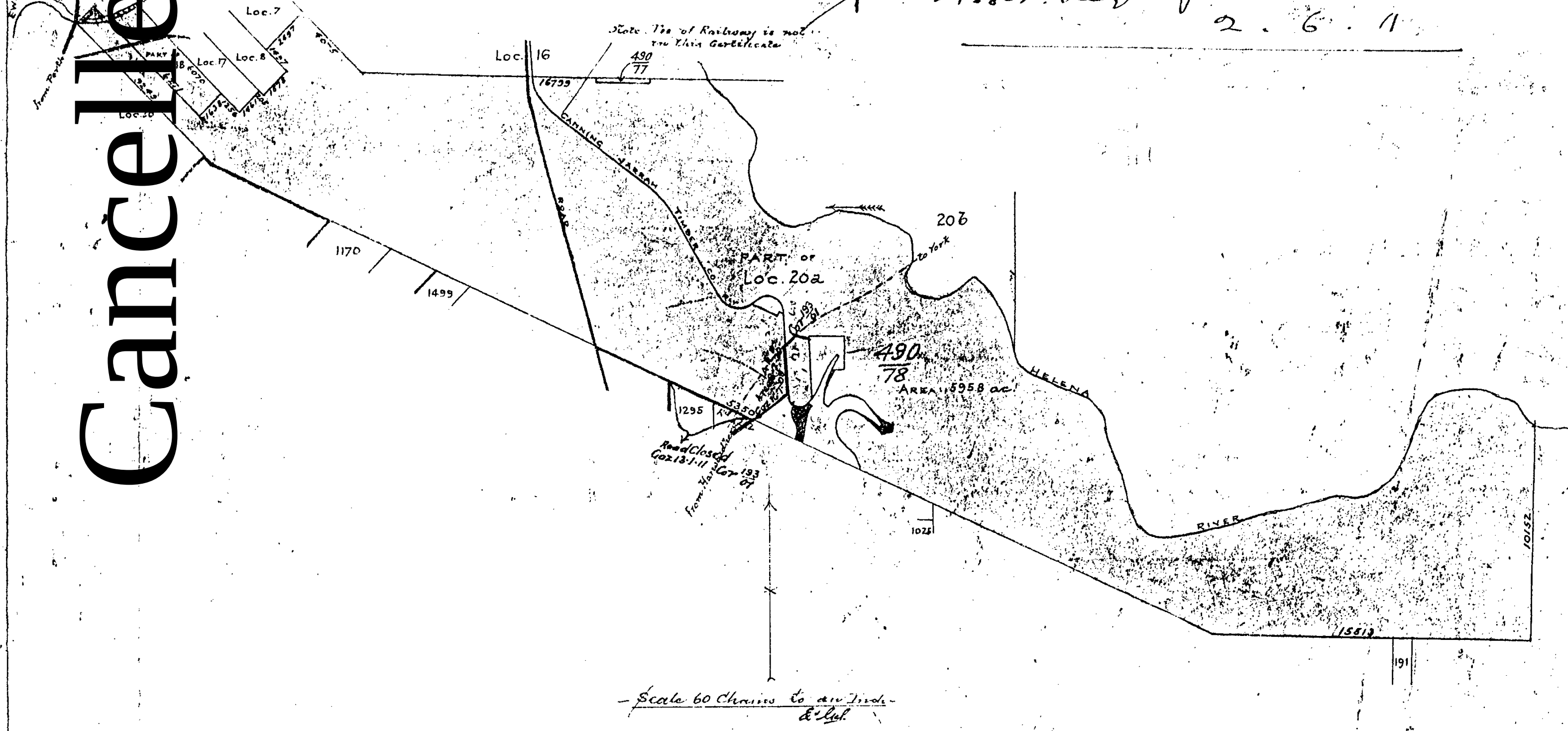
of an estate in fee simple in possession subject to the easements and encumbrances notified hereunder, in All those pieces of land delineated and coloured green on the map hereon, containing in the aggregate five thousand nine hundred and fifty eight acres or thereabouts, being part of each of Helena Locations 18 and 20a

Application 1028/1911 Totally Cancelled (except as to the portion resumed) and a new Certificate issued for balance of within land

490 - 78.

Alf Geode

Ass't Regr of Titles 2. 6. 11



Dated the twenty eighth day of August, One thousand nine hundred and six

Alf Geode

Registrar of Titles.

For encumbrances and other matters affecting the land see back.

EASEMENTS AND ENCUMBRANCES REFERRED TO.

Transfer 2971 Portion A R P 5 1 0 subject of diagram 3259 to Robert Bsurner [illegible]
[illegible] 1911 Registered 2nd June 1911 at 2.[illegible]
490 - 77
[illegible]

Cancelled

CT 0376 0009 B

Registered Vol. 376 Fol. 9

INDEXED

APPLICATION 1028/1911 VOL. 376, FOL. 9

R 9657/11

Diag. 3754
" 3301

REGISTER BOOK.

Vol. 490 Fol. 78

WESTERN AUSTRALIA.

Certificate of Title

under "The Transfer of Land Act, 1893."

Sch. 5, 56 Vic., 14.

CT 0490 0078 F

James Morrison of Perth, Station Agent

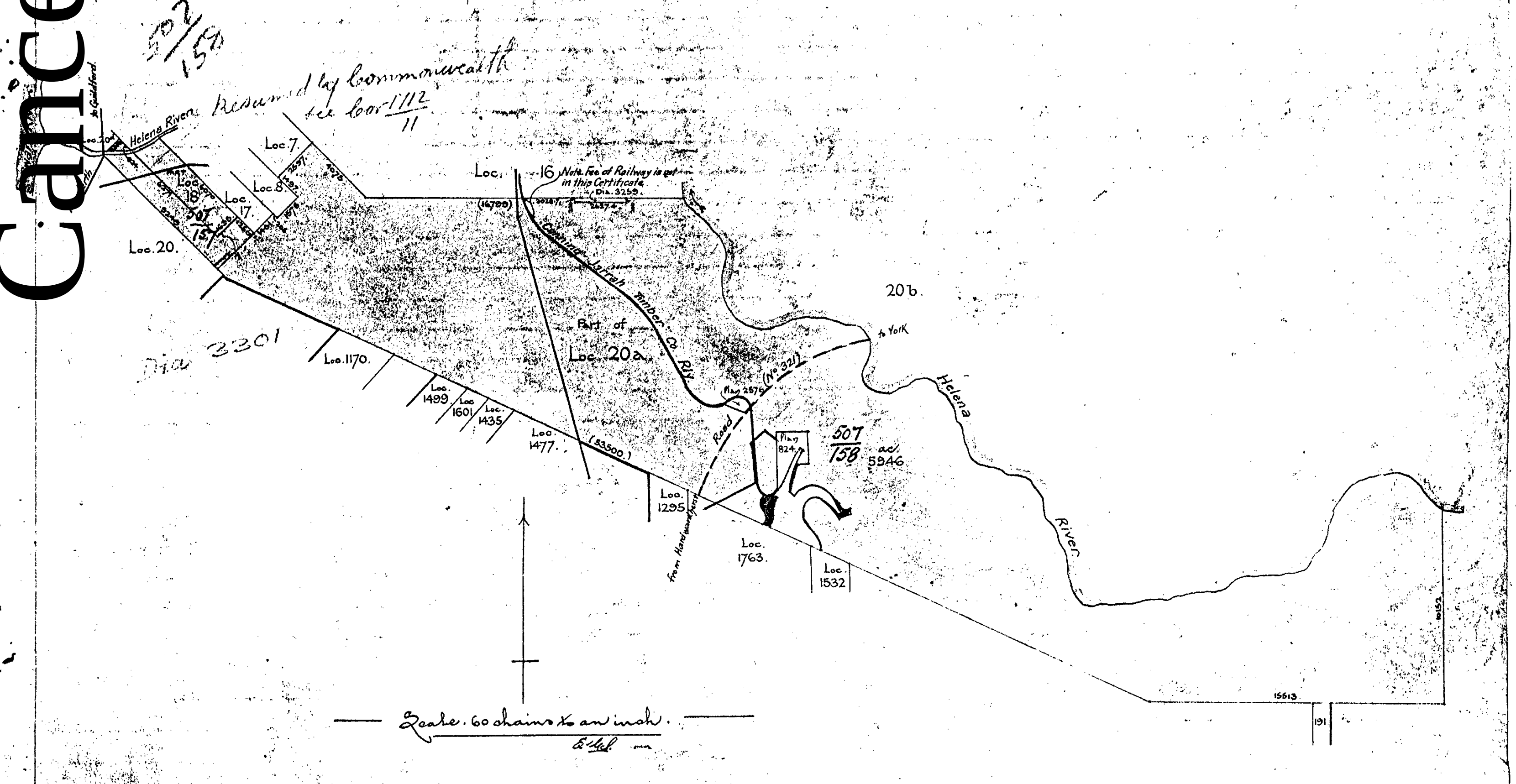
is now the sole proprietor

of an estate in fee simple in possession subject to the easements and encumbrances notified hereunder, in ALL those pieces of land delineated and coloured green on the map hereon, containing five thousand nine hundred and forty six acres — or thereabouts, being portion of each of Helena Location 18 and 20a —

Application 2364/1911 Totally Cancelled and a new Certificate issued for balance of within land

507 - 158.

A.F. Steele
Ass^t. Registrar of Titles
24 . 12 . 11



Dated the second day of June, One thousand nine hundred and eleven

A.F. Steele
Registrar of Titles.

For encumbrances and other matters affecting the land see back.

[c114/09.]

EASEMENTS AND ENCUMBRANCES REFERRED TO.

Transfer 7606/1911 Portion of Locn. 18 (20a. (201A. 2R.) (Diagram 3301 to the Commonwealth of Australia. Registered 23rd December 1911 at 10.20 Alf Steede

507. 157

Cancelled

CT 0490 0078 B

Registered Vol. 490 Fol. 78

Application 2364/1917 ~~Transfer~~ Vol. 490, Fol. 8

R 762/12 919/12

INDEXED

Diag 3436.

REGISTER BOOK.

Vol. 507 Fol. 158 ~~3056~~

WESTERN AUSTRALIA.

Certificate of Title

under "The Transfer of Land Act, 1893."

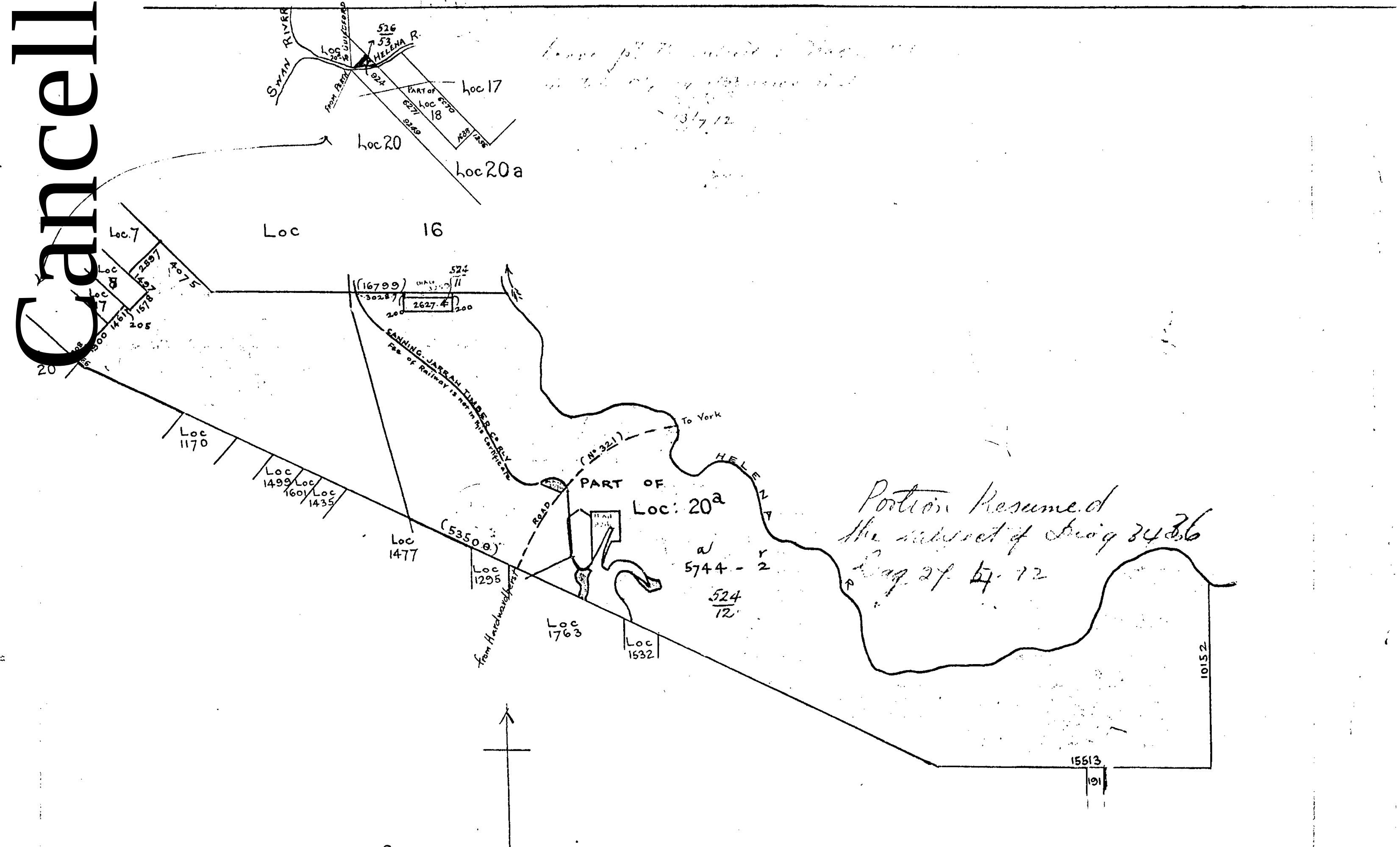
Sch. 5, 56 V., 14.

CT 0507 0158 F

James Morrison, of Perth, Station Agent,

is now the sole proprietor of an estate in fee simple in possession subject to the easements and encumbrances notified hereunder, in All that piece of land delineated and coloured green on the map hereon, containing five thousand seven hundred and forty four acres and two roods, or thereabouts, being portion of Helena Location 20a

Transfers 1241/1913 3006/1912 } Totally Cancelled balance to The Commonwealth of Australia. Registered 21st February 1913 at 12.55 o'c pm. 526—53



— Scale 60 chains to an inch —

Dated the twenty fourth day of December, One thousand nine hundred and eleven

Registrar of Titles.

For encumbrances and other matters affecting the land see back.

[D9582/11.]

Cancelled

EASEMENTS AND ENCUMBRANCES REFERRED TO.

Transfer 4418/1912 Portion 22 to subject of Diagram 3284 to Robert Oswald [illegible]
Registered 9th July, 1912 at 3 pm.
524 . 11

[illegible signature]

× Application 1409/1912 A separate Certificate issued for portion (5/15) of within land
524 . 12

[illegible signature]

Assist. Reg. of Titles

Transfer 1241/1913 3006/1912 Portion of Helena Location 20A, (Diagram 3436) to The Commonwealth of Australia Registered 21st February 1913 at 12.55
326 . [illegible]

Arthur [illegible]

Registered Vol. 507 Fol. 158

CT 0507 0158 B

R. 12106/12

APPLICATION $\frac{1409}{1912}$ Vol. 507 Fol. 158

INDEXED

REGISTER BOOK.

Vol. 524 Fol. 12

CT 0524 0012 F

WESTERN AUSTRALIA.

Certificate of Title

under "The Transfer of Land Act, 1893."

Sch. 5, 56 V., 14.

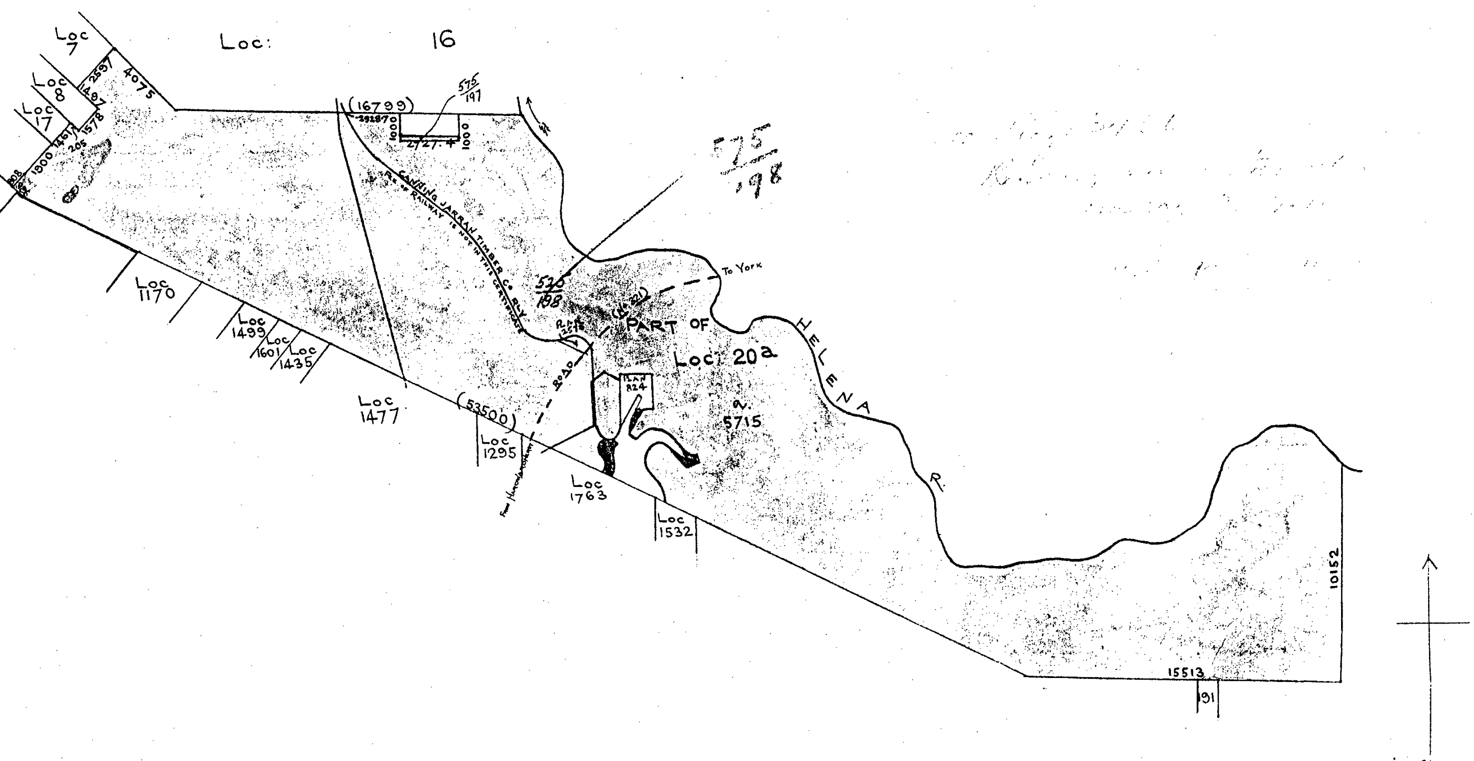
James Morrison of Perth Station Agent

is now the sole proprietor of an estate in fee simple in possession subject to the easements and encumbrances notified hereunder in ALL that piece of land delineated and coloured green on the map hereon, containing five thousand seven hundred and fifteen acres or thereabouts being portion of Helena Location 20a –

Application 25122/1913 Totally Cancelled and a new certificate issued for balance of within land. Registered 15th December 1913 at 2.35 o'c

575 – 198

Cancelled



Dated the ninth day of July, One thousand nine hundred and twelve

Registrar of Titles.

For encumbrances and other matters affecting the land see back.

x6863/12.

EASEMENTS AND ENCUMBRANCES REFERRED TO.

Transfer 7810/1913 (Portion subject of diagram 3958 to Robert Oswald Law
Registered 13th December 1913 at 12.35 o'c
5/5 - ...

A. Steele
ASSISTANT REGISTRAR OF TITLES

Cancelled

CT 0524 0012 B

Registered Vol. 524 Fol. 12

142/14

Application 1922 VOL. [illegible] , FOL. [illegible]
TRANSFER 191

INDEXED

REGISTER BOOK.
Vol. 575 Fol. 198.

WESTERN AUSTRALIA.

CT 0575 0198 F

CANCELLED

Certificate of Title

under "The Transfer of Land Act, 1893."
(Sch. 5, 56 V., 14.)

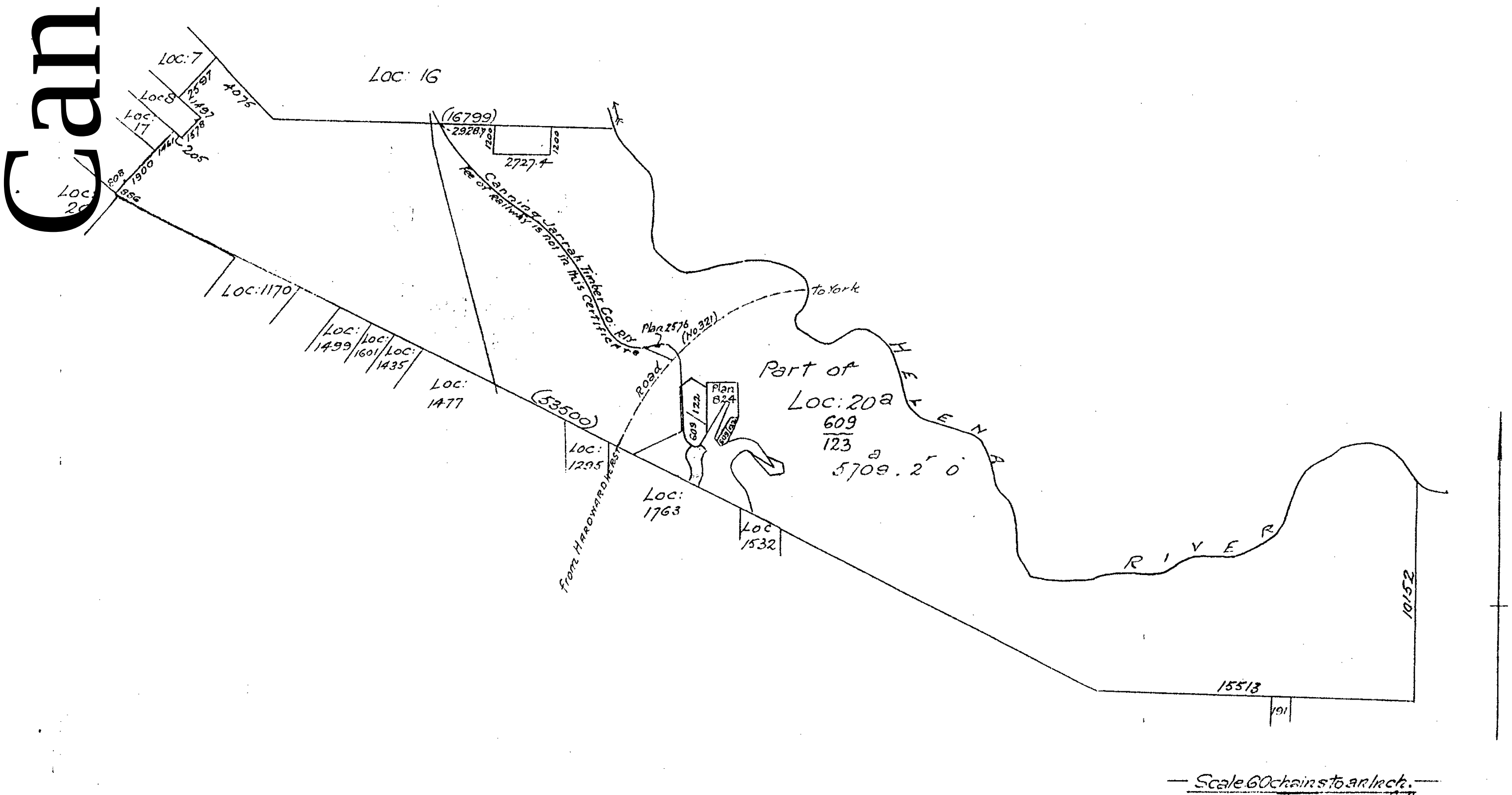
James Morrison of Perth [illegible]

is now the sole proprietor

of an estate in fee simple in possession subject to the easements and encumbrances notified hereunder in ALL that piece of land delineated and coloured green on the map hereon, containing about five thousand seven hundred [illegible] or thereabouts, being portion of Helena Location 20a

Application 61/1915 Totally cancelled and a new certificate issued for balance of within land. Registered 13th January 1915 at 2.30 o'c pm
609 — 123
[illegible]

Cancelled



Scale 60 chains to an inch.

Dated the [illegible] day of [illegible], One thousand nine hundred and [illegible]

[illegible]

Registrar of Titles.

o3802/13.

For encumbrances and other matters affecting the land see back.

EASEMENTS AND ENCUMBRANCES REFERRED TO.

Transfer 219/1915 (Portion (diagram 3193) 66 acres) to Thomas Statham. Registered 13th January 1915 at 2.30
604 — 122

Cancelled

CT 0575 0198 B

Registered Vol. 575 Fol. 198

Application TRANSFER 61/1915 VOL. 575, FOL. 198.

R 1255/15.

INDEXED

Diag 4347

REGISTER BOOK.

Vol. 609 Fol. 123.

WESTERN AUSTRALIA.

CT 0609 0123 F

CANCELLED

Certificate of Title

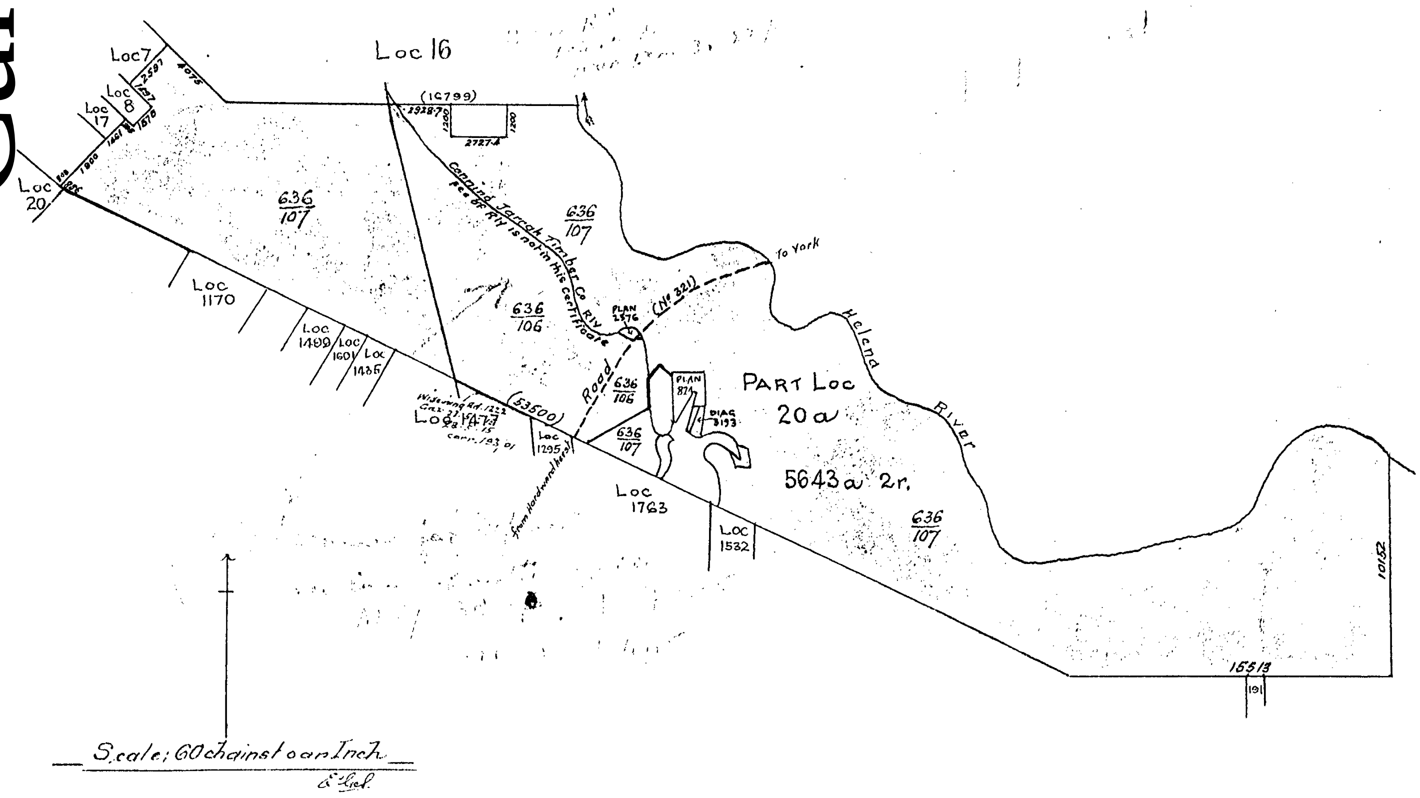
under "The Transfer of Land Act, 1893."

(Sch. 5, 56 V., 14.)

James Morrison of Perth Station Agent

is now the sole proprietor of an estate in fee simple in possession subject to the easements and encumbrances notified hereunder in ALL that piece of land delineated and coloured green on the map hereon, containing ~~about~~ five thousand six hundred and forty three acres two roods or thereabouts, being portion of Helena Location 20a.

Application 1642/1915. Totally cancelled and a new certificate issued for the balance of within land. Registered 22nd December 1915 at 10.30 a.m. 636–107



Scale: 60 chains to an Inch

Dated the Thirteenth day of January, One thousand nine hundred and fifteen

Registrar of Titles.

For encumbrances and other matters affecting the land see back.

8510/14.

EASEMENTS AND ENCUMBRANCES REFERRED TO.

Transfer 1968/1915 Lands Acquisition Act No 13 of 1906 Sec 20 Commonwealth. Portion [illegible] 1733 acres now certificated in the name of the Commonwealth of Australia in Volume [illegible] Folio 106. Registered 2nd [illegible] 1915 [illegible]

[illegible]
ASSISTANT REGISTRAR OF TITLES

Cancelled

CT 0609 0123 B

Registered Vol. 609 Fol. 123

INDEXED

409/16 618/16

APPLICATION 1642/1915 Vol. 609 Fol. 123

REGISTER BOOK.

Vol. 636 Fol. 107

WESTERN AUSTRALIA.

CT 0636 0107 F

Certificate of Title

under "The Transfer of Land Act, 1893."

(Sch. 5, 56 V., 14.)

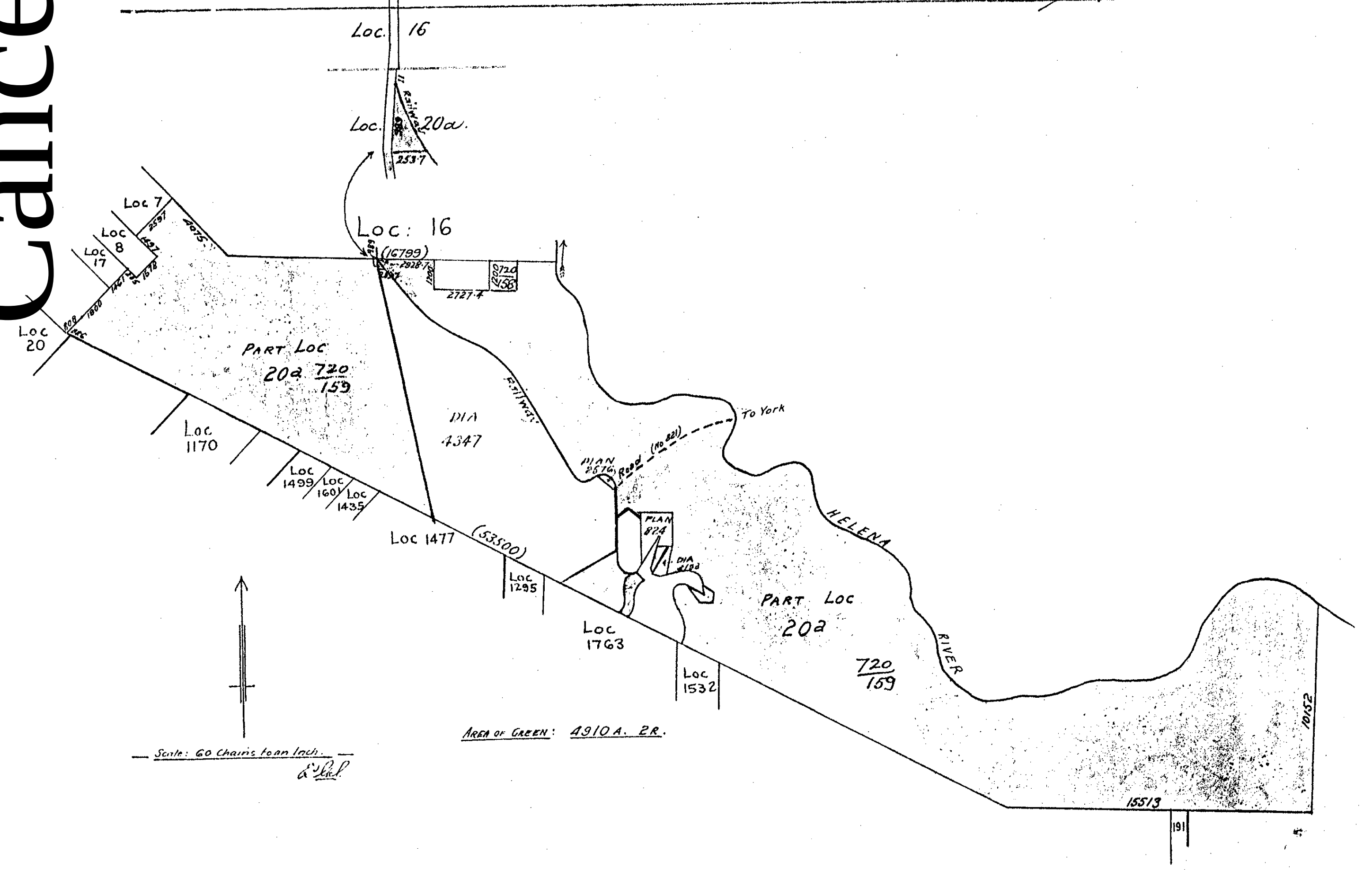
James Morrison of Perth Station Agent

is now the sole proprietor

of an estate in fee simple in possession subject to the easements and encumbrances notified hereunder in ALL that piece of land delineated and coloured green on the map hereon, containing four thousand nine hundred and ten acres two roods or thereabouts being portion of Helena Location 20a

Application 1467/1919 Totally cancelled and a new certificate issued for balance of within land. Registered 6th October 1919 at 3.00 pm
720 – 159
Registrar of Titles

Cancelled



Dated the twenty second day of December, One thousand nine hundred and fifteen

Registrar of Titles.

For encumbrances and other matters affecting the land see back.

F6689/13.

EASEMENTS AND ENCUMBRANCES REFERRED TO.

Transfer 6880/1919 portion (16. 3. 8) to Robert Oswald Law Registered 6th October 1919 at 3 oc
720 - 158

Cancelled

CT 0636 0107 B

Registered Vol. .... Fol. ....

Application ~~Transfer~~ 1467 Vol. 636 , Fol. 107
1919 / 1502/32

14229 / 17 10841 / 24 8015 / 20 14144 / 25 5550 / 23 10102 / 29 28599/52

INDEXED.

Plan 4539 / 4553 / ~~4559~~ / 4572 / 4633 / 4634

Dia 10227

REGISTER BOOK.

Vol. 720 Fol. 159

WESTERN AUSTRALIA.

Certificate of Title

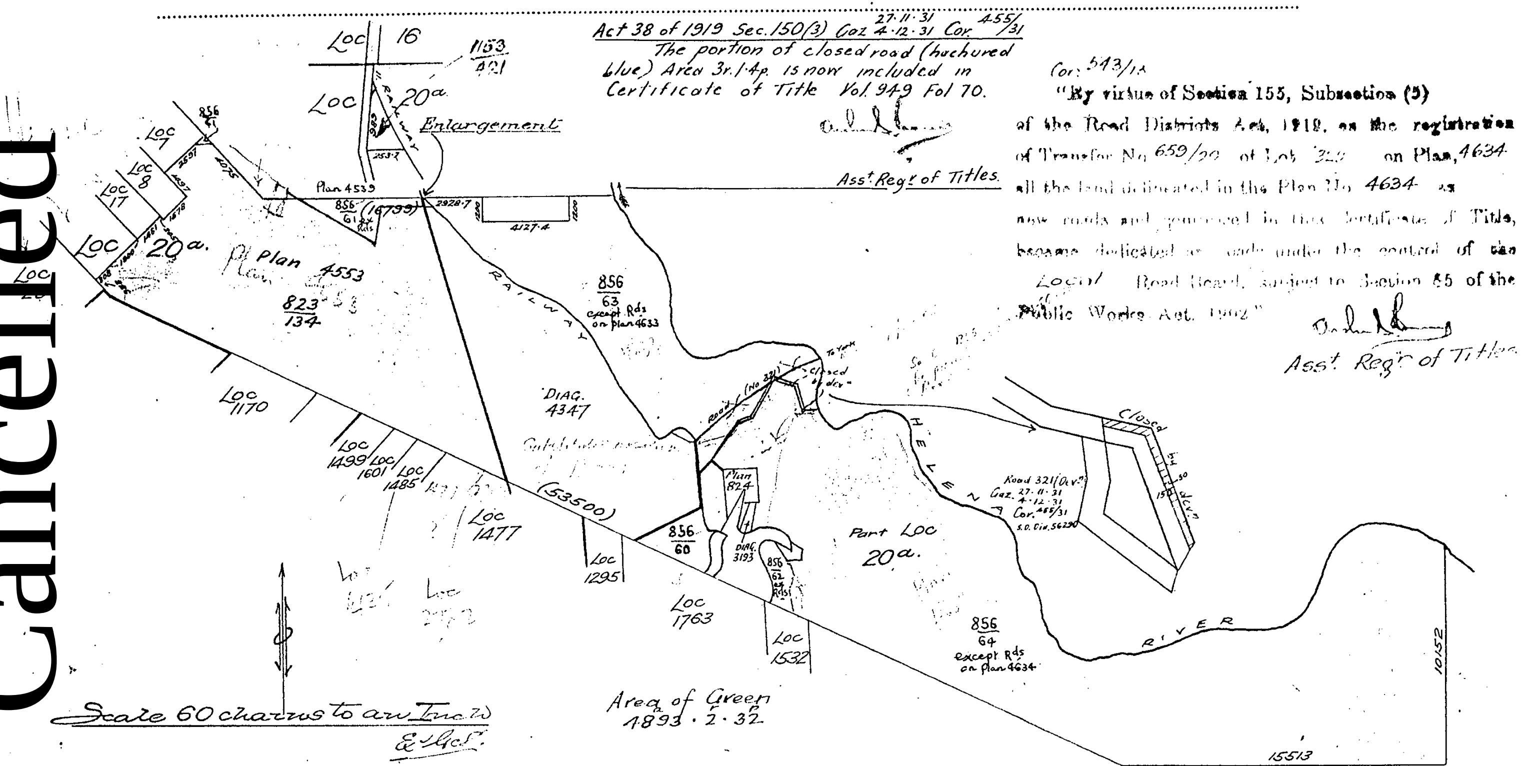
under "The Transfer of Land Act, 1893," (Sch. 5, 56 Vic., 14.)

James Moorrison of Perth, Station Agent

is now the sole proprietor of an estate in fee simple in possession subject to the easements and encumbrances notified hereunder in All that piece of land delineated and coloured green on the map hereon, containing four thousand eight hundred and ninety three acres two roads and thirty two perches, or thereabouts, being portion of Helena Location 20a

Act 38 of 1919 Sec. 150(3) Goz 27-11-31 / 4-12-31 Cor 455/31
The portion of closed road (hachured blue) Area 3r. 14p. is now included in Certificate of Title Vol. 949 Fol 70.
Asst Regr of Titles.

Cor. 543/13
"By virtue of Section 155, Subsection (5) of the Road Districts Act, 1919, on the registration of Transfer No 659/20 of Lot 325 on Plan 4634 all the land delineated in the Plan No 4634 as new roads and comprised in this Certificate of Title, became dedicated as roads under the control of the Local Road Board, subject to Section 85 of the Public Works Act, 1902."
Asst Regr of Titles



Cancelled

Cor. 543/13.
By virtue of Section 155, Sub-section (5) of the Road Districts Act 1919 on the registration of Transfer No 4746/44 of Lot 300 on Plan 4572 all the land delineated in the Plan No 4572 as new roads and comprised in this Certificate of Title became dedicated as roads under the control of the Local Road Board subject to Section 85 of the Public Works Act 1902."
1·8·1944 Registrar of Titles.

Dated the Sixth day of October, One thousand nine hundred and nineteen

Registrar of Titles.

56 Vic. No. 14 Sec. 187.
Application 15/1929. On the 24th December 1927 James Morrison died. On the 12th April 1928 probate of his Will and two Codicils was granted to The West Australian Trustee Executor and Agency Company Limited of 135 St. George's Terrace Perth the executor named in the said Will. the executrix named in the said first Codicil having renounced probate.
Assistant Registrar of Titles 8th January 1929.

CT 0720 0159 F

Public Roads alone remain

m 2789/19*

For encumbrances and other matters affecting the land see back.

11

EASEMENTS AND ENCUMBRANCES REFERRED TO.

DISCHARGED

Instrument stamped £93.15.0.—
Mortgage 2326/1920. James Morrison to The Western Australian Bank to secure £63908.9.1. and further advances and interest as therein. Registered 16th April 1920 at 3 o/c.

Application 206/1923 A separate certificate issued for portion of the within land being part of the land on plan 4553. Registered 9th February 1923 at 3 o/c pm.
823 - 134.

Application 482/1924 A separate certificate issued for lots being the subject of diagram 3194 - Registered 1st April 1924 at 12.35 O.C. pm
856 - 60.

Application 483/1924 A separate certificate issued for portion of the within being part of the land the subject of plan 4539 - Registered 9th April 1924 at 12.35 O.C pm
856 - 61.

Application 484/1924 A separate certificate issued for portion of the within land, being the numbered subdivision plan 4572 - Registered 1st April 1924 at 12.35 O.C pm
856 - 62

Application 485/1924 A separate certificate issued for portion of the within land, being the subject of plan 4633 - Registered 1st April 1924 at 12.35 O.C pm.
856 - 63

Application 486/1924 A separate certificate issued for portion of the within land, being the subject of plan 4634 - Registered 1st April 1924 at 12.35 O.C pm.
856 - 64.

Primary Security Bond stamped £9.7.6.
Mortgage 5049/1925 James Morrison to The Western Australian Bank to secure moneys and interest as therein. Registered 14th July 1925 at 3 o/c.

Cancelled

Transfer No. 4461 /1927 of Mortgages 2326/1920 and 5049/1925 to BANK OF NEW SOUTH WALES of corner of St. George's Terrace and William Street, Perth, Registered at 3 o'c. this 10th day of August 1927.

ASSISTANT REGISTRAR OF TITLES

DISCHARGE 7992/1952 of Mortgages 2326/1920 and 5049/1925
Registered 19th September 1952 at 10.45 o'c.
As to lot 366 on diagram 7027 only.

TRANSFER 136/1953 Lot 366 on diagram 7027 to Cecil Morris

Registered 6th January 1953 at 3.30 o'c.
W. 1153 - 421
Registrar of Titles

CT 0720 0159 B

CERTIFICATE OF TITLE.

Registered Vol.......................Fol........................

Application 206 VOL. 650 , FOL. 170
1923 730 159

INDEXED.

REGISTER BOOK.
Vol. 823 Fol. 134.

WESTERN AUSTRALIA.

Certificate of Title

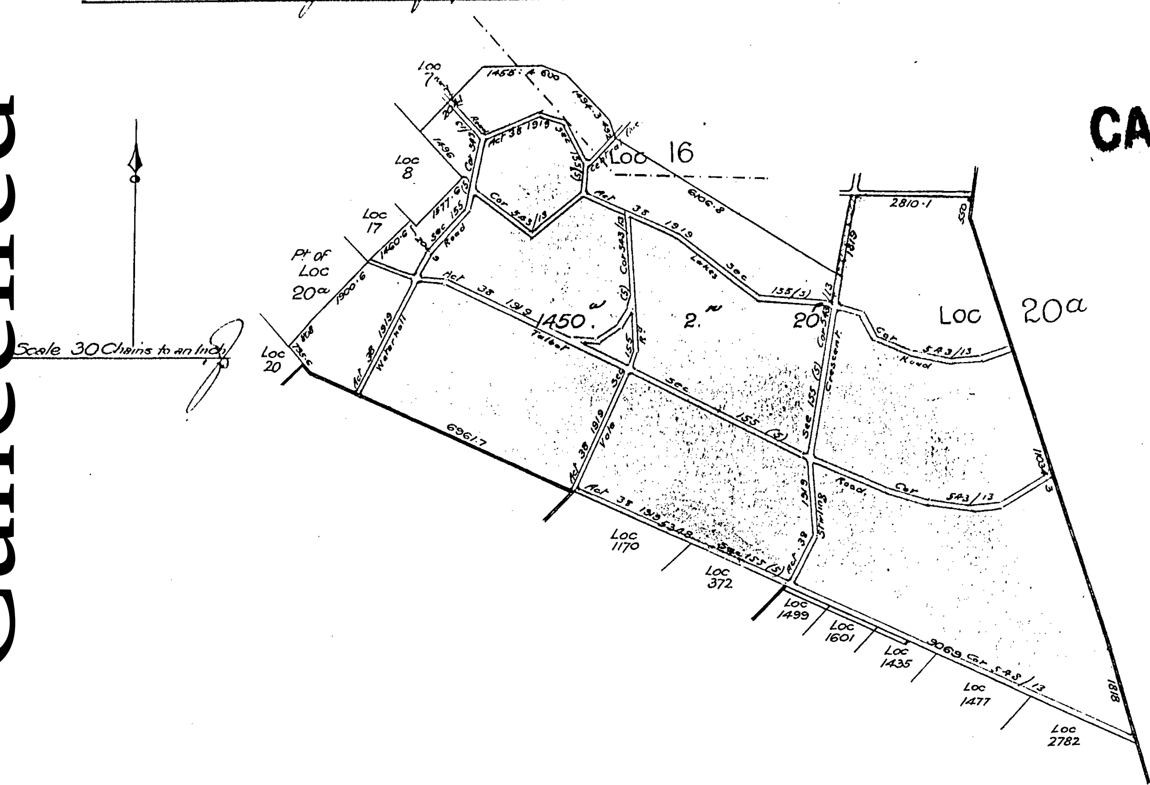
ORIGINAL

CT 0823 0134 F

under "The Transfer of Land Act, 1893" (Sch. 5, 56 Vic., 14.)

James Morrison of Waterhall Guildford Esquire

is now the sole proprietor of an estate in fee simple in possession subject to the easements and encumbrances notified hereunder in ALL that piece of land delineated and coloured green on the map hereon, containing one thousand four hundred and fifty acres two roods and twenty perches or thereabouts, being portions of Swan Location 16 and Helena Location 20a the subject of plan 1553



Dated the ninth day of February One thousand nine hundred and twenty-three

A. Clarke
Registrar of Titles.

Application 180/1924. Totally cancelled and a new certificate issued for the balance of the within land. Registered 1st April 1924 at 12.35 o'c.
856-58.

Assistant Registrar of Titles.

p 4588/22*

For encumbrances and other matters affecting the land see back.

EASEMENTS AND ENCUMBRANCES REFERRED TO.

CT 0823 0134 B

Instrument Stamped £93.15.0
Mortgage 2326/1920 James Morrison to The Western Australian Bank to secure £63.908.9.1 and further advances and interest as therein – Registered 16th April 1920 at 3 O.C.

[illegible] Registrar of Titles. (Sd) Arthur G. Harvey [illegible] Registrar of Titles.

As to Lots 183. 184. 185 and 186 plan 4553.
Discharge 458/1923 of Mortgage 2326/1920 – Registered 9th February 1923 at 3 O.C. pm.

[illegible] Registrar of Titles

Transfer 1140/1923 Lots 183. 184. 185 and 186 to Charles Jecks
Registered 9th ~~January~~ February 1923 at 3 O.C. pm.
823. 135

[illegible] Registrar of Titles.

Cancelled

CERTIFICATE OF TITLE.

Registered Vol.................Fol..................

Application 480 Vol. 823. , Fol. 134.
1924

13542/24 30488/26 30...
Rn240 Wm 27 33506/37 1871/29

INDEXED.

REGISTER BOOK.

Vol. 856 Fol. 58 Diagram 7651

WESTERN AUSTRALIA.

Certificate of Title

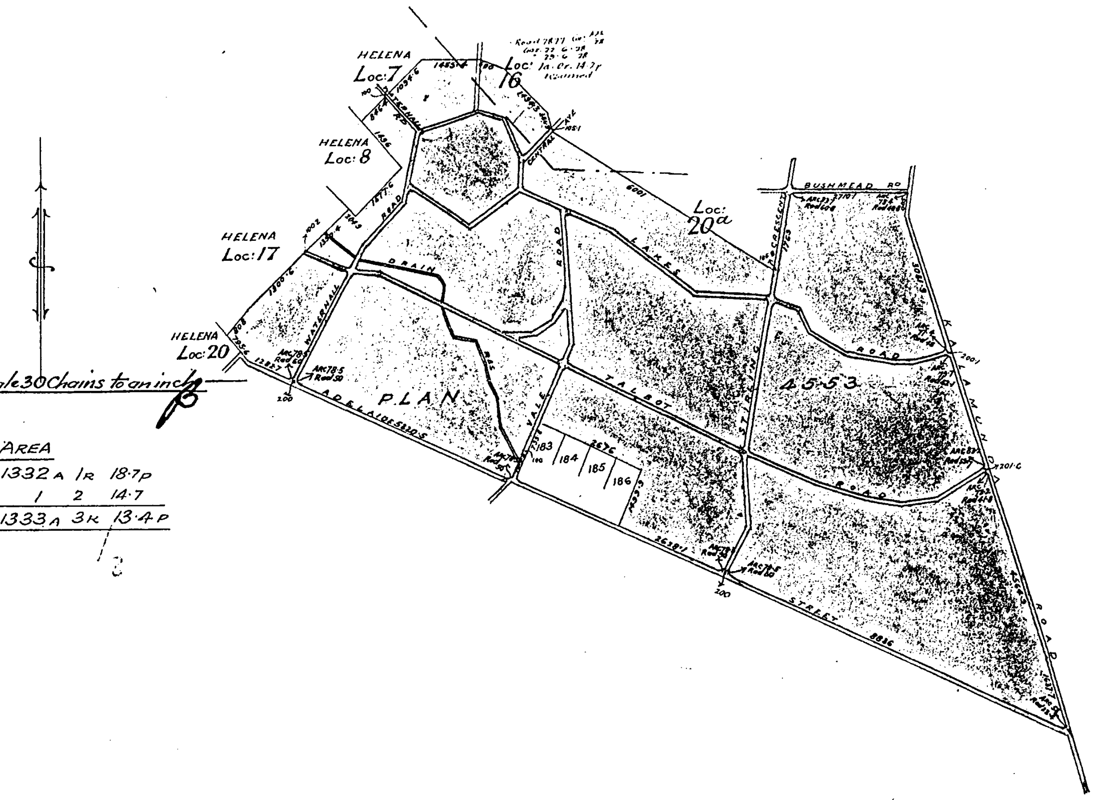
CT 0856 0058 F

under "The Transfer of Land Act, 1893" (Sch. 5, 56 Vic., 14.)

James Morrison of Waterhall Guildford Esquire

is now the sole proprietor

of an estate in fee simple in possession subject to the easements and encumbrances notified hereunder in ALL that piece of land delineated and coloured green and blue on the map hereon, containing one thousand three hundred and thirty three acres three roods thirteen and four tenths perches or thereabouts, being portion of Swan Location 16 and portion of Helena Location 20a and being part of the land on plan 4553



Dated the first day of April One thousand nine hundred and twenty-four.

Registrar of Titles.

56 Vic No. 14 Sec. 187.
Application 15/1929. On the 24th December 1927 James Morrison died. On the 12th April 1928 probate of his Will and two Codicils was granted to The West Australian Trustee Executor and Agency Company Limited of 135 St. George's Terrace Perth the executor named in the said Will. The executrix named in the first Codicil having renounced probate

Assistant Registrar of Titles. 8th January 1929.

Application 2778/1929 Totally cancelled and a new certificate issued for the balance.
Registered 5th December 1929 at 11·30 o'c
1015 · 105

Assistant Registrar of Titles.

For encumbrances and other matters affecting the land see back.

Cancelled

EASEMENTS AND ENCUMBRANCES REFERRED TO.

Instrument stamped £93.15.0

Mortgage 2326/1920. James Morrison to The Western Australian Bank to secure £63908-9-1 and further advances and interest as therein. Registered 16th April 1920 at 3 o.c.
Arthur S. Harvey
Assistant Registrar of Titles.

As to Lots. 175 and 176 on plan 4553.
Discharge 3825/1924. of Mortgage 2326/1920. Registered 30th September 1924 at 2.45 o'c. Arthur S. Harvey

Transfer 7934/1924. Lot. 175 to Wilfred Walker Queen the elder. Registered 30th September 1924 at 2.45 o'c.
Arthur S. Harvey
870.190.

Transfer 7935/1924. Lot. 176 to Wilfred Walker Queen the younger. Registered 30th September 1924 at 2.45 o'c.
Arthur S. Harvey
870.191.

As to Lot 137 only
Discharge 4124/1925 of Mortgage 2326/1920. Registered 9th October 1925 at 2.50 o'c.
Arthur S. Harvey

Transfer 8148/1925. Lot 137 to Edward Vincin Ryan. Registered 9th October 1925 at 2.50
Arthur S. Harvey
902. 37.

as to lot 181 on Plan 4553 only
Discharge 6063/1926 of Mortgage 2326/1920 Registered
17th December 1926 at 2.55 o'c
A. Bartnall
Asst. Registrar of Titles
~~dup CT not produced~~

Transfer 15/1927 Lot 181 to Sarah Wickman Registered 4th January 1927 at 2.45 o'c
Arthur S. Harvey
949-133

Transfer No. 7461 /1927 of Mortgage 2326/1920 to BANK OF NEW SOUTH WALES of corner of St. George's Terrace and William Street, Perth, Registered at 3 o'c. this 10th day of August 1927.
George Smith
ASSISTANT REGISTRAR OF TITLES.

As to Lot 100
Discharge 5274/1927 of Mortgage 2326/1920 Registered 11th October 1927 at 3 o'c
Arthur S. Harvey
ACTING REGISTRAR OF TITLES.

Transfer 10715/1927 Lot 100 to George Harper Registered 25th October 1927 at 1.25 o'c
Arthur S. Harvey
981-117

As to Lot 177 only.
Discharge 5578/1927. of Mortgage 2326/1920. Registered
19th October 1927 at 12 o'c.
Arthur S. Harvey
Registrar of Titles.

Transfer 10992/1927 Lot 177 to William Thomson Registered 1st November 1927 at 3 o'c
Arthur S. Harvey
REGISTRAR OF TITLES.
983-11

As to Lot 143 only.
Discharge 5829/1927. of Mortgage 2326/1920. Registered
16th November 1927 at 12.10 o'c
Arthur S. Harvey
Asst. Registrar of Titles.

Transfer 11941/1927 Lot 143 to Owen John Smith Registered 28th November 1927 at 9.30 o'c
Arthur S. Harvey
980-129

As to Lots 128, 129, 130 and 131 only.
Discharge 6271/1927. of Mortgage 2326/1920. Registered
16th December 1927 at 11.55 o'c.
A. Bartnall
Asst. Registrar of Titles

As to Lots 166 167 168 and 169
Discharge 6447/1927 of Mortgage 2326/1920 Registered 30th December 1927 at 1 o'c
Arthur S. Harvey

Transfer 152/1928 Lots 166 167-168 and 169 to Edwin Raymond Grenfell Hicks Registered 6th January 1928 at 3 o'c
Arthur S. Harvey
Assistant Registrar of Titles.
989-84

Transfer 1014/1928 Lots 128, 129, 130 and 131 to Francis Edward Deane Freeman Registered 2nd February 1928 at 3 o'clock
Arthur S. Harvey
991-129

As to Lots 180 158 159, 187, 188 and 157 only
Discharge 323/1929 of Mortgage 2326/1920 Registered
18th January 1929 at 3 o'c
A. Bartnall
Asst. Registrar of Titles

CERTIFICATE OF TITLE.
Registered Vol. 856 Fol. 58

Transfer 607/1929 Lot 114 to Frank Arthur Leslie Clements Registered 19th January 1929 at 11.30 o/c
[signature] ASSISTANT REGISTRAR OF TITLES.
1006-595

Transfer 608/1929 Lot 187 and 188 to Walter James [illegible] Registered 19th January 1929 at 11.[illegible]
[signature] ASSISTANT REGISTRAR OF TITLES.
1006-596

Transfer 862/1929. Lot 157 to Reginald Albion Way. Registered 26th January 1929. at 11.20 o/c
[signature] ASSISTANT REGISTRAR OF TITLES.
1006-711.

As to Lot 156 only:
Discharge 183/1929 of Mortgage 2326/1920 Registered 13th February 1929 at 2.45 o/c
[signature] Asst. Registrar of Titles

Transfer 2602/1929 Lots 158 and 159 to John Pimfrey. Registered 14th March 1929 at 10.35 o/c.
[signature] ASSISTANT REGISTRAR OF TITLES.
1008. 493.

As to Lot 90.
Discharge 3955/1929 of Mortgage 2326/1920 Registered 10th July 1929 at 3 o/c [signature] ASSISTANT REGISTRAR OF TITLES.

Transfer 7658/1929 Lot 156 to James Mahoney Registered 6th July 1929 at 3 o/c
1011-419
[signature] ASSISTANT REGISTRAR

Transfer 8314/1929 Lot 90 to W. A Flour Mills Limited Registered 22nd July 1929 at 12 o/c
1011-693.
[signature] ASSISTANT REGISTRAR OF TITLES.

As to Lot 91.
Discharge 4357/1929 of Mortgage 2326/1920 Registered 29th July 1929 at 11.25 o/c [signature]

As to Lot 161.
Discharge 4645/1929 of Mortgage 2326/1920 Registered 12th August 1929 at 12.20 o/c. [signature]

Transfer 9228/1929. Lot 91 to Samuel Clarkson. Registered 12th August 1929 at 12.20 o/c
1012-114
[signature] ASSISTANT REGISTRAR OF TITLES.

As to Lot 155.
Discharge 6312/1929 of Mortgage 2326/1920. Registered 14th November 1929 at 11.45 o/c [signature]

Transfer 13176/1929 Lot 155 to Albert Edward Smith Registered 14th November 1929 at 3 o/c
1014-773.
[signature] ASSISTANT REGISTRAR OF TITLES.

Cancelled

601/10/29

856-58

856 - 58

Applic. 2778
~~Transfer~~ 1929 Vol. 856, Fol. 58.
37875/29.

ORIGINAL

INDEXED. 7M

REGISTER BOOK.

Vol. 1015 Fol. 105.

Diag 11041
" 11042
Plan 7475

WESTERN AUSTRALIA.

CANCELLED

~~D69210~~ See M292265.

Certificate of Title

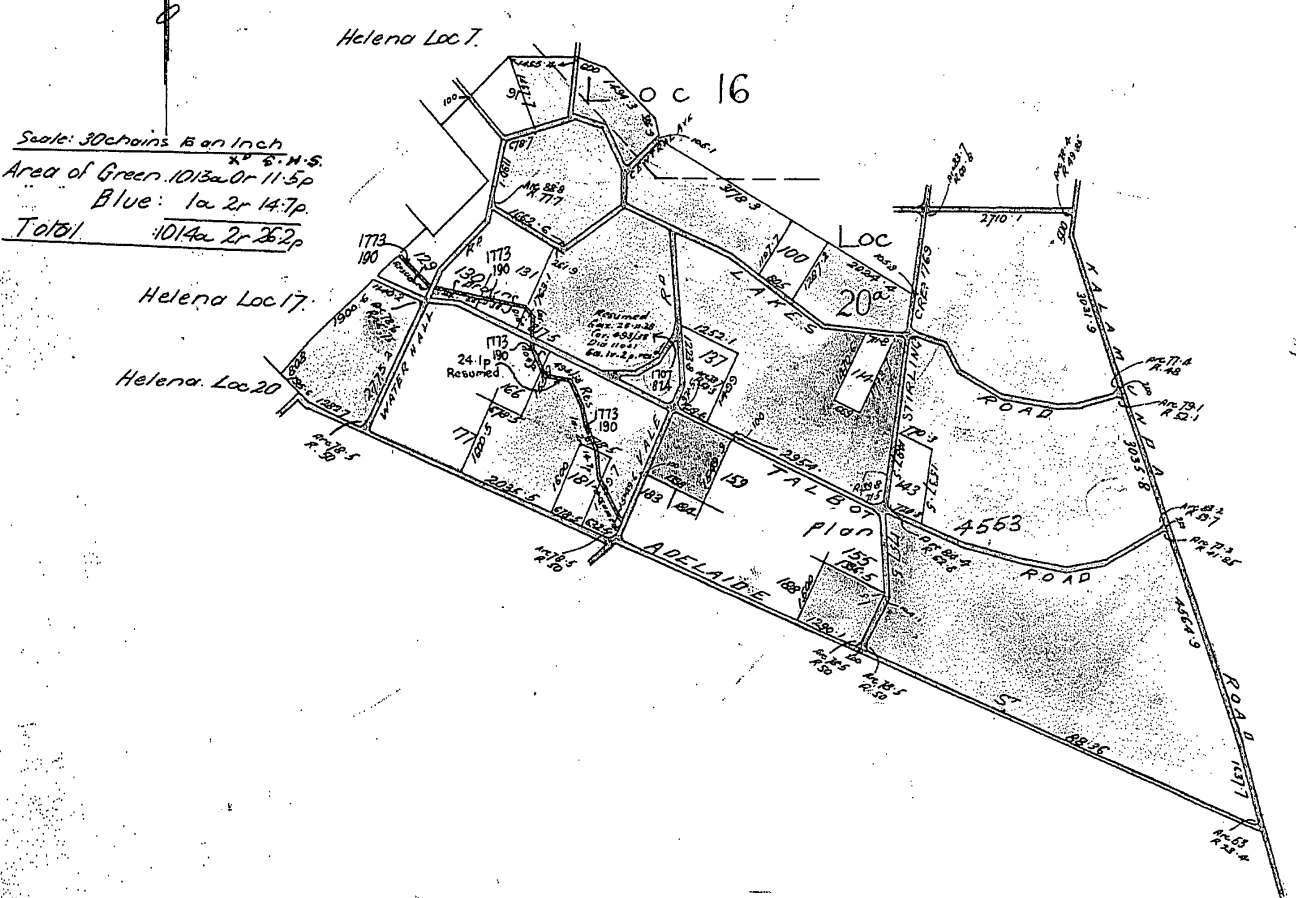
under "The Transfer of Land Act, 1893" (Sch. 5, 56 Vict., 14.)

CT 1015 0105 F

The West Australian Trustee Executor and Agency Company Limited of 135 St George's Terrace Perth, executor of the will and codicils thereto of James Morrison deceased

WILL NO 15547.

is now the sole proprietor of an estate in fee simple in possession subject to the easements and encumbrances notified hereunder in ALL those piece of land delineated and coloured green and blue on the map hereon, containing ~~in the aggregate one thousand and fourteen acres two roods twenty six and two tenths perches~~ or thereabouts, being portions of Swan Location 16 and portion of Helena Location 20a and being part of the land on plan 4553



As to the part of the land comprised in Diagram 11042
APPLICATION D537511
INCLUDED IN VOL. 1773 FOL. 190
REGISTERED 13th August 1987 at 11.33am

OFFICE OF TITLES Western Australia

Dated the fifth day of December One thousand nine hundred and twenty-nine.

A. L. Cleary
Assistant Registrar of Titles.

Public Works Act 1902.
Ov 493/38 Gazette 25.11.38 Area 6a. 1r. 2p. Dia 11041
Portion of the land herein comprised (excluding under Section 15 of the above Act subject to exceptions therein mentioned the right to any mines of coal or other minerals) is resumed for the purpose of Parks at Morrison Estate, Bushmead and the said land is vested in His Majesty.
Registered at 3 o'clock on 24.2.39. A. W. Gleadell
Ast. Registrar of Titles.

Public Works Act 1902.
Ov 494/38 Gazette 25.11.38 Area 1a. 2r. 14.7p Dia 11042
Portion of the land herein comprised (excluding under Section 15 of the above Act subject to exceptions therein mentioned the right to any mines of coal or other minerals) is resumed for the purpose of Drainage at Morrison Estate Bushmead and the said land is vested in His Majesty.
Registered at 3 o'clock on 24.2.39
A. W. Gleadell
Ast. Registrar of Titles.

CANCELLED
Entered in Error

R.O. 182/59
PUBLIC WORKS ACT 1902-1953.
Gaz. 24.6.60 Plan 7475
Pt. Lot 60 Drain resumed and vested in Her Majesty
F. A. BLOTT,
Registrar of Titles.

Portions resumed together with all mines of coal and other minerals save as reserved in the original Crown Grant in the terms of Section 15 of the Public Works Act 1902, ~~as~~

GAZ : 19.7.85 LOT 136 ON PLAN 4553
NOW VESTED IN THE METROPOLITAN
REGION PLANNING AUTHORITY

Land Parcel identifier amended - Regulation 6 of Transfer of Land (Surveys) Regulations 1995
Corr. 1775-2000-01
Date: 3.3.09 J.F.

PUBLIC WORKS ACT 1902-1953.
In the portion resumed Gaz. 25.11.38 24.6.60 the right to mines of coal or other minerals is resumed and revested in Her Majesty as of her former estate.
F. A. Blott

~~Minerals In Resumed Portion Alone Remains~~

y3277/28

For encumbrances and other matters affecting the land see back.

EASEMENTS AND ENCUMBRANCES REFERRED TO.

CANCELLED

Instrument stamped £93.15.0
Mortgage 2326/1920 James Morrison to The Western Australian Bank to secure £63.908 - 9 - 1 and further advances and interest as therein. Registered 16th April 1920 at 3 oc
sgd Arthur G. Harvey
ASSISTANT REGISTRAR OF TITLES

Transfer No. 7761 /1927 of Mortgage 2326/1920 to BANK OF NEW SOUTH WALES of corner of St. George's Terrace and William Street, Perth, Registered at 3 o'c. this 10th day of August 1927.
sgd. George Barrett
ASSISTANT REGISTRAR OF TITLES.

As to Lot 180
Discharge 323/1929 of Mortgage 2326/1920. Registered 18th January 1929 at 3 oc
sgd. A. J. Dartnall
ASSISTANT REGISTRAR OF TITLES

As to Lot 161
Discharge 4645/1929 of Mortgage 2326/1920. Registered 12th August 1929 at 12.20 oc.
sgd. Arthur G. Harvey
ASSISTANT REGISTRAR OF TITLES

As to Lot 145
Discharge 572/1930 of Mortgage 2326/1920. Registered 18th February 1930 at 3 oc

Transfer 1379/1930 Lot 161 to Dorothy Ashcroft Registered 18th February 1930 at 3o
1017-116

Transfer 1508/1930 Lot 145 to George Garrett Dempsey Registered 21st February 1930 at 12.20 oc
1017-176
ASSISTANT REGISTRAR OF TITLES

As to Lot 119 only
Discharge 895/1930 of Mortgage 2326/1920. Registered 8th March 1930 at 11.30 oc,
ASSISTANT REGISTRAR OF TITLES

Transfer 2137/1930 Lot 119 to Alexander Niven Allan. Registered 14th March 1930 at 11 oc
1017-468
ASSISTANT REGISTRAR OF TITLES

As to Lots 170 to 174 (inclusive) only:-
Discharge 3774/1930 of Mortgage 2326/1920. Registered 3rd November 1930 at 12.10 oc
ASSISTANT REGISTRAR OF TITLES

(as to Lot 190 only)
Discharge 392 /1931 of Mortgage 2326 /1920 Registered 18th February 1931 at 12.25
Asst. Registrar of Titles.

Transfer 1320/1931 Lot 190 to John Gerard Scullen. Registered 18th March 1931 at 2.45 oc
1024-57
ASSISTANT REGISTRAR OF TITLES

As to Lot 141 only
Discharge 63 /1932 of Mortgage 2326 / 1920. Registered 12th January 1932 at 12.30 oc
Asst. Registrar of Titles

Transfer 612/1932 Lot 141 to Alexander Robert Russell. Registered 12th February 1932 at 2.50 oc
1028-438
ASSISTANT REGISTRAR OF TITLES

As to Lots 139 and 140 only
Discharge 1699 /1932 of Mortgage 2326 / 1920 Registered 9th July 1932 at 2.30 oc.
Asst. Registrar of Titles

Transfer 4668/1932 Lots 139 and 140 to Alfred George Ewing. Registered 14th September 1932 at 12.35 oc
1031-62
ASSISTANT REGISTRAR OF TITLES

As to Lot 182 only
Discharge 2864 /1932 of Mortgage 2326 1920 Registered 9th November 1932 at 12.30 oc,
Asst. Registrar of Titles.

CANCELLED

As to Lot 143 only
Discharge 2934 /1932 of Mortgage 2326 1920 Registered 17th November 1932 at 12.40 oc,
Asst. Registrar of Titles.

CERTIFICATE OF TITLE.

Registered Vol. 1011 Fol. 105

Transfer 6000/1932 Lot 142 to Quirino Gamba. Registered 21st November 1932 at 3 o'c

1031 · 591

ASSISTANT REGISTRAR OF TITLES

As to Lot 113 only
Discharge 2749/1933 of Mortgage 2326/1920. Registered 7th February 1933 at 3 o'c

ASSISTANT REGISTRAR OF TITLES

Transfer 611/1933 Lot 113 to Alfred Henry Walker. Registered 8th February 1933 at 10.45 o'c

1033 · 129

ASSISTANT REGISTRAR OF TITLES

As to Lot 125 only
Discharge 1984/1933 of Mortgage 2326/1920 Registered 10th July 1933 at 2.30 o'c

Asst. Registrar of Titles

CANCELLED

Transfer 3693/1933 Lot 125 to Anselmo Gaddini. Registered 12th July 1933 at 12 o'c

1034 · 367

ASSISTANT REGISTRAR OF TITLES

Transfer 6476/1934 Lot 182 to Henrietta Vida Jecks. Registered 3rd October 1934 at 3 o'c

1040 · 623

ASSISTANT REGISTRAR OF TITLES

As to Lots 196, 197, 198, 199, 200 and 201 only
Discharge 1369/1935 of Mortgage 2326/1920. Registered 8th April 1935 at 11.45 o'c

ASSISTANT REGISTRAR OF TITLES

Transfer 2388/1935 Lots 196, 197, 198, 199, 200 and 201 to Jack Vincent Hyne and Charles Murray Hyne. Registered 8th April 1935 at 11.45 o'c

1042 · 391

ASSISTANT REGISTRAR OF TITLES

As to Lots 95 to 99 inclusive and Lots 101 and 102 only
Discharge 4587/1935 of Mortgage 2326/1920. Registered 28th November 1935 at 2.55 o'c

Transfer 8764/1935 Lots 95 to 99 inclusive and Lots 101 and 102 to Dalgety and Company Limited and included in Vol 1045 Fol 828. Registered 28th November 1935 at 2.55 o'c

1045 - 828

ASSISTANT REGISTRAR OF TITLES

As to Lot 116 only
Discharge 458/1936 of Mortgage 2326/1920. Registered 12th February 1936 at 3 o'c

ASSISTANT REGISTRAR OF TITLES

Transfer 952/1936 Lot 116 to John Edwin Marsden. Registered 12th February 1936 at 3 o'c

1046 · 521

ASSISTANT REGISTRAR OF TITLES

As to Lot 138 only
Discharge 1629/1936 of Mortgage 2326/1920 Registered 6th May 1936 at 3 o'c

ASSISTANT REGISTRAR OF TITLES

Transfer 3241/1936 Lot 138 to Albert George Ewing Registered 6th May 1936 at 3 o'c

1048 · 504

ASSISTANT REGISTRAR OF TITLES

As to Lots 126, 178 and 179 only
Discharge 1926/1936 of Mortgage 2326/1920. Registered 28th May 1936 at 3 o'c

ASSISTANT REGISTRAR OF TITLES

Transfer 3977/1936 Lots 178 and 179 to Olive Ernestine Worth. Registered 28th May 1936 at 3 o'c

1048 · 794

ASSISTANT REGISTRAR OF TITLES

Transfer 3978/1936 Lot 126 to Gwylym Edward Samuel Griffiths. Registered 28th May 1936 at 3 o'c

1048 · 795

ASSISTANT REGISTRAR OF TITLES

As to Lot 94 only
Caveat 1262/1936. Lodged 6-11-1936 at 11.30 o'c.

WITHDRAWN

CANCELLED

Withdrawal 162/1937 of Caveat 1262/1936 Lodged 23/2/1937 at 12.50 o'c

ASSISTANT REGISTRAR OF TITLES

As to Lot 94 only
Discharge 624/1937 of Mortgage 2326/1920 Registered 23rd February 1937 at 12.50 o'c

ASSISTANT REGISTRAR OF TITLES

Transfer 1337/1937 Lot 94 to Joseph Whitehead Registered 23rd February 1937 at 12.50 o'c

1053 · 36

ASSISTANT REGISTRAR OF TITLES

As to Lot 124 only
Discharge 2583/1937 of Mortgage 2326/1920. Registered 7th July 1937 at 3 o'c

ASSISTANT REGISTRAR OF TITLES

Transfer 5411/1937 Lot 124 to Montague Joseph Bryant, Elsie Josephine Bryant and Muriel Chapman Carlson. Registered 7th July 1937 at 3 o'c

1054 · 706

1015 — 105

to the unresumed portion of Lot 93.
Discharge 4821/1937 of Mortgage 2326/1920. Registered 30th November 1937 at 3 o'c
A W Bleadell
ASSISTANT REGISTRAR OF TITLES

Transfer 10206/1937. The unresumed portion of Lot 93. to George Shirley Sharp. Registered 30th November 1937 at 3 o'c
1056 - 684.
CANCELLED
A W Bleadell
ASSISTANT REGISTRAR OF TITLES

Transfer 206/1938. Lots 170. 171. 172. 173 and 174 to Alexander Elphinstone Dick, Alexander Robinson and Robert Alfred Robinson. Registered 11th January 1938 at 1 o'c
1058-174
A W Bleadell
ASSISTANT REGISTRAR OF TITLES

As to Lot 92 only
Discharge 129/1938 of Mortgage 2326/1920. Registered 13th January 1938 at 11.50 o'c
A W Bleadell
ASSISTANT REGISTRAR OF TITLES

Transfer 256/1938. The unresumed portion of Lot 92 to Anselmo Gaddini. Registered 13th January 1938 at 11.50 o'c
1056-983
A W Bleadell
ASSISTANT REGISTRAR OF TITLES

as to Lots 70 to 73 inclusive 103 to 112 inclusive and 146 to 148 inclusive
Discharge 2940/1939 of Mortgage 2326/1920. Registered 10th July 1939 at 3 o'c
A W Bleadell
ASSISTANT REGISTRAR OF TITLES

Transfer 6082/1939. Lots 70 to 73 inclusive 103 to 112 inclusive and 146 to 148 inclusive to Dalgety and Company Limited. Registered 10th July 1939 at 3 o'c
1066-371.
A W Bleadell
ASSISTANT REGISTRAR OF TITLES

as to Lot 144 only
Discharge 4910/1939 of Mortgage 2326/1920. Registered 21st November 1939 at 2.40 o'c.
A W Bleadell
ASSISTANT REGISTRAR OF TITLES

Transfer 9984/1939 Lot 144 to Emma Maria Hauser. Registered 21st November 1939 at 2.40 o'c
1068-10
A W Bleadell
ASSISTANT REGISTRAR OF TITLES

As to Lot 122 only
Discharge 5066/1939 of Mortgage 2326/1920. Registered 6th December 1939 at 11-25 o'c
A W Bleadell
ASSISTANT REGISTRAR OF TITLES

Transfer 10318/1939. Lot 122 to Beatrice Louisa Bevan. Registered 6th December 1939 at 11-25 o'c.
1068-151
A W Bleadell
ASSISTANT REGISTRAR OF TITLES

As to Lot 135 only
Discharge 2713/1940 of Mortgage 2326/1920. Registered 1st July 1940 at 12 o'c
A W Bleadell
ASSISTANT REGISTRAR OF TITLES

Transfer 5276/1940 Lot 135 to John Richard Hind. Registered 4th July 1940 at 12.10 o'c
1071-382
A W Bleadell
ASSISTANT REGISTRAR OF TITLES

Transfer 2257/1941 Lot 180 to Gertrude Mary Cotterill. Registered 31st March 1941 at 11.35 o'c
1073-941.
A W Bleadell
Registrar of Titles

As to Lots 191 and 192 only.
Discharge 2461/1941 of Mortgage 2326/1920. Registered 27th June 1941 at 2.45 o'c
A W Bleadell
REGISTRAR OF TITLES

As to Lot 120 only.
Discharge 2770/1941 of Mortgage 2326/1920. Registered 11th July 1941 at 2.50 o'c
A W Bleadell
REGISTRAR OF TITLES

Transfer 4776/1941. Lot 120 to Ellen Gertrude Daisy Woodward. Registered 16th July 1941 at 2.50 o'c
1074. 866.
A W Bleadell
REGISTRAR OF TITLES

Transfer 4818/1941. Lots 191 and 192 to Daisy Isabel McCracken. Registered 16th July 1941 at 2.50 o'c
1074. 875.
A W Bleadell

as to lot 153 only
Discharge 3796/1941. of Mortgage 2326/1920. Registered 24 September 1941. at 2.55. o'c.
R C Clifton
ASSISTANT REGISTRAR OF TITLES.

As to Lot 189 only
Discharge 850/1942 of Mortgage 2326/1920. Registered 2nd March 1942 at 12.45 o'c.
A W Bleadell
REGISTRAR OF TITLES

Transfer 1291/1942 Lot 189 to Edward Edney. Registered 3rd March 1942 at 3.50 o'c
1077-200.
CANCELLED
A W Bleadell
REGISTRAR OF TITLES

As to Lot 152 only.
Discharge 1441/1942 of Mortgage 2326/1920. Registered 15th April 1942 at 12.10 o'c. [signature] Registrar of Titles.

Transfer 1901/1942. Lot 152 to Norman Dempsey. Registered 15th April 1942 at 12.15 o'c.
1077-389 [signature] Registrar of Titles.
CANCELLED

As to Lot 121 only.
Discharge 2583/1942 of Mortgage 2326/1920. Registered 20th July 1942 at 11.40 o'c. [signature] Assistant Registrar of Titles.

Transfer 3297/1942. Lot 121 to Beatrice Louisa Bevan. Registered 20th July 1942 at 12.5 o'c.
1077-882 [signature] Assistant Registrar of Titles.

As to Lot 123 only
Discharge 2984/1942 of Mortgage 2326/1920 Registered 20th August 1942 at 11.45 o'c [signature] Assistant Registrar of Titles.

As to Lots 132, 133 and 134 only.
Discharge 791/1943 of Mortgage 2326/1920. Registered 1st March 1943 at 11.30 o'c. [signature] Registrar of Titles.

Transfer 865/1943. Lots 132, 133 and 134 to Lavinia Constance Kaeding. Registered 2nd March 1943 at 12 o'c.
1079-918 [signature] Registrar of Titles.

As to Lot 149 only.
Discharge 2821/1943 of Mortgage 2326/1920. Registered 7th July 1943 at 11.30 o'c [signature] Registrar of Titles.

Transfer 3037/1943. Lot 149 to Elizabeth Rawolle. Registered 7th July 1943 at 11.30 o'c
1080-724. [signature] Registrar of Titles.

As to Lot 118 only.
Discharge 4346/1943 of Mortgage 2326/1920 Registered 8th October 1943 at 12.20 o'c. [signature] Assistant Registrar of Titles.

Transfer 5046/1943. Lot 118 to Henry John Livermore. Registered 11th October 1943 at 12 o'c.
1081-384 [signature] Assistant Registrar of Titles.

Transfer 2754/1944. Lot 123 to Edith Maria Catherine Paula Burke. Registered 19th May 1944 at 3.40 o'c.
1082-876 [signature] Registrar of Titles.

As to Lot 127 only.
Discharge 2808/1944 of Mortgage 2326/1920. Registered 30th June 1944 at 2.10 o'c. [signature] Registrar of Titles.

As to Lots 150 and 151 only.
Discharge 434/1945 of Mortgage 2326/1920. Registered 2nd February 1945 at 3.15 o'c [signature] Registrar of Titles.

Transfer 836/1945. Lots 150 and 151 to Annie Rachel Bell. Registered 2nd February 1945 at 3.15 o'c
1086-642 [signature] Registrar of Titles.

Transfer 2601/1945. Lot 153 to George Garratt Dempsey. Registered 4th April 1945 at 12.20 o'c
1087-356 [signature] Registrar of Titles.

As to Lot 162 only.
Discharge 4384/1945 of Mortgage 2326/1920 Registered 10th September 1945 at 12 o'c. [signature] Assistant Registrar of Titles.

Transfer 7903/1945. Lot 162 to Murray Nesbit Anderson. Registered 20th September 1945 at 11.40 o'c
1089-452 [signature] Assistant Registrar of Titles.

Transfer 9812/1945. Lot 127 to Filomena Gaddini. Registered 15th November 1945 at 10.45 o'c.
1090-150 [signature] Registrar of Titles.

As to Lot 160 only
Discharge 1291/1946 of Mortgage 2326/1920 Registered 28th February 1946 at 11.10 o'c. [signature] Registrar of Titles.

Transfer 2476/1946. Lot 160 to Angus Valentine Macpherson. Registered 28th February 1946 at 11.10 o'c.
1092-806. [signature] Registrar of Titles.
CANCELLED

As to Lot 145 only.
Discharge 4278/1946 of Mortgage 2326/1920. Registered 24th June 1946 at 11.5 o'c. [signature] Registrar of Titles.

Transfer 8335/1946. Lot 145 to Roger Bell. Registered 24th June 1946 at 11.10 o'c
1094-824 [signature] Registrar of Titles.

As to Lot 115 only.
Discharge 5605/1947 of Mortgage 2326/1920. Registered 24th July 1947 at 10.30 o'c. [signature] Registrar of Titles.

1015-105

For further endorsements, see OVER.

As to Lot 117 only.
Discharge 5606/1947 of Mortgage 2326/1920. Registered 24th July 1947 at 10-30 o'c.

REGISTRAR OF TITLES.

Transfer 10487/1947. Lot 115 to Annie Mary Keeley. Registered 24th July 1947 at 10·30 o'c.

1103-182.

REGISTRAR OF TITLES.

As to Lots 193 and 194 only.
Discharge 6035/1947 of Mortgage 2326/1920. Registered 8th August 1947 at 10.40 o'c.

REGISTRAR OF TITLES.

Transfer 11297/1947. Lots 193 and 194 to John Stanley Robertson. Registered 8th August 1947 at 10-40 o'c.

1103-577.

REGISTRAR OF TITLES.

As to Lot 154 only.
Discharge 6955/1948 of Mortgage 2326/1920. Registered 17th September 1948 at 11 o'c

REGISTRAR OF TITLES.

Transfer 12317/1948 Lot 154 to James Caulfield Stephenson Registered 20th September 1948 at 3.5 o'c

1112.659.

REGISTRAR OF TITLES.

Transfer 16504/1948 Lot 117 to James Frederick Ellery Registered 3rd December 1948 at 4 o'c

1115-117.

Ast. REGISTRAR OF TITLES.

DISCHARGE 9178/1950. of Mortgage. 2326/1920.
Registered 12th October 1950 at 12 o'c.

CANCELLED

TRANSFER 8444/1951
Lots 163, 164 and 165 to Ellen Amelia Graves.
Registered this 27th day of April 1951
at 3.25 o'c.
1136.160
AST. Registrar of Titles

Not Resumed

As to Portion of Drain Reserve on Diagram 11042 and Portion on Diagram 11041
R.D. 182/1959 Public Works Act 1902-1955 Sec. 17 (5)
NOTICE OF INTENTION TO RESUME
Gov. Gaz. 26-6-59 Item 12, 18
~~ACTION COMPLETE~~ ASSISTANT REGISTRAR OF TITLES

APPLICATION D117096
Registered 26th September 1985 at 11.49 o'c.
Lot 136 on Diagram 11041
To Vol. 1707 Fol. 824.

Entered in Error
~~CANCELLED~~

1015-105

25547/46 3156/48 10736/49

Transfer 8335/1946
Application
From Volume 1015 Folio 105

ORIGINAL

INDEXED.

REGISTER BOOK.
Vol. 1094 Fol. 824
Plan 6909
P. 13697

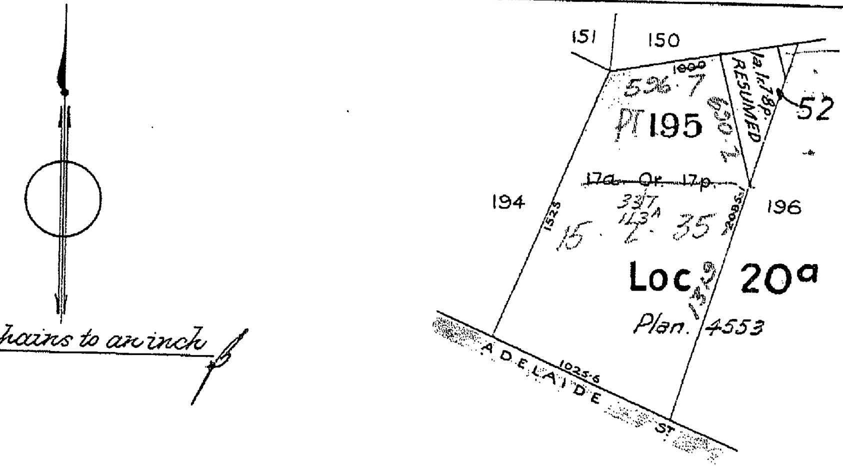
WESTERN AUSTRALIA.

Certificate of Title

under "The Transfer of Land Act, 1893" (56 Vic., 14, Sch. 5).

CT 1094 0824 F

ROGER BELL, of Narembeen, Bin Attendant, is now the proprietor of an estate in fee simple subject to the easements and encumbrances notified hereunder in ALL that piece of land delineated and coloured green on the map hereon containing seventeen acres and seventeen perches or thereabouts, being portion of HELENA LOCATION 20a and being Lot 195 on plan 4553.



Scale 8 chains to an inch

Distances from Plan 6909

Dated the twenty-fourth day of June One thousand nine hundred and forty-six.

Registrar of Titles.

Transfer 501/1948. Transferred to John Stanley Robertson of Maida Vale Shearer. Registered 15th January 1948 at 3.30 o'c

ASSISTANT REGISTRAR OF TITLES.

Transfer 6152/1949 Transferred to Westralian Farmers Co-operative Limited of 569 Wellington Street Perth. Registered 3rd May 1949 at 10 o'c

ASSISTANT REGISTRAR OF TITLES.

PUBLIC WORKS ACT 1902-1953.
R.D. 1/56
Gaz. 15.3.57 Plan 6909
Lot 52
portion resumed and vested in
Her Majesty
R. Buchanan
Registrar of Titles.

PUBLIC WORKS ACT 1902-1953.
the portion resumed Gaz 15.3.57
right to mines of coal or other
[illegible] is resumed and revested in Her
[illegible] as of her former estate.
R. Buchanan
Registrar of Titles.

Land Parcel Identifier amended - Regulation 6 of Transfer of Land (Surveys) Regulations 1995
Corr. 1775-2000-01
Date: 13/4/06

L 15666/45*

For encumbrances and other matters affecting the land see back.

EASEMENTS AND ENCUMBRANCES REFERRED TO.

AD1/56 As to portion only ~~Act 59 of 1955~~ Section 17 (5) Notice of Intention to Resume. Gov. Gaz. 16.3.1956 item 80. Public Works Act 1902-1955

L.F. Symes
ASSISTANT REGISTRAR OF TITLES

TRANSFER A271114
Registered 18th March 1970 at 11.09 o'c.
Part of Lot 195
To Vol. 337 Fol. 111A.
OFFICE OF TITLES WESTERN AUSTRALIA

APPLICATION A271115
Registered 18th March 1970 at 11.09 o'c
Part of Lot 195
(The unresumed portion).
To Vol. 337 Fol. 113A.
OFFICE OF TITLES WESTERN AUSTRALIA

CT 1094 0824 B

CERTIFICATE OF TITLE.

Vol. *Fol.*

28211/47

Application
Transfer 11297/1947
From Volume 1015 Folio 105

1073/49

ORIGINAL

REGISTER BOOK.

Vol. 1103 Fol. 577

INDEXED.

WESTERN AUSTRALIA.

D 76128

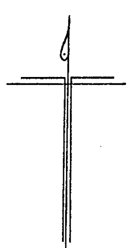
Certificate of Title

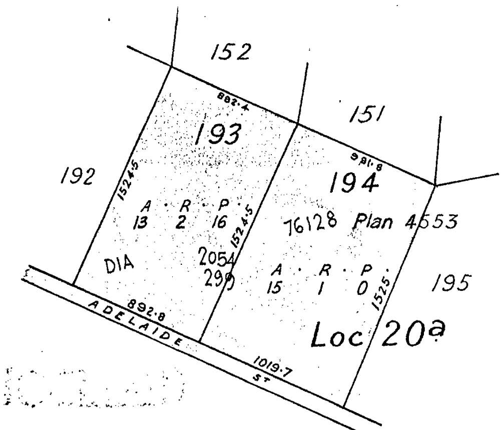
under "The Transfer of Land Act, 1893" (56 Vic., 14, Sch. 5).

CT 1103 0577 F

CANCELLED

John Stanley Robertson of Adelaide Street, Maida Vale, Pig Farmer, is now the proprietor of an estate in fee simple subject to the easements and encumbrances notified hereunder in ~~the natural surface and so much as is below the natural surface to a depth of~~ ~~feet of~~ all those pieces of land delineated and coloured green on the map hereon containing together twenty-eight acres three roods and sixteen perches or thereabouts, being portion of Helena Location 20a and being Lots 193 and 194 on plan 4553.





Scale: 8 Chains to an Inch.

CANCELLED

Dated the eighth day of August One thousand nine hundred and forty-seven.

Registrar of Titles.

Transfer 6152/1949 Transferred to Westralian Farmers Co-operative Limited of 569 Wellington Street Perth. Registered 3rd May 1949 at 10 oc

ASSISTANT REGISTRAR OF TITLES.

Transfer D54176 to Wesfarmers Ltd., of 21st Floor, Allendale Square, 77 St. George's Terrace, Perth. Registered 27th June, 1985 at 3.06 o'c.

OFFICE OF TITLES Western Australia

Transfer D361255 to Oxendon Investments Pty. Ltd. of 226 Great Eastern Highway, Belmont. Registered 13th November, 1986 at 10.45 o'c.

OFFICE OF TITLES WESTERN AUSTRALIA

TOTALLY CANCELLED	LODGED/REGISTERED
~~WITHDRAWAL/S~~ ~~DISCHARGE/S~~ APPLICATION G704 As to Diagram 76128 Included In Vol. 2054 Fol. 299	9.10.95 at 10.47 hrs.

CANCELLED

L 17219/46*

For encumbrances and other matters affecting the land see back.

Cancelled

EASEMENTS AND ENCUMBRANCES REFERRED TO.

Mortgage D361256 to Geneva Finance Ltd. Registered 13th November, 1986 at 10.45 o'c. DISCHARGED

Discharge D697594 of Mortgage D361256. Registered 15th March, 1988 at 14.17 hrs.

Mortgage D697595 to Statewide Savings & Building Society. Registered 15th March, 1988 at 14.17 hrs. DISCHARGED

Mortgage D697596 to Capital Hall Finance Pty. Ltd. Registered 15th March, 1988 at 14.17 hrs. DISCHARGED

Discharge E130120 of Mortgage D697595 Registered 20th June, 1989 at 10.14 hrs.

Discharge E130121 of Mortgage D697596. Registered 20th June, 1989 at 10.14 hrs.

Mortgage E130122 to Beneficial Finance Corporation Ltd and Beneficial Leasing Pty. Ltd. Registered 20th June, 1989 at 10.14 DISCHARGED

Mortgage E223538 to Commonwealth Bank of Australia. Registered 31st October 1989 at 10.02 hrs.

Discharge E410821 of Mortgage E130122. Registered 25th July, 1990 at 9.27 hrs.

As to Portion only:
Caveat E674833. Lodged 9.8.91 at 11.27 hrs.

Warrant E694684 (Plaint 15854/91). Lodged 2.9.1991 at 11.09 hrs.

Memorial E730989 of Section 46 Land Tax Assessment Act 1976. Registered 25th October, 1991 at 9.15 hrs.

Caveat F544516. Lodged 10.5.94 at 12.17 hrs.

Cancelled

CT 1103 0577 B

CERTIFICATE OF TITLE.

Registered Vol. Fol.

INDEXED JT *

ORIGINAL REGISTER BOOK

Application A271115
Volume 1094 Folio 824

WESTERN AUSTRALIA

VOL. 337 FOL. 113 A

P. 13697

Certificate of Title

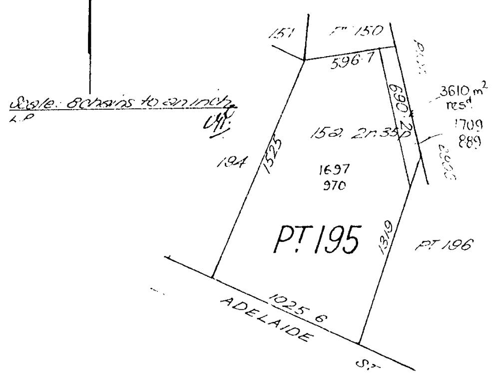
CT 0337 0113A F

UNDER THE "TRANSFER OF LAND ACT, 1893" AS AMENDED

Westralian Farmers Co-operative Limited of 569 Wellington Street, Perth, is now the proprietor of an estate in fee simple subject to the easements and encumbrances notified hereunder in all that piece of land delineated and coloured green on the map hereon containing fifteen acres two roods and thirty-five perches or thereabouts, being portion of Helena Location 20a and being part of Lot 195 on Plan 4553.

CANCELLED

Dated the 18th day of March, 1970.



REGISTRAR OF TITLES.

PUBLIC WORKS ACT 1902-1953
RD 13.82
Gaz. 16.4.82 Plan 13697
Portion resumed and vested in
METROPOLITAN REGION TOWN PLANNING AUTHORITY
Registrar of Titles

PUBLIC WORKS ACT 1902-1953
In the portion resumed Gaz. 16.4.82 the right to mines of coal or other minerals is resumed and revested in Her Majesty as of her former estate.
Registrar of Titles

APPLICATION D142317
INCLUDED IN VOL. 1709 FOL. 889
REGISTERED 6TH NOVEMBER 1985 at 9.19 a.c.

OFFICE OF TITLES WESTERN AUSTRALIA

CANCELLED

Minerals in Portion resumed alone remains

67221/12/69-12M-O/FAL

For encumbrances and other matters affecting the land see back

EASEMENTS AND ENCUMBRANCES REFERRED TO

TRANSFER D54176
Registered 27th June 1985 at 3.06 o'c.
Part of Lot 195
To Vol. 1697 Fol. 970.

Cancelled

CT 0337 0113A B

CERTIFICATE OF TITLE

VOL. 337 FOL. 113 A

LT. 37

ORIGINAL – NOT TO BE REMOVED FROM OFFICE OF TI

CT 1697 0970 F

Transfer D54176

Volume 337 Folio 113A

WESTERN AUSTRALIA

1697 970

D. 76128

CERTIFICATE OF TITLE

UNDER THE "TRANSFER OF LAND ACT, 1893" AS AMENDED

Page 1 (of 2 pages) 1697 VOL. 970 FOL.

I certify that the person described in the First Schedule hereto is the registered proprietor of the undermentioned estate in the undermentioned land subject to the easements and encumbrances shown in the Second Schedule hereto.

Dated 27th June, 1985

CANCELLED

N. J. Smyth
REGISTRAR OF TITLES

OFFICE OF TITLES WESTERN AUSTRALIA

ESTATE AND LAND REFERRED TO

Estate in fee simple in portion of Helena Location 20a and being part of Lot 195 on Plan 4553 (Sheet 3), delineated and coloured green on the map in the Third Schedule hereto.

FIRST SCHEDULE (continued overleaf)

~~Wesfarmers Ltd., of 21st Floor, Allendale Square, 77 St. George's Terrace, Perth~~

SECOND SCHEDULE (continued overleaf)

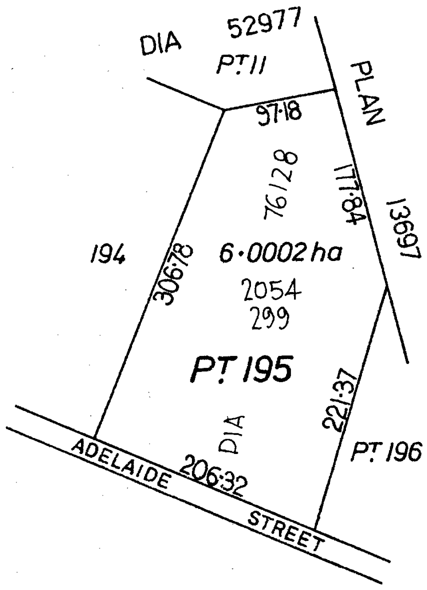
NIL

N. J. Smyth
REGISTRAR OF TITLES

THIRD SCHEDULE

Cancelled

CANCELLED



SCALE 1 : 6000

CANCELLED

NOTE: RULING THROUGH AND SEALING WITH THE OFFICE SEAL INDICATES THAT AN ENTRY NO LONGER HAS EFFECT. ENTRIES NOT RULED THROUGH MAY BE AFFECTED BY SUBSEQUENT ENDORSEMENTS.

PERSONS ARE CAUTIONED AGAINST ALTERING OR ADDING TO THIS CERTIFICATE OR ANY NOTIFICATION HEREON

72009/12/77–45M–S/2860

LT. 37

Cancelled

FIRST SCHEDULE (continued)

NOTE: RULING THROUGH AND SEALING WITH THE OFFICE SEAL INDICATES THAT AN ENTRY NO LONGER HAS EFFECT. ENTRIES NOT RULED THROUGH MAY BE AFFECTED BY SUBSEQUENT ENDORSEMENTS.

REGISTERED PROPRIETOR	INSTRUMENT NATURE	INSTRUMENT NUMBER	REGISTERED	TIME	SEAL	INITIALS
Oxendon Investments Pty. Ltd. of 226 Great Eastern Highway, Belmont.	Transfer	D361255	13.11.86	10.45		

TOTALLY CANCELLED	LODGED/REGISTERED
~~WITHDRAWAL/S~~ ~~DISCHARGE/S~~ APPLICATION G 704 As to Diagram 76128 Included ~~In~~ Vol. 2054 Fol. 299	9.10.95 at 10.47 hrs

SECOND SCHEDULE (continued)

NOTE: RULING THROUGH AND SEALING WITH THE OFFICE SEAL INDICATES THAT AN ENTRY NO LONGER HAS EFFECT. ENTRIES NOT RULED THROUGH MAY BE AFFECTED BY SUBSEQUENT ENDORSEMENTS.

INSTRUMENT NATURE	INSTRUMENT NUMBER	PARTICULARS	REGISTERED	TIME	SEAL	INITIALS	CANCELLATION	NUMBER	REGISTERED OR LODGED	SEAL	INITIALS
~~Mortgage~~	~~D361256~~	~~to Geneva Finance Ltd.~~	~~13.11.86~~	~~10.45~~			Discharged	D697594	15.3.88		
Mortgage	D697595	to Statewide Savings & Building Society.	15.3.88	14.17			Discharged	E130120	20.6.89		
Mortgage	D697596	to Capital Hall Finance Pty. Ltd.	15.3.88	14.17			Discharged	E130121	20.6.89		
Mortgage	E130122	to Beneficial Finance Corporation Ltd and Beneficial Leasing Pty. Ltd.	20.6.89	10.14			Discharged	E410821	25.7.90		
Mortgage	E223538	to Commonwealth Bank of Australia.	31.10.89	10.02							
Caveat	E674833	Lodged 9.8.91 at 11.27 hrs.									
Warrant	E694684	(Plaint 15854/91). Lodged 2.9.1991 at 11.09 hrs.									
Caveat	F544516	Lodged 10.5.94 at 12.17 hrs.									

CERTIFICATE OF TITLE VOL. 1697 970

REGISTER NUMBER	
20/D76128	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
3	13/6/2008

WESTERN AUSTRALIA

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

VOLUME **2054** FOLIO **299**

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

REGISTRAR OF TITLES

LAND DESCRIPTION:

LOT 20 ON DIAGRAM 76128

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

HAZELLAND PTY LTD OF SUITE 5, 17 FOLEY STREET, BALCATTA
(TP K606822) REGISTERED 26 MAY 2008

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

1. *K606823 NOTIFICATION CONTAINS FACTORS AFFECTING THE WITHIN LAND. LODGED 26.5.2008.
2. *L520703 MEMORIAL. CONTAMINATED SITES ACT 2003 (CONTAMINATED SITE - REMEDIATION REQUIRED) REGISTERED 30.12.2010.

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

--END OF CERTIFICATE OF TITLE--

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND:	2054-299 (20/D76128).
PREVIOUS TITLE:	1697-970, 1103-577.
PROPERTY STREET ADDRESS:	LOT 20 ADELAIDE ST, HAZELMERE.
LOCAL GOVERNMENT AREA:	CITY OF SWAN.

LT. 37

ORIGINAL—NOT TO BE REMOVED FROM OFFICE OF TITLES

Application G704

Volume	Folio
1103	577
1697	970

WESTERN AUSTRALIA

REGISTER BOOK
VOL. FOL.
CT 2054 299

CERTIFICATE OF TITLE

UNDER THE "TRANSFER OF LAND ACT, 1893" AS AMENDED

I certify that the person described in the First Schedule hereto is the registered proprietor of the undermentioned estate in the undermentioned land subject to the easements and encumbrances shown in the Second Schedule hereto.

Dated 9th October, 1995

G. Sach
REGISTRAR OF TITLES

VOL. 2054 FOL. 299

PERSONS ARE CAUTIONED AGAINST ALTERING OR ADDING TO THIS CERTIFICATE OR ANY NOTIFICATION HEREON

ESTATE AND LAND REFERRED TO

Estate in fee simple in portion of Helena Location 20a and being Lot 20 the subject of Diagram 76128, delineated on the map in the Third Schedule hereto.

FIRST SCHEDULE (continued overleaf)

~~Enviroclean Waste Services Pty Ltd of Post Office Box 347 Victoria Park.~~

SECOND SCHEDULE (continued overleaf)

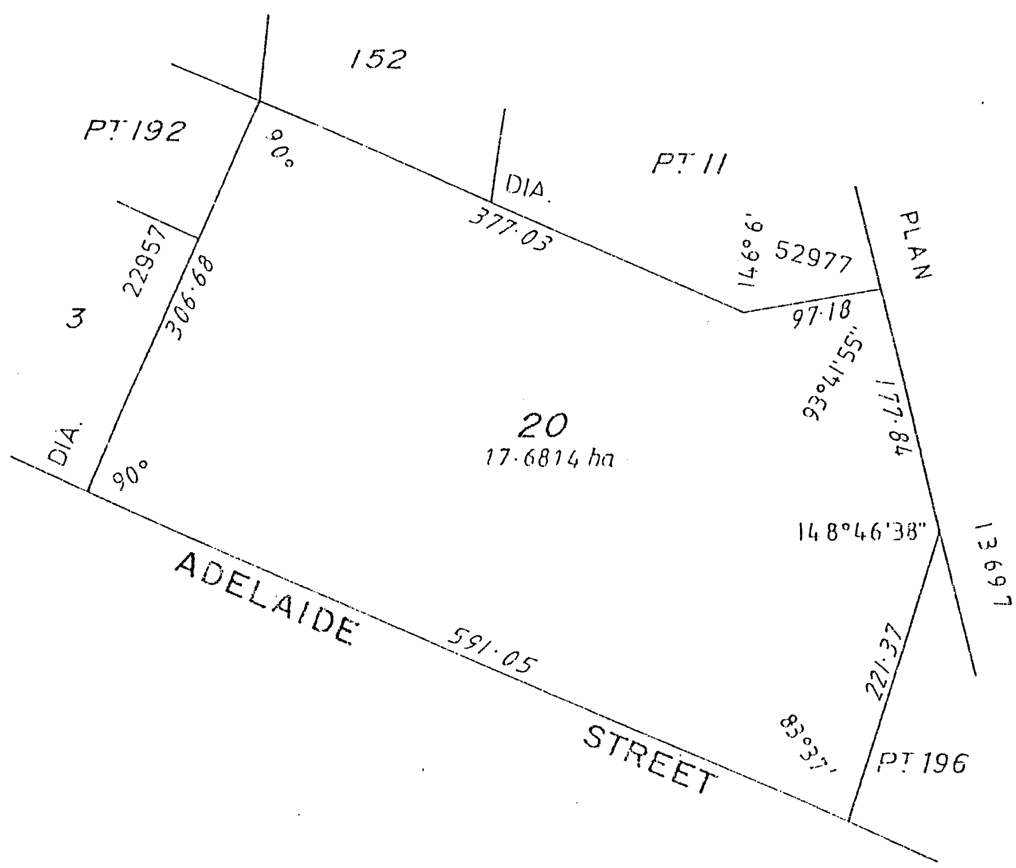
~~1. MORTGAGE E223538 to Commonwealth Bank of Australia. Registered 31.10.89 at 10.02 hrs.~~
Discharged G108671 23.2.96

~~As to portion only:~~
~~2. CAVEAT E674833 Lodged 9.8.91 at 11.27 hrs.~~
Withdrawn G108674 23.2.96

~~As to portion only:~~
~~3. MEMORIAL E730989 of Section 46 Land Tax Assessment Act 1976. Registered 25.10.91 at 9.15 hrs.~~
Withdrawn G108673 23.2.96

~~4. CAVEAT F544516 Lodged 10.5.94 at 12.17 hrs.~~
Withdrawn G108672 23.2.96

THIRD SCHEDULE



SCALE 1:5000

NOTE: ENTRIES MAY BE AFFECTED BY SUBSEQUENT ENDORSEMENTS.

FIRST SCHEDULE (continued)

NOTE: ENTRIES MAY BE AFFECTED BY SUBSEQUENT ENDORSEMENTS

REGISTERED PROPRIETOR	INSTRUMENT NATURE	INSTRUMENT NUMBER	REGISTERED	TIME	SEAL	CERT. OFFICER
Westgroup Pty Ltd of 665 Welshpool Road, Wattle Grove.	Transfer	G108675	23.2.96	10.18		

SECOND SCHEDULE (continued)

NOTE: ENTRIES MAY BE AFFECTED BY SUBSEQUENT ENDORSEMENTS

INSTRUMENT NATURE	INSTRUMENT NUMBER	PARTICULARS	REGISTERED	TIME	SEAL	CERT. OFFICER	CANCELLATION	NUMBER	REGISTERED OR LODGED	SEAL	CERT. OFFICER
Mortgage	G108676	to Cash Resources Australia Pty Ltd	23.2.96	10.18			Discharged	G708165	9.2.98		
Mortgage	G108677	to Cash Resources Australia Pty Ltd	23.2.96	10.18			Discharged	G708165	9.2.98		
Caveat	G108552	Lodged 23.2.96 at 10.18 hrs.					Withdrawn	G708164	9.2.98		
Mortgage	G708166	to National Australia Bank Ltd.	9.2.98	9.16							
Caveat	G708167	Lodged 9.2.98 at 9.16 hrs.					Withdrawn	H178898	27.7.99		
Memorial	G806391	Land tax Assessment Act 1976. Lodged 29.5.98 at 15.00 hrs.									
Memorial	H663104	Land Tax Assessment Act 1976. Lodged 7.2.01 at 10.35 hrs.									

CERTIFICATE OF TITLE VOL. FOL.

Appendix B – Community Consultation (Greg Rowe Associates)

GREG ROWE & associates
FOCUSED ON ACHIEVEMENT

COMMUNITY MANAGEMENT STRATEGY
REMEDIATION OF FORMER LANDFILL SITE
LOT 20 ADELAIDE STREET, HAZELMERE

GRA REF 7229 30 MAY 2013

DOCUMENT CONTROL

This report has been authorised by;

Alan Stewart Town Planner

30/05/13

Alan Stewart Team Leader

30/05/13

Alan Stewart Quality Control

30/05/13

Document1
Printed 3

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Community Management

Given the scope of the project, and the proximity of an established residential area to the south, it is recognised that the remediation works will be closely scrutinised by the community, and may cause some level of concern amongst residents. This **DRAFT** Community Management Strategy ('CMS') has therefore been prepared to ensure residents are fully informed of the project and provided with various mediums through which to obtain information.

Community Management Strategy

The **DRAFT** CMS has been prepared in accordance with the DEC's Reporting of Site Assessments Guidelines and the Contaminated Sites Management Series Community Consultation Guidelines. The table below summarises the key components of the proposed Community Consultation Program.

PROCESS	RESPONSIBILITY	METHOD	OUTCOMES / COMMENTS
Development Application (DA)			
Advertising of this DA, including Remediation Management Plan ('RMP') and DRAFT Community Consultation Strategy ('CCS')	City of Swan and Wasterock Pty Ltd	Newspaper, Letters to Owners / Residents, Website, Site Signage	Consideration of submissions and modify (if required) Development Application, DRAFT RMP and DRAFT CCS.
Remediation Management Plan and Community Consultation Strategy			
Submission of RMP and CCS to DEC for approval, along with Schedule of Submissions	DEC Wasterock Pty Ltd		Approval of RMP and CCS by the DEC.
Pre-Works Consultation			
Information Brochure	Wasterock Pty Ltd	Letters to Owners / Residents	Information about remediation process will be provided, including start date and point of contact details.
Establish Website	Wasterock Pty Ltd	Website	A link to the website will be available on the City of Swan and Shire of Kalamunda websites. Residents will be able to register on line to request and receive information.
Remediation Works			
Information Brochures	Wasterock Pty Ltd	Letter Drop and Email	Regular Information Brochures will be sent to residents to advise of progress.
Establish Complaints Register	Wasterock Pty Ltd	Various	Complaints to be registered on-line, email, telephone or post. Complaints Register to be available on line for public review.
Establish Incidents Register	Wasterock Pty Ltd	Various	Incidents Register to be maintained and available on line for public review.
Notice of Completion	Wasterock Pty Ltd	Newspaper / Website	Information that Remediation is complete
Review of Community Consultation Strategy			
Invite comments on the CCS	Wasterock Pty Ltd	Newspaper / Website	Community invited to submit comments on the CCS and its effectiveness.

Incidents and Complaints Management

The objective of the Remediation Management Plan is to actively manage all environmental and social incidents. Immediate action will be taken in the event of a complaint. Upon receipt of a complaint, an investigation will commence within 24 hours and be completed within seven days. Should corrective actions be required, these will be implemented within an agreed timeframe commensurate with the nature and scope of the required corrective action.

The following points must be followed upon receipt of a complaint:

» Take any necessary immediate action;

» Report the incident or complaint, including to Local and State Government, if necessary;

» Undertake an investigation;

» Determine the root causes;

» Undertake any necessary corrective or preventative actions;

» Monitor action implementation; and

» Audit the effectiveness of the action.

The site Project Manager will be the first point of contact for reporting incidents and complaints. The complainant will be advised of what action, if any, is required to be taken. Should further incidents occur or complaints be received in relation to a previous occurrence, an appropriate selection of the following actions will be undertaken:

» Additional environmental awareness training of the workforce with respect to the procedures to be followed for environmental incidents or complaint;

» Investigation into why the incident/complaint was not addressed within the specified time frame; and

» Undertake incident/complaint follow-up according to the results of the investigation.

COMMUNITY MANAGEMENT STRATEGY

REMEDIATION OF FORMER LANDFILL SITE

LOT 20 ADELAIDE STREET
HAZELMERE

OUR REF: 7229 18/03/2014

ROWE GROUP

DOCUMENT CONTROL

Printed 19 March 2014   7229_14mar01R_as

Version	File Name	Prepared by	Approved by	Date
1	7229_14mar01R_as	Alan Stewart	Alan Stewart	18 March 2014

This report has been authorised by;

Alan Stewart Senior Planner

Susie Blatchford Quality Control

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CONTENTS

01 Introduction 1

02 Description of Site 2

2.1 Location 2

2.2 Existing Improvements 2

2.3 Contamination 2

03 Community Management 3

3.1 Community Stakeholders 3

3.2 Consultation Strategy 4

3.3 Consultation Program 6

FIGURES

1. Local Location
2. Site Plan

01 Introduction

Rowe Group acts on behalf of Hazelland Pty Ltd, the owner of Lot 20 Adelaide Street, Hazelmere (herein referred to as the 'subject site').

Rowe Group has been engaged to assist in obtaining the necessary approvals to remediate the subject site. This will include preparing and lodging a Development Application with the City of Swan seeking consent to excavate and remediate the site.

The Development Application includes a Site Remediation Plan (SRP) that is to be lodged with the Department of Environment and Conservation (DEC). A multi-disciplinary team has been engaged to prepare the Development Application and SRP. The project team consists of:

Rowe Group	Town Planning
Strategen Environmental Consultants	Environmental
MDW Environmental Services	Hydrology and Compliance Monitoring
SGS Australia	Geotechnical
VDM Engineering Pty Ltd (VDM)	Civil Engineering

The DEC requires community management/consultation to be addressed as part of the SRP. This report addresses the community management requirements of the SRP and includes a description of the following matters:

- Location of the subject site;
- Description of the site contamination;
- Description of remediation works;
- Overview of the relevant stakeholders;
- Justification of the proposed community management strategy; and
- Description of community engagement and management review process.

02 Description of Site

2.1 Location

The subject site is located in the Municipality of the City of Swan on the border with the Shire of Kalamunda, approximately 15 kilometres east of the Perth Central Area and 3 kilometres east of the Perth Airport.

The subject site is situated in the suburb of Hazelmere on the northern border of the residential suburb of High Wycombe, which is located in the Shire of Kalamunda. The subject site is approximately 1.5 kilometres south of the existing Hazelmere Industrial Precinct and approximately 4.0 kilometres south of the Midland Town Centre.

Refer Figure 1 – Local Location.

2.2 Existing Improvements

The subject site is approximately 17.6814 hectares with a frontage of approximately 565 metres to Adelaide Street. The subject site is mostly vacant with one small shed located in the south western corner of the site. Grass, weeds and some low lying shrubs and trees grow sporadically over the site.

The topography of the subject site varies with levels of approximately 27 metres AHD at the south western portion, 33 metres AHD at the south eastern portion, and up to 36 metres AHD throughout the central portion of the site.

Refer Figure 2 – Site Plan.

2.3 Contamination

The subject site operated as a licensed inert landfill from 1987 to 1997 after first being mined for sand. During this period the site was filled with inert building wastes being mostly sand masonry concrete / demolition wastes with minor incidents of other wastes such as car bodies, drums, asbestos sheets, some reported recycling sludge's containing hydrocarbons and emulsion factory wastes, drums of kerosene, bitumen, pesticide contaminated soils and hospital wastes (Parsons Brinkerhoff, 2006).

A number of studies were undertaken between 1992 and 2006 which identified varying levels of contamination primarily caused by total petroleum hydrocarbons, monocyclic aromatic hydrocarbons, asbestos and heavy metals.

Following an investigation by Parson Brinkerhoff in 2006 the subject site was classified as "Contaminated – Remediation Required" by the DEC. This classification means the site is contaminated and needs to be cleaned up to ensure it does not present a risk to human health or the environment. Preparation of the SRP is the first step required in the remediation process.

03 Community Management

The Community Management Strategy has been prepared in accordance with the DEC's Reporting of Site Assessments Guidelines 2001 and the Contaminated Sites Management Series Community Consultation Guidelines 2006, following preliminary site investigations by the project team.

3.1 Community Stakeholders

Stakeholders who will be invited to participate in the community consultation process have been identified based on the nature of contamination and the site's location. The following factors have guided our choice of stakeholders:

- Proximity of the site to local residents in High Wycombe.
- Known contaminants on site (i.e. asbestos, hydrocarbons and heavy metals).
- Ground water flow direction (north west away from High Wycombe residents).
- Prevailing winds from south west direction.
- Location of the site on the Municipal boundary of the City of Swan and Shire of Kalamunda.

The following is a list of stakeholders that should be informed as to the remediation work being undertaken on site and be invited to participate in community consultation:

- Residents south of Adelaide Street, north of Benson Way, in the residential suburb of High Wycombe.
- Residents north of Adelaide Street, south of Great Eastern Highway Bypass, east of Stirling Crescent and west of Roe Highway in the suburb of Hazelmere.
- Residents on the eastern side of Roe Highway, north of Adelaide Street, west of Midland road and south of Talbot Road in the suburb of Hazelmere.
- Any resident groups/community associations within the above mentioned residential localities.
- City of Swan Technical Officers (Planning and Health Departments) and elected members (Ward Councillor/s and Mayor).
- Shire of Kalamunda Technical Officers (Planning and Health Departments) and elected members (Ward Councillor/s and Mayor).
- Technical Officers from the Health Department, Department of Environment and Conservation and Department of Planning.
- State Government Midland electorate Member of Parliament (Ms Michelle Roberts MLA).
- State Government Forrestfield electorate Member of Parliament (Mr Andrew Waddell MLA).
- State Government East Metropolitan Region electorate Member of Parliament (Ms Donna Evelyn MLC).

3.2 Consultation Strategy

An investigation undertaken by Parson Brinkerhoff in 2006 revealed the subject site is contaminated with various components, including asbestos, hydrocarbons and heavy metals.

The project team has since undertaken preliminary site investigations. These investigations have included ground water monitoring to determine whether any of the contaminants have become mobile and leached into the groundwater system.

The remediation strategy proposes to process all waste on site by recycling appropriate materials and either removing contaminants from the site or relocating them on site, in accordance with an approved remediation plan, before placing an amount of clean fill above. The potential contamination of ground water will continue to be monitored during the remediation process.

Access to the subject site for remediation works is proposed from Talbot Road via Lot 152 Talbot Road, Hazelmere. Hazelland Pty Ltd and the landowner of Lot 152 have a written agreement allowing access. No access is proposed to Adelaide Street during the remediation process. Hazelland Pty Ltd has obtained Planning Approval from the City of Swan and Western Australian Planning Commission (WAPC) allowing access to the subject site via Lot 152 to Talbot Road.

Planning Approval from the City of Swan and Western Australian Planning Commission has also been obtained for 2.0 metre high bunding plus fencing along the south western (this includes the portion of the site fronting Adelaide Street and the existing residents of High Wycombe), western and northern boundaries of the subject site. The bunding and fencing will assist to improve security to the site, reduce any potential noise and dust impacts and reduce potential for contaminants moving off site.

Given there has already been various investigations undertaken by Parson Brinkerhoff and the project team and Planning Approvals for access, bunding and fencing have been secured it is proposed that engagement with the community firstly be in the form of a fact sheet or brochure that will update stakeholders on the steps undertaken to date.

The initial fact sheet or brochure will indicate what steps are anticipated in the remediation process, in terms of gaining necessary approvals, work periods, remediation process and further community consultation. The fact sheet or brochure should be accompanied with a comment form to encourage two-way communication, allow comments on the proposed remediation strategy and determine the extent of future community consultation.

At the same time the fact sheet is released, newspaper and online advertising on the City of Swan and Shire of Kalamunda websites will occur. Newspaper advertising will be brief and direct stakeholders to the City and Shire's website for further information. Online advertising will provide the same information as the fact sheet and allow stakeholders to make comments online that will be directed to Strategen and Hazelland Pty Ltd for consideration and a response.

Feedback from stakeholders following initial consultation (i.e. fact sheet and advertising) will assist to finalise the remediation strategy (for lodgement with DEC), determine the next phase of consultation and may assist to determine points of contact within the community (e.g. resident associations and elected members of both Local and State Government). All feedback from stakeholders will be documented. It is at this stage the SRP will be lodged with the DEC. Notwithstanding, future consultation will be undertaken which can impact the remediation strategy.

The next phase of consultation will involve either one relatively large public meeting or smaller meetings with specific stakeholder groups. If a range of individuals with different issues respond to the fact sheet and advertisement then one public meeting will likely be organised to allow all individuals to be involved. At the public meeting the preliminary investigations and proposed remediation strategy will be discussed. Specialised members from the project team will attend the public meeting, present on certain aspects if necessary and then be available to answer questions from stakeholders. The feedback from this meeting will be documented and used to improve the remediation strategy, if necessary. At this point Strategen will liaise with the DEC and update the remediation strategy if necessary. As an alternative, if it becomes clear following initial consultation (i.e. fact sheet and advertising) that there are certain groups or resident associations with similar issues, smaller meetings with specific stakeholder groups will be considered. Again, these meetings will be represented by members of the project team who will address any issues raised by stakeholders. Feedback from these meetings will be documented and used to improve the remediation strategy before lodgement. Again, at this point, Strategen will liaise with the DEC and update the remediation strategy if necessary.

Following the public meeting or small stakeholder group specific meetings, a written and online update will be provided to summarise the results of the consultation sessions. An indication of how the consultation impacted the remediation strategy will be provided. An update once the remediation strategy is approved by DEC will be advertised online and forwarded to any points of contact within the community. Once the remediation works begin, periodic updates online and to points of contact within the community will be issued on a regular basis (e.g. every 3 months), highlighting the progress of remediation work, and expected timeframes. During the remediation process, any complaints will be directed to the City and Shire. All complaints will be forwarded to Strategen and Hazelland Pty Ltd who will register the complaints, take any necessary action and respond to all complainants.

Once the remediation process is complete, a final notice will be issued to stakeholders and confirmation advertised online. At this stage, a review of the community consultation process will be undertaken. Community feedback will be requested when the final notice of completion is issued to stakeholders. Community feedback will also be requested at the online source.

3.3 Consultation Program

The Consultation Program has been prepared in accordance with the Contaminated Sites Management Series Community Consultation Guidelines 2006.

Process	**Timeframe**	**Outcomes**
Initial fact sheet / brochure drop to selected stakeholders. Request for comments regarding remediation process.	Allow 3 weeks for stakeholders to respond to fact sheet / brochure.	The comments received may impact the SRP and future consultation.
Advertise (newspaper and online) remediation works and request comments on proposed strategy.	Allow 3 weeks. To run concurrently with fact sheet / brochure release.	The comments received may impact the SRP and future consultation.
SRP is finalised and lodged with the DEC for assessment.	3 weeks to amend SRP and lodge with DEC. DEC likely take 4 months to assess and approve SRP.	DEC approve SRP.
Public meeting or stakeholder specific meetings to present on issues and address stakeholder concerns.	Public meeting or stakeholder specific meetings to occur 7 weeks following fact sheet / brochure release. This will allow approximately 4 weeks to review initial comments received and organise meetings.	Comments and concerns raised during the meetings may impact the SRP.
Strategen to liaise with DEC regarding consultation. SRP may be amended.	3 weeks to liaise with DEC and amend SRP if necessary. From this point DEC likely take 3 months to assess and approve.	DEC approve SRP.
Remediation begins. Periodic updates on progress and expected timeframes moving forward. Updates provided online and to points of contacts in community.	Every 3 months.	Community kept informed.
Complaints register made available online.	During entire remediation process (estimate of 3-4 years).	Allows review of remediation process if issues are raised.
Remediation complete. Final notice issued to stakeholders and advertised online.	1 week.	Confirms to stakeholders the completion of remediation.
Community consultation review. Request for comments on consultation undertaken sent with final notice of completion.	Allow 3 weeks for stakeholders to comment.	Comments received will be taken into consideration for future projects involving consultation.

FIGURES

ROWEGROUP

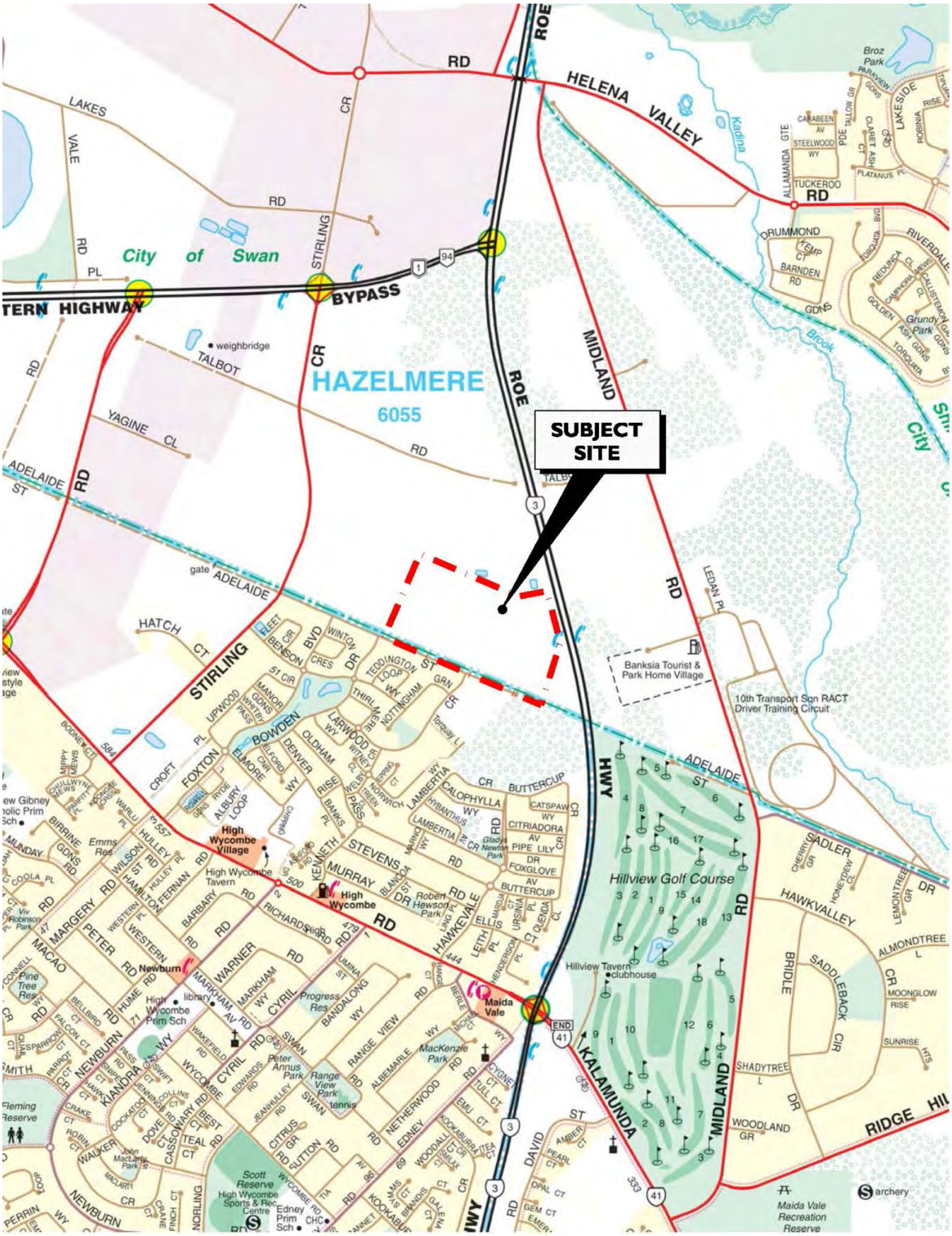

Figure 1 Local Location

Figure 2 Site Plan

wasterock
RESOURCE RECOVERY & REMEDIATION

22nd October 2013

To The Hazelmere Land Owner Group,

Lot 20 Adelaide Street, Hazelmere Remediation Project

There have been some questions and uncertainties regarding the proposed remediation of Lot 20 Adelaide Street. For this reason the community liaison officer for Wasterock recently visited the area to identify the main concerns of the community.

We would like to address those concerns raised by residents of Adelaide Street and neighbouring streets which included but was not limited to:

1. **Dust**
   Specific controls will be in place for winds which adversely affect the residents. These are predominately winds from the east and controls such as dust alarms set to site personnel mobile phones, wind socks to guide operators, spotters to monitor the works and daily weather checks prior to works commencing. It should also be noted that the Dust control measures on the Remediation Site will exceed the Urban Development Institute of Australia (UDIA) best practice management guidelines, which sets the benchmark. Dust control will also include boundary swales and wind speed reduction screening, broad scale wetting and misting and real-time wind monitoring to assist dust control management.

   WORKS WILL CEASE SHOULD ANY SITE OR WEATHER CONDITIONS POSE A HAZARD TO THE COMMUNITY. THEY WILL NOT RE-COMMENCE TILL IT IS DEEMED SAFE TO DO SO.

2. **Traffic and routes**
   No Truck entry from Adelaide Street. Trucks will enter via approved WAPC route off Talbot Road. Trucks that are currently using Adelaide Street have nothing to do with our company or with the Remediation Site.

3. **Waste content and contaminants**
   Majority of the fill is brick, concrete, sand, timber and scrap. The landfill has been extensively tested. The reported oil and offal (crayfish) waste has biodegraded and is not detectable. Fragments of Asbestos Containing Material (PACM) have been generally found in the fill. We will use an on-site deep burial method for ACM, which is preferred by the Department of Environment Regulation.

Contaminants are at levels generally below DER's strictest criteria – Ecological Investigation Levels and well below Health Investigation Levels for urban land. The Fill is classified INERT.

No odours have been detected in any of the deep inspection pits.

4. **Ground water**
We have performed groundwater-monitoring quarterly from numerous purpose-constructed wells around the Site. This testing indicates that the groundwater quality at the Site is similar to the water quality throughout the general area and is considered free from Site contamination.
It should be noted the waste material has an 8m clay soil foundation between it and the existing ground water reserve to prevent leaching.

5. **How it will be done**
Remediation works will start on the northwest corner far from Adelaide Street housing. Work will progress into the centre of the landfill maintaining an embankment between Adelaide Street and the process area for noise, wind and dust control and visual screening.

The developer and Wasterock would like to advise that this development will provide substantial positives for the community in the following ways:

- *Linear public open space opposite the housing on Adelaide Street. Construction of the public open space will begin in the winter of the 2nd year of works and will be completed in the 3rd year.*
- *Improved local amenity, and potential for substantially improved land values for all.*
- *Conversion of this hazardous site to a safe environment*
- *Permanently remove the continuous summer fires hazard*

Should you have any questions regarding this letter, or the project, please feel free to contact our community liaison officer, Phil McElhinney on 0429 170 657.

Kind Regards,

Jane Moltoni
Project Manager

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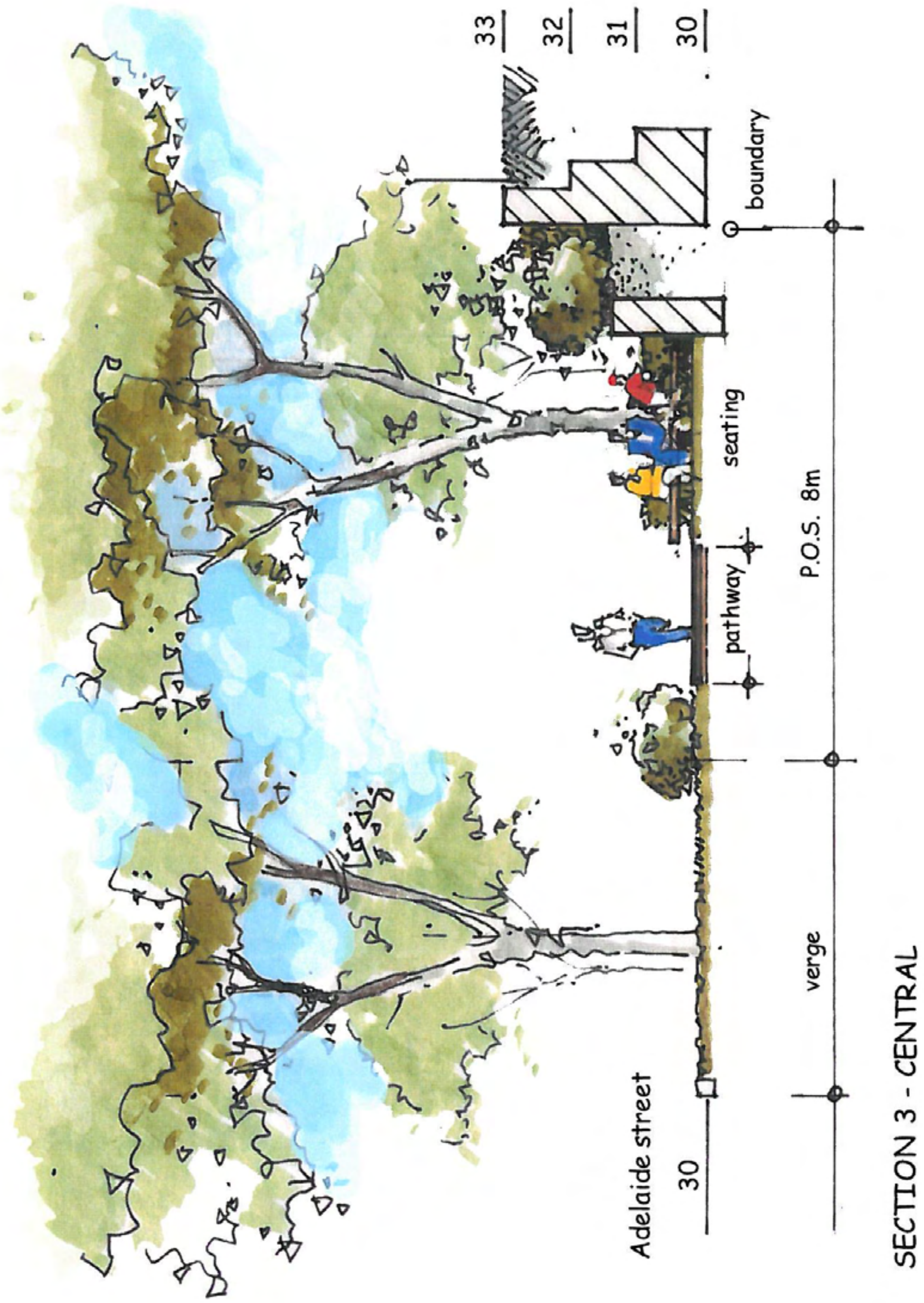
8m Wide Linear Park – Opposite All Housing



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Telephone: +61 8 6241 4100 **Fascimile:** +61 8 9240 6220
Email: enquiries@wasterock.com.au

The Choice

THE CURRENT SITUATION	REMEDIATION BENEFITS
Potential hazards on surface	Removed from surface and disposed of correctly, safely and lawfully
Spot fires cause: Respirable dust problems due to ash and bared land Hidden, smouldering sink holes	Fire risk removed
Snakes and vermin on site	Will no longer be a danger once long grasses and bush scrub on site are all removed
Minimal amounts of asbestos and PCBs from light fittings	Will be capped in deep underground cells or removed from site, no longer a potential hazard
Site is an eyesore for local residents	Site will be visually appealing, clean and feature land-scaped area parallel to Adelaide St.
Site is a cost burden for the city	Create rateable land fit for use

Truck Management

We have a strict traffic management plan, which avoids the use of residential streets to access the site.

Vehicles transporting waste materials will access the site from Talbot Road, to the north. To access the road from the regional road network, trucks will turn left or right into Stirling Crescent from the Great Eastern Highway Bypass and then turn into Talbot Road before entering the site.

Trucks to be checked prior to tipping on site. Only suitable suppliers and materials will be accepted.

Duration of Works and Operating Times

It is anticipated the process will take up to five years to complete. Operations will be limited to the following times:

Monday – Friday: **7am – 5:30pm**
Saturday: **8am – 4pm**

No works will be carried out on Sundays or public holidays.

The Team

Landowner	*Hazelland Pty Ltd*
Remediation contractor	*Wasterock Pty Ltd*
Project leader	*Rowe Group*
Environmental specialists	*MDW Environmental*
Groundwater	*MDW Environmental*
Dust and Noise experts	*Herring Storer*
Geotechnical	*Stats WA and CMW Australia*
Auditor (DER approved)	*EA Australia*

Questions or Comments

Please call or email us with any questions, comments or feedback. We are happy to chat and look forward to working with the community to make sure this site is safer for everyone.

Jane Moltoni, Project Manager
Wasterock Pty Ltd
P: (08) 6241 4100
E: janem@wasterock.com.au

Wasterock, working to make your community safer

Overview

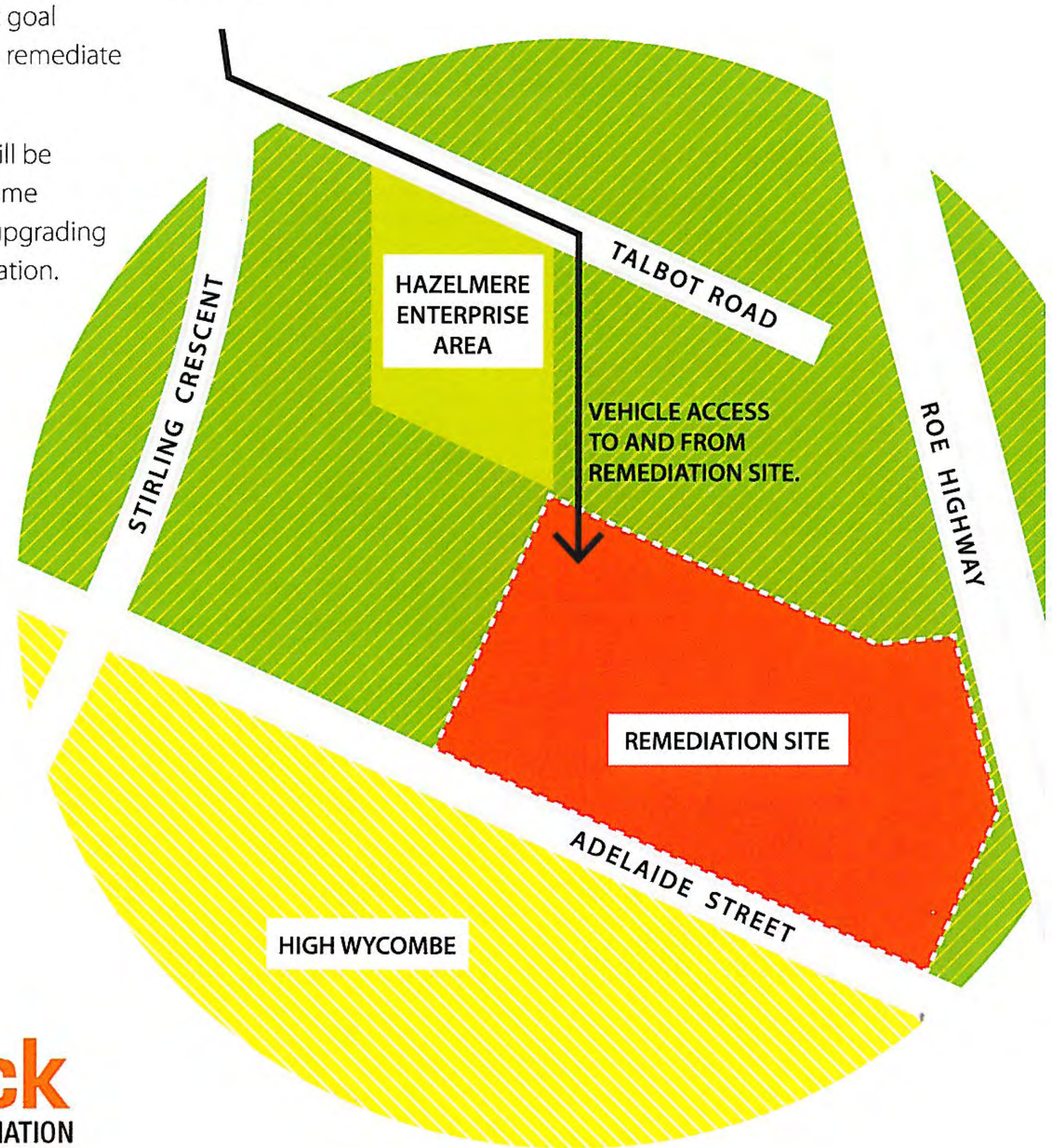
Lot 20 Adelaide St, Hazelmere, is a former inert landfill site. It was a dumping ground for construction waste materials and was classified by the Department of Environment Regulation as 'Contaminated...Remediation Required'.

Instead of just complying with the legislative requirement to remediate, the landowners want to **transform it from a contaminated site to an area that will be valued by the local community**. To achieve that goal Wasterock has been contracted to remediate and upgrade the site.

A total of 17.68 hectares of land will be remediated, taking unused and some potentially unsafe ex-landfill and upgrading it into an environmentally safe location.

This remediation will improve the amenity and value of the surrounding area by making the land fit for use rather than an unsafe wasteland.

Community safety is of paramount importance to Wasterock and we would not begin this remediation program if safety was compromised.



wasterock
RESOURCE RECOVERY & REMEDIATION

10th Oct 2013

Notes from Phil McElhinny

Adelaide Street House Visits

- Wasn't able to contact any of the businesses or property owners on the north side of Adelaide St except for Borrello's.
- Arthur McHugh informed me that there are a lot of shift workers and fly in fly out workers in street. A lot of houses have roller shutters down. Which may explain difficulty in contacting quite a few people as we have been out on 3 occasions
- Visited 34 homes in Adelaide St – 14 not home
- Visited 7 homes in Larwood Cr – 3 not home
- Visited 5 homes in Bowden Dr – 2 not home
- 90% of residents main concerns were
    - Truck Traffic on Ade St as there is already a problem for the waste facility at end of rd.
    - Asbestos Control and what else could be dug up that could be a major hazard. Especially with the easterly winds being so strong.
    - Dust and noise and general health hazards

No Weekend Work	Vibration concerns	No Go/Prefer Left	Ok if done safely	Def. no trucks on Ade St
4	2	12	8	2

- Businesses:
  There are approximately 4 businesses or properties on left hand side of Adelaide St. Borrello meats shouldn't be too hard to contact as they can probably be contacted by phone. The house on one property is owner I believe by country people. The rest have no contact details.

Name	**Address**	**Comments**
McDonald 0439 528 360	212 Ade St	Health concerns, Truck traffic, dust, noise & vibrations
	214 Ade St	Not Home (Left Card x 2)
	216 Ade St	Not Home (Left Card x 2)
Mr. Smith 0447 008 820	218 Ade St	Trucks, traffic accidents on corner, winds spreading contamination. Doesn't want it to go ahead, will object as he doesn't believe it can be done safely
	220 Ade St	Not Home (Left Card x 2)

Lisa Anderson 9454 7186	222 Ade St	Not happy about it going ahead. General safety, noise, truck traffic (older lady, not well)
Mr. Andrews (no number)	224 Ade St	Health concerns, contaminated waste being dropped along road and mainly truck traffic on Adelaide as it is already a problem
Mrs. Duncan 9454 5802	226 Ade St	Strongly objects to remediation. House values, asbestos (heard trucks to be washed only once per week and she has done some research). Truck traffic, should have consulted whole area not just street and will object again to shire.
Sam Bradburn 0458 851 018	228 Ade St	Mainly asbestos, ok if done correctly. Not happy about it being light industrial and doesn't want street used as truck access
	232 Ade St	Not Home (Left Card x 2)
Mr. McConnell 0451 161 988	234 Ade St	Trucks, asbestos, noise and dust
Wylie 0438 806 355	236 Ade St	Not Home (Left card husband will ring)
*Pauline Hockley	238 Ade St	Dust, Traffic *Can be convinced
	240 Ade St	Not Home (Left Card x 2)
Mr. & Mrs. Crawford 0400 351 433	242 Ade St	Doesn't want it to go ahead. Main concern asbestos, trucks
Mr. & Mrs. Jellicoe 0433 360 106	244 Ade St	Doesn't see how it can be done safely with the strong easterly winds, truck traffic, toxic waste, no weekend work
Stuart Dickson 0438 907 731	250 Ade St	Worried about kids' health, traffic, noise and dust. Concerned that it's done right, prefers left, totally against
Glenn & Molly McKellar 0487 385 445	252 Ade St	Prefers left as is. Concerned about noise and asbestos. Mother-in-law died recently from asbestosis (against)
*John Rebifz 0428 311 543	254 Ade St	All for it. Just control dust
Mr. Alison 0450 443 014	256 Ade St	No weekend work, as long as done safely no particular concerns
	258 Ade St	Not Home (Left Card x 2)

Mr. Baxter 0419 996 473	260 Ade St	Concerned about what is buried, asbestos especially with the easterly winds, dust, truck traffic, suggested constant monitoring needed and an independent authority monitoring the works at all times.
*Elizabeth Thompson 9454 6304	262 Ade St	Lived here 50 years. Concerned about dust, traffic and noise
Mr Laurie Wenn 9454 7409	264 Ade St	Totally against will fight it all the way. This is one of the residents that went to ABC News.
-	266 Ade St	No House or Number
Mr & Mrs Arpana 046705976	1/268 Ade St	Dust, noise, Truck Traffic
Mr & Mrs Gosstray 9454 9729	2/268 Ade St	Kids home no adults
*Adrian Holey 0410 476 315	3/268 Ade St	OK but should have a meeting
Clarke Keld-Carter	272 Ade St	Not too concerned if done right. Mainly traffic and trucks
Renter (wouldn't give name)	274 Ade St	Prefers it to stay as is, Truck traffic and noise concerns
Lauren Michelini 0407 803 663	276 Ade St	Prefers it to remain as is. Health and hazard concerns and truck issues.
Jan & Paul Kosovich 0459 128 970	278 Ade St	Lots of concerns, contamination spreading, asbestos control, vibration, trucks, noise, noise from generator to pump water. As they are shift workers no sat/weekend work. Also worried about contaminated ground water being used as a dust suppressor. And doesn't want to see the light industrial area from her house. Prefers no truck access on Ade St
	280 Ade St	Not Home (Left Card x 2)
	282 Ade St	Not Home (Left Card x 2)
Arthur McHugh 9454 6530 0427 546 530	Lot 13 Ade St	*This is the other resident that went to ABC. He is totally against it and will keep objecting. He doesn't believe it can & will be done safely. He knows everything that goes on in the area spoke to him for a good half hour.
	192 Ade St	Left Card

Borrello Group Vanessa Borrello 0407 904 608 9352 8599	Lot 3 Ade St	Dust and traffic concerns but can be convinced
	Lot 2 Cnr Stirling Cres & Ade St	Appears to be the nursery that backs on to Adelaide St – Left card
#There also appears to be a property between Borrello and the house at 192 but again can't be sure who owns this. No letter box.		
Mrs. Belle 0407 080 017	59 Bowden Rd	Dust, cracks in house, noise, health hazards, asbestos
Pryce 0422 716 516	58 Bowden Rd	Not concerned as long as done right
*Peter Daniels 9454 3154	57 Bowden Rd	
Mrs. Palmer 0430 431 965	56 Bowden Rd	Not too worried only just moved in, mainly concerned about what is in there
	55 Bowden Rd	Not Home (Left Card x 2)
Amy Sears	10 Larwood Cr	Dust from easterlies
Fullerton 9353 3955	15 Larwood Cr	Against. Concerned about asbestos, trucks, noise and dust. Written to council to object.
Mrs. Wigmore 0409 299 791	12 Larwood Cr	Not too concerned as long as it is done correctly
Mr. Dumbleton 0439 359 195	14 Larwood Cr	Really concerned about the easterly winds spreading contamination. Also truck traffic, dust, wind and asbestos issues. Prefers no weekend work.
*Fox 0450 608 260	5/16 Larwood Cr	No real concerns as long as done properly
	4/16 Larwood Cr	Not Home (Left Card x 2)
	6 Cnr of Nottingham	Not Home (Left Card x 2)

- <u>Negatives:</u>
    - Dust
    - Traffic
    - Material
    - Groundwater – clean

- <u>Positives:</u>
    - P.O.S – Proposed trees/garden/BBQ drawing
    - Land values up?? – get real estate agent (local) to give opinion of proposed re-development

McElhinney Consultancy Pty Ltd - Lot 20 Adelaide St Hazelmere Remediation Project - Resident Contact Doc.

McElhinney Consultancy Pty Ltd were engaged by Wasterock to consultant with the resident stakeholders adjacent to Lot 20 to ascertain their views in regards to the proposed remediation works. The residents were visited over a 3 week period in October 2013 and the following (authorised) quotes were provided.

John Rebifz

254 Adelaide St

0428311543

"All for the remediation/development as long as dust is controlled"

Clarke Keld-Carter

272 Adelaide St

"not concerned if it is done right"

Mr & Mrs Fox

5/16 Larwood

0450608260

"as long as it is done properly"

Adrian Holey

268/3 Adelaide St

0410476315

"Ok with the remediation but would like to discuss it further"

Mrs Price

58 Bowden St

0422716516

"no problem as long as it is done right"

SUMMARY

Whilst there were issues raised regarding the proposed remediation from the residents it was very clear there were many misconceptions about the project including but not limited to:

1. Type of waste

2. Groundwater quality

3. Traffic access through Adelaide St

Regards

Phillip McElhinney

Director

John & Leanne Bishop

From: "John & Leanne Bishop" <bishopjlant@westnet.com.au>
Date: Monday, 14 October 2013 1:00 PM
To: "Robert Moltoni" <RobertM@wasterock.com.au>
Subject: Landfill Site

To Whom It May Concern

As a landowner near the Adelaide St Landfill site I wish to offer my strong support to the overall cleanup of this site and it is a matter that should be done immediately,
so that it does not impact on development of the area while removing forever the hazards generally associated with the site.

The remediation of the old landfill is very important as it has become a hazard and is very dangerous to our living environment. It compromises the value of the land which effects us deeply.

I don't understand how a site like this was ever allowed especially being so close to residents.

I hope this can be cleaned up without any further delay and is given a high priority.

Yours sincerely

J R Bishop

John Bishop

Bluepark Nomines Pty Ltd
P O Box 2054
HIGH WYCOMBE WA 6057
Email: Vanessaborrello@borrellogroup.com.au
Ph: 08 9352 8599

11 October 2013

Mr C Zannino
City of Swan
P O Box 196
MIDLAND WA 6936

Dear Sir/Madam:

RE: Landfill Site, Lot 20 Adelaide Street, Hazelmere

I am writing with regard to the above, which boundaries my property, Lot 3 Adelaide Street, Hazelmere. I wish to offer my strong support for the remediation of the landfill site.

It at present poses a severe fire risk to our property, on which is situated a factory constructed of highly flammable sandwich panelling and an ammonia plant. There have been two serious fires in the past four years, both of which started on Lot 20, and both came to within meters of our buildings and plant.

In addition to the fire risk we are also experiencing problems with vermin that are breeding on the landfill site. We have had to implement an extensive pest control program at a substantial cost to us.

I believe that the remediation of the property would greatly benefit all within its surrounds, and that it is fortunate that the current owners have the resources to be able to convert a useless tract of land, that poses a threat to those within its immediate vicinity, to a valuable asset to the area.

Yours faithfully,

Vanessa Borrello

Appendix C – Hazelmere Site Remediation Works Agreement & Site Management Plan

LOT 20 ADELAIDE ST, HAZELEMERE
SITE REMEDIATION WORKS AGREEMENT AND
SITE MANAGEMENT PLAN

Prepared for:

Department of Environment Regulation

Document Reference:

6045.K.09_090812_SMP

Date:

March 2014

Document Control

Document title: Lot 20 Adelaide St, Hazelmere Site Remediation Works Agreement and Site Management Plan

Document reference: 6045.K.09_090812_SMP

Project name: Adelaide Street Remediation (**ASR**)

Project number: 6045

Project leader: Peter Moltoni

Client name: Hazelland Pty Ltd

Client contact: David Aylmore

Contractor Wasterock Pty Ltd

Revision	Revision Type	Issue Date	Prepared By		Approved By	
			Name	Signature	Name	Signature
0	Draft	12/08/2009	E. Barkman		R. Moltoni	
1	Draft	10/09/2012	P. Moltoni		P. Moltoni	
2	Draft	02/04/2013	P. Moltoni		P. Moltoni	
3	Final	17/03/2014	M. Waite		P. Moltoni	

TABLE OF CONTENTS

1 INTRODUCTION 4
1.1 BACKGROUND 4
1.2 SITE INFORMATION 4
1.3 ENVIRONMENTAL ISSUES 5
1.4 SCOPE OF WORKS 6
2 SITE MANAGEMENT PLAN 8
2.1 DOCUMENT CONTROL 8
2.2 RESPONSIBLE PARTIES 8
2.3 OBJECTIVES 8
2.4 ROLES AND RESPONSIBILITIES 9
2.4.1 Project Manager 9
2.4.2 Site Manager 9
2.5 SITE SPECIFIC TRAINING 10
2.5.1 Induction 10
2.5.2 Suitable Remediation & Waste Management Training for On-Site Contractors 10
2.5.3 First Aid 10
2.6 RELEVANT SITE CONTACT INFORMATION 11
3. SITE MANAGEMENT PLAN COMPONENTS 12
3.1 SOIL MANAGEMENT PLAN 12
3.2 MANAGEMENT OF REMEDIAL WORKS 13
3.3 SOIL TRACKING MANAGEMENT 13
3.3.1 On-site soil tracking management 13
3.4 SOIL HANDLING MANAGEMENT 16
3.4.1 On-site soil handling management 16
3.4.2 Off-site soil handling management 20
3.5 ASBESTOS MANAGEMENT 21
3.6 TRUCKING MOVEMENT MANAGEMENT 23
3.7 WATER CONTAMINATION MANAGEMENT 24
3.8 AIR QUALITY, DUST AND EMISSIONS MANAGEMENT 26
3.9 NOISE MANAGEMENT 28
3.10 RESOURCE RECOVERY AND GENERAL WASTE MANAGEMENT 29
3.11 CHEMICALS AND DANGEROUS GOODS MANAGEMENT 31
3.12 OCCUPATIONAL HEALTH AND SAFETY 32
3.13 INCIDENTS AND COMPLAINTS 34
4 SMP REVIEW 36
5 REFERENCES 37

1 INTRODUCTION

1.1 BACKGROUND

Lot 20 Adelaide St, Hazelmere (Site) (Appendix 1) had been operated as a licensed inert landfill from 1987 to 1997, after first being mined for sand down to the clay substrate. From time to time during the land-filling period, a number of non-inert wastes were dumped on site, with the knowledge of the regulating authorities (Parsons Brinckerhoff, 2006).

A number of studies which took place between 1992 and 2006 (Appendix 2) identified varying levels of contamination primarily caused by Total Petroleum Hydrocarbons (TPH's), Monocyclic Aromatic Hydrocarbons (MAH's), Asbestos and Heavy Metals. Based on these findings, the (then) Department of Environment and Conservation (DEC) issued a site classification of 'Possibly Contaminated – Investigation Required' on 27 April 2007 (VDM, 2008).

Current site owners Hazelland Pty. Ltd (Owner) subcontracted Wasterock Pty Ltd (WRK) to undertake the required remediation work in order to make the Site developable in the future. This document presents detailed information on the scope of the agreement reached between the Owner and WRK, in addition to a draft Environemntal Management Plan (EMP) highlighting the procedures which will be undertaken during the remediation works, including the basis and justifications of mitigation measures and corrective actions.

1.2 SITE INFORMATION

The Site fronts onto Adelaide Street, Hazelmere and comprises a single lot that is irregularly shaped. The Site measures approximately 565m in length and 300m in width with a total combined area of approximately 16.9 ha. The non-landfilled site surface appears to have a generally flat topography, that ranges between approximately 27m Australian Height Datum (AHD) in the southwest corner, sloping gently upwards to approximately 33m AHD in the south eastern corner. The original surface levels have been altered due to historic sand mining and landfill at the site (Parsons Brinkerhoff, 2006).

Table 1 below, provides a brief summary of the site identification information (Parsons Brinkerhoff, 2006).

Table 1: Summary of General Site Identification Information

Site Address	Lot 20 Adelaide St, Hazelmere WA
Site Name	Adelaide Street Remediation **ASR**
Site Owner	Hazelland Pty Ltd
Title Identification Details	Lot 20 on Diagram 76128, Vol. 2054 Fol. 299
Local Authority	City of Swan
Zoning	General Rural zone TPS No. 9, City of Swan

General land use around the site includes residential dwellings on semi-rural properties containing disused market gardens and horse trotting tracks to the north, medium density residential development and residential dwellings on semi-rural properties across the separating road to the south and an ice works and old residential dwellings on semi-rural properties to the immediate west. The site is bound by Roe Hwy and a small sand quarry on the east (Parsons Brinkerhoff, 2006).

There are no surface water bodies in close proximity to the site. According to the on-line Perth Groundwater Atlas (Department of Water, 2009) the average groundwater table is at 15m AHD and flowing from south-east to north-west.

1.3 ENVIRONMENTAL ISSUES

The Site has been used for sand mining (between 1978 and 1982), up to 4m below natural ground. This was followed by subsequent landfilling with inert building wastes to a level of up to 8 m above ground up to 1990. However, car bodies and drums including asbestos sheets, recycling sludge’s containing hydrocarbons and emulsion factory wastes, drums of kerosene, bitumen, pesticide contaminated soils and hospital wastes have also been reported (Parsons Brinkerhoff, 2006). A number of studies carried out between 1992 and 2006 (Appendix 2) identified varying levels of contamination, primarily caused by Total Petroleum Hydrocarbons (TPH’s), Monocyclic Aromatic Hydrocarbons (MAH’s), Asbestos and Heavy Metals.

It is estimated that the site contains some 1.1 million m^3 of wastes covered by soils (WSP, 2007). Some 0.7 million m^3 needs to be removed and/or processed during remediation works.

1.4 SCOPE OF WORKS

The scope of remediation works agreed by the Owner and WRK are provided below. The owner will appoint WRK as the site manager. WRK will:

- Excavate the uncontrolled fill and process it by;
    1. Removal of timber, brick, concrete and ferrous and non-ferrous metals for recycling.
    2. Removal of various contaminants including soils and hazardous wastes that might contain elements which could leach into the groundwater, or be harmful to the environment or the general public;
    3. Placement of stable non-leaching processed waste as engineered fill in a deep fill cell created over the entire Site. This will include asbestos fragments, as asbestos contaminates the entire Site;
    4. Management of any bulk asbestos pockets identified during the works (such as loads of old sheeting) as being specific areas of asbestos contaminated materials (ACM) requiring special attention. Such asbestos will be saturated with water and continue to be wet down during the mechanical loading process and taken directly to a cell on site and placed a minimum of 3 metres below Final Finished Level (FFL) - preferably in a public open space location or below designated future roadways. Compaction of the placed asbestos will be done using impact/dynamic compaction, *afte*r a cover of 1 metre of clean fill has been placed over the asbestos. The area is to be kept wet at all times during the works
    5. Recovering and crushing brick and concrete material for use in the barrier layer at 1.5 metres below finished surface, or for other site uses (roads and hardstand) to reduce the volume by up to 50 % and deliver FFL 's as close as practicable to surrounding land contours. Retaining walls of agreed and appropriate height will be constructed where necessary to accommodate future land use, but are not included in the rehabilitation works
    6. Recovering sand from the soil amendment and soil recycling processes, to be used for the capping layer of clean sand, which is placed over the deep fill and barrier layer to a depth of 1.5m.
- Be responsible for the day to day management of the site works
- Be responsible for the sourcing approvals to carry out the remediation works, including, but not limited to, the importation of clean fill to the site, including the establishment of a Category 62 – Solid Waste Depot, as a 'Resource Recovery Facility'.
- Ensure all waste recovery and processing activities are designed to meet the regulatory authority requirements for dust and noise control and State sustainability objectives

- Be responsible for completion of the remediation and bulk earthworks, including sand capping, to practical completion.
- Cover the Site with 1.5 m of clean fill on completion of the remediation works. Sourcing, cost and placement of the clean fill will be the sole responsibility of WRK;
- Issue to the owners a 'certificate of practical completion', on practical completion of the remediation and bulk earthworks and sand capping.
- Employ suitably qualified environmental and geotechnical consultants to monitor the works. The consultants will report on the ongoing status of the project and deliver a Final Report to certify the site as "remediated, fit for use".
- Be responsible for the delivery of the Final Report, within 6 months of the works achieving Practical Completion.

The Owner will:

- Appoint Greg Rowe and Associates as project coordinator for the remediation phase of the works;
- Appoint NEWCO as project manager for the development of the site;
- Provide The Manager with a master plan for the development of the site prior to the commencement of the Remedial bulk earthworks on site, such that The Manager can execute the earthworks to accommodate the needs of the future development of the site.
- Assist WRK as and where possible with all approvals.

All parties will share in the cost of the approvals and development on a pro-rata basis.

2 SITE MANAGEMENT PLAN

2.1 DOCUMENT CONTROL

This Site Management Plan (SMP) is subject to a document control procedure, to ensure that all SMP holders only have up-to-date document versions. This initial (draft) version of the document is designated as Revision 0. As the SMP is updated or supplemented, replacement pages will be inserted and the complete document will be designated as Revisions 1, 2, 3, etc. Old pages will be removed and stored. A record of the up-to-date version of the document will be maintained using the format below. The Site Manager is responsible for ensuring that the SMP is kept up-to-date and will sign the record to confirm, whenever replacement or new pages have been incorporated into the SMP.

Table 2: Document Control Format

Revision	Revision Type	Issue Date	Prepared By		Approved By	
			Name	Signature	Name	Signature
0	Draft	24/07/2009	E. Barkman			
1	Draft	10/09/2012	P. Moltoni			

2.2 RESPONSIBLE PARTIES

WRK is the responsible party for the implementation and management of the SMP.

2.3 OBJECTIVES

The objectives of the SMP are to:

- Provide evidence of practical and achievable plans for the management of the Site to ensure compliance with environmental requirements;
- Set out control measures and contingency arrangements required to minimise adverse environmental and human health effects from the remediation operation, both on and off the site;
- Outline the responsibilities of the various parties and procedures to be followed in preparing the site for future use;

- Provide WRK with a framework which will confirm compliance with relevant policies and requirements; and
- Provide the community with evidence that the project is being managed in an environmentally acceptable manner.

The SMP will be reviewed and periodically updated, if necessary, to reflect knowledge gained during the course of operations. Changes to the SMP will be implemented in consultation with the relevant authorities where necessary.

2.4 ROLES AND RESPONSIBILITIES

2.4.1 Project Manager

The WRK Project Manager has overall responsibility for the management of environmental issues at the Site, ensuring the SMP is implemented and maintained and conducting periodic reviews of site personnel.

2.4.2 Site Manager

WRK, as the Site Manager is responsible for the remediation activities at the Site, will be responsible for the implementation of the SMP for all aspects of this work.

The Site Manager will ensure that:

- The SMP is maintained within the framework of the document control procedure;
- The SMP is current and accurate, by conducting risk assessments for new environmental hazards and developing appropriate environmental actions when new issues arise;
- The management measures identified in the SMP are carried out;
- Inspection and monitoring requirements and environmental incident and complaints handling procedures are implemented;
- All construction site workers and external contractors are made aware of the SMP and adhere to its requirements;
- Periodic audits are carried out to ensure that the SMP is being implemented at the site;
- The SMP is periodically reviewed by the project coordinator and the site manager and updated to reflect changes in operations at the site; and
- All documentation associated with the SMP is maintained and all inspection and monitoring records are available for review, as and when required.

2.5 SITE SPECIFIC TRAINING

2.5.1 Induction

The contents of this SMP will be addressed as part of a site induction, so that site employees and contractors are aware and informed of the site issues and the management procedures associated with them. A site-specific induction regime will be implemented and maintained by the Site manager.

2.5.2 Suitable Remediation & Waste Management Training for On-Site Contractors

It will be the responsibility of the Site Manager to ensure that all site employees and contractors are aware of the SMP, its contents and impact on their work methods, before work is commenced. The most appropriate method of achieving this will be determined, depending on the eventual site activities and staff structure. However, induction training, prior to commencement of site works, will ensure that the requirements specified in the SMP are known and further training sessions will be conducted if changes have been made. Any revised procedure updates will be incorporated into the Site Management Plan..

The exact training content and schedule will be developed as the need arises. The training will, however, include the following as a minimum:

- The role of the SMP in managing human and environmental impacts;
- Health and Safety requirements for all onsite personnel and anyone entering the site.
- Roles and responsibilities of all site personnel as they relate to the environment;
- Personal responsibilities for environmental management; and
- Emergency procedures, including the use of a chemical spill control/clean-up kits (if fuel is kept on-site).

2.5.3 First Aid

WRK will provide a comprehensive First Aid kit, which will be kept on Site. It is expected that at least one of the field personnel on site for the work will be qualified to perform emergency first aid.

2.6 RELEVANT SITE CONTACT INFORMATION

Table 3 below contains the relevant site contact information.

Table 3: Relevant Site Contact Information

Title	Contact Name	Contact Number
Project Manager	TBA	TBA
Site Manager	TBA	TBA
Environmental Consultants	TBA	TBA
Auditor	TBA	TBA
Emergency Services	N/A	000
DEC – Information	N/A	6467 5000
DEC – Emergency Pollution Response	N/A	1300 784 782
City of Swan	N/A	9267 9000
Work Safe	N/A	1300 30 78 77
Royal Perth Hospital	N/A	9224 2244
Fire Services North Metro Region	N/A	9374 2700
Midland Police Station	TBA	9250 0333

3. SITE MANAGEMENT PLAN COMPONENTS

Each of the key matters identified by WRK has been addressed in the following sections of the SMP:

- Section 3.3 Soil tracking management.
- Section 3.3.1 On-site soil tracking management
- Section 3.3.2 Off-site soil tracking management
- Section 3.3.3 Excavation management
- Section 3.4 Soil handling management.
- Section 3.4.1 On-site soil handling management
- Section 3.4.2 Off-site soil handling management
- Section 3.5 Asbestos management.
- Section 3.6 Trucking movement management
- Section 3.7 Water contamination management
- Section 3.8 Air quality, dust and emissions management
- Section 3.9 Noise management
- Section 3.10 General waste management
- Section 3.11 Chemicals and dangerous goods management
- Section 3.12 Occupational health and safety
- Section 3.13 Incidents and complaints management

Each of the above sections deals with the following issues in relation to the respective matter:

- Environmental objectives;
- Targets;
- Actions required;
- Review and monitoring; and
- Corrective actions.

The relevant forms are located within Appendix 1.

3.1 SOIL MANAGEMENT PLAN

In order to manage the environmental and social issues specifically applicable to the relocation of contaminated material across the site, a Soil Management Plan has been prepared and is covered within Sections 3.3-3.5. The purpose of this Soil Management Plan is to detail how imported, excavated clean and excavated contaminated soil will be relocated and the environmental protocols for managing temporary stockpiles of such materials before they are relocated.

3.2 MANAGEMENT OF REMEDIAL WORKS

Specific procedures have been prepared which will be followed by the Project Manager and the Site Manager to ensure all site works are undertaken in a safe and effective manner and in accordance with the environmental approvals given. These are outlined below:

- A Soil Tracking Form (STF) will ensure all the imported and excavated material is accounted for and relocated to its appropriate location as designated in the site classification plan, as well as the sampling program employed for each type of material and the allocated material ID;
- Internal Waste Handling procedures for management of the excavation, stockpiling, spreading, sampling and covering of the imported and excavated materials;
- Off-site Waste Disposal procedures for the transportation and disposal of waste material off-site;
- Importation of clean fill where required due to a shortage of clean fill materials on site to ensure only suitable material is used as fill and cover; and
- Environmental Incident Report forms to keep record of environmental incidents and resulting remediation plans determined by the Project Manager after such an event occurs.

Each procedure will address the objectives and provide actions to achieve the objectives, targets, monitoring programs and potential corrective actions to remediate the issue specified should a problem arise.

Specific management of visible asbestos waste is described separately in the asbestos waste management section of the SMP.

3.3 SOIL TRACKING MANAGEMENT

3.3.1 On-site soil tracking management

Objective: To facilitate the remediation of the Site, all material being brought into the Site or moved around the Site will be monitored. Any excavated, potentially contaminated soil will be relocated to a designated stockpile area, unless the material has previously been validated, whereby it will be relocated to a designated deposition area, as determined by the Site Classification Plan. The site classification plan depicting such relocation positions will be maintained by the Project Manager prior to commencement of site works and will be monitored by the Site Auditor.

Target: To account for the relocation or movement of all material either being brought into or moved around the site, clean or remediated ground will not inadvertently be covered by contaminated material as part of the relocation exercises. Such areas (clean and contaminated) will be designated within the Site Classification Plan prior to commencement of site works to prevent this from occurring.

Actions: The STF (soil tracking form) will be used to manage and monitor the movement and placement of all material being brought into or moved on site. The STF will:

- Record and document the internal transfer of each soil load denoting approximate volumes being moved and notations of the origin and destination.
- Monitor movement of materials being brought into the site. Record of each soil load denoting approximate volumes being moved and notations of the destination will be noted. They will be placed:
  - In a sorting area if the load is mixed or requires treatment;
  - In a holding area if treatment or validation sampling is needed before movement,
  - To the appropriate area as designated by the Site Classification Plan if validated prior to delivery to site and noted as clean by visual assessment on arrival.

  If double handling is required both the initial and final locations will be noted.
- Provide a record of accidental placement of contaminated material on natural or remediated ground. This includes soil movement as well as chemical or waste spills on-site. The corrective action undertaken (as described below) is to be reported in an Environmental Incident Report form.

The following actions will be used to effectively manage the movement of material across and into the site:

- The Site will be classified using a grid format system. The grids will be given relative numbers with the numbers relating to origin and destination of the material being stated on the STF when soil is excavated or moved or brought onto site.
- There will be an initial site induction for all personnel involved with the movement and relocation of the waste. They will be informed of the

site/location of waste and transport routes to be used, as well as the grid system and how this applies to different types of material.

- The boundary of the old landfill (as mapped out in the site classification plan) will be identified at regular 10m intervals by survey pegs, this will ensure clean and remediated ground is not inadvertently covered with waste by nominating specific areas as 'yet to be processed' areas.

Each incoming load is to be checked by the Site Manager or his representative to classify material prior to deposition of material at the site. Note: This process is discussed in the Environmental Site Management Plan.

Specific unloading instructions are described below:

- Once the material has been classified as 'clean fill' material or needing further processing, it will be moved to the appropriate area, as designated by the Site Classification Plan. 'Origin', 'destination', 'classification' and' amount of material being imported' should be noted on the STF.
- Trucks are to use an internal track which is to be wide enough to allow the safe passing of vehicles, the track is to be clearly defined with signage where required and be kept damp to prevent nuisance dust.
- A speed limit of 30 Km/h will apply to all traffic on tracks and 10 Km/h for machinery operating off-track.

Monitoring and Reporting:

Monitoring and reporting will include:

- All STF's are to be summarised at the completion of the remediation phase for inclusion into the Remediation and Validation Report.
- Any accidental placement of waste fill on natural and remediated ground will be noted on the STF. The corrective action undertaken will be detailed and reported in an Environmental Incident Report form.
- Routine random checks of the STF's will be undertaken by the Project Manager to ensure all details are being completed and that material is being relocated to the appropriate areas as stated on the STF.

Corrective Action:

Where material has been accidentally placed on natural ground or ground that has been previously been validated as not requiring further remediation, the Site Manager will be required to remove the material as described in Section 3.4.1.

Any subsequent movement of the soil should be noted on the STF and an Environmental Incident Report form completed, to ensure location of the contaminated soil is known and remediation can be completed.

3.4 SOIL HANDLING MANAGEMENT

3.4.1 On-site soil handling management

Objective: To ensure that the handling of all soil materials on-site is undertaken in a safe and environmentally responsible manner.

Actions: The following actions are to be used to ensure that all soil materials are being handled in a safe and environmentally responsible manner:

- Training of relevant personnel and implementation of safe work practices for minimizing the risk of spillage and cross-contamination when soil is being moved around the site.
- Induction of employees, suppliers and contractors in their environmental protection responsibilities.
- All workers will undergo a site induction, which informs them of the dangers of asbestos, how to recognise asbestos products and the procedures to follow should asbestos be uncovered.
- Remediation of newly or previously contaminated land will be undertaken using the most appropriate method available, as designated by the Project Manager, to achieve required commercial/industrial guideline validation results.
- All old landfill material will be considered as being potentially asbestos impacted, and will be handled according to the asbestos management procedure described in Section 3.5.

The following actions are to be used for managing the excavation, processing and transfer onto and around the Site, stockpiling and sampling of excavated material. Soils being brought into the site shall be processed in designated areas according to the approved SAMP procedures.

- Excavations (should be numbered and movement of material should be noted on the STF)
  - All material being excavated will be initially assessed for contamination using visual and olfactory methods. The material will

be relocated to areas specified on the site classification map based on this initial assessment. The base is to be sampled for validation purposes and will remain open with appropriate fencing where required until it is validated by the laboratory as suitable to receive backfill. A visual/photographic log will be maintained. Each excavation, and the resulting stockpiled material, will be given a specific label as well as the grid notation to further facilitate the soil tracking process.

    - Once the excavation area has been validated, as stated above, it will be filled with engineered fill produced from the processing of the old landfill materials, then capped. The STF will be used to monitor relocation of such materials.
    - Information related to sampling of the excavation areas, excavated materials and clean fill materials brought onto site will be noted on the STF. The Project Manager or his representative will conduct the sampling of such materials.
    - Processed landfill material will be transferred to the relocation area as designated by the Site Classification Plan (including any stockpiling) or, if unsuitable, removed to a designated landfill.
- Stockpiles
    - The Project Manager or his representative will identify stockpile locations for imported clean fill material (if needed) prior to commencement of works in the Site Classification Plan. Stockpile locations will be identified by signage as to the status (type of fill) so that relocation to appropriate positions as specified in the Site Classification Plan is easy to implement.
    - The Project Manager or his representative will identify stockpile locations for suspected contaminated material prior to commencement of works in the Site Classification Plan. Stockpile locations will be identified by signage as to the status (i.e. for on-site or off-site disposal) as well as the grid id associated with the origin of the material.
    - Material that is odorous or aesthetically unappealing will be stockpiled in designated areas as depicted in the Site Classification Plan so that classification can be performed and remediation or disposal plan determined by the Project Manager. Remediation of

such material on site will be in accordance the agreed SAMP procedures.
    - Runoff from the stockpiled material is to be managed in accordance with the Water Contamination Management Plan described below.
    - Dust suppression techniques are to be used on the temporary and long-term stockpiles in accordance with the Air Quality Management Plan.
- Spreading
    - All old landfill processed materials, classified as suitable to use as engineered fill material or being remediated in a designated area are to be spread in a damp condition to reduce the potential for dust generation as per the requirements of the Air Quality Management Plan.
    - Clean fill material that is being used as capping will be spread evenly over the engineered fill, covering it completely to a depth of 1.5 metres
    - Machinery operating in the excavation exclusion zone will be thoroughly cleaned with a high pressure hose at a dedicated wash-down area prior to leaving the zone.
- Sampling
    - All excavated or imported material that is being moved around the site is required to be sampled for classification purposes. All excavations are required to be validated by sampling of the base before they can be back filled.
    - The STF will be used to record the information related to sampling of the excavated materials and clean fill materials brought onto site. Sampling will be the responsibility of the Project Manager or his representative, and will include a laboratory analysis suite of date, time, sample id and requested turn around times for the receipt of results. Sampling incidence will be determined according to the amount of material and required frequency, as stated in the (then) DEC guidelines.
    - All sampling is to be performed by a suitably trained employee as designated by the Project Manager. Appropriate sampling procedures will be employed with attention to appropriate PPE from potentially contaminated material.
- Cover

    - If excavated material is particularly odorous it will be stockpiled in areas designated for bioremediation or disposed of as depicted in the Site Classification Plan. Following sampling and after laboratory results are received, the material will be processed or sent for disposal as deemed necessary by the environmental consultant. Once the results are received, the Project Manager will decide whether it can be re-used or remediated on site, or whether it requires off-site disposal.
    - If awaiting laboratory results for material that is particularly odorous, the excavation from whence the material originated will also be sampled and covered with a minimum 300 mm layer of non-odorous landfill material to prevent further exposure to the unknown contaminants, until validation of the area has been confirmed.
- Unsuitable /uncertified soil placed on validated clean ground
    - Where such material has been accidentally placed on natural ground or ground that has been previously been validated as not requiring further remediation, the Project Manager will be required to remove the material, including the underlying 0.1m of ground beneath the fill. The Project Manager or his representative will collect samples from the natural ground beneath the misplaced soil and test for contamination to ensure levels are below the environmental guidelines. Sampling frequency is to be performed in accordance with the landfill guidelines.
    - Once this material has been excavated, it should be transported to its original intended location, with any new material removed with it. Both intermediate and final locations will be noted on the STF.

<u>Monitoring and Reporting</u>:

Monitoring and reporting will include:

- Any accidents involving the spillage of contaminated material from trucks or the accidental placement of unsuitable/ uncertified soil on natural or clean ground. The corrective action undertaken for each situation will be reported in an Environmental Incident Report form.
- Earthmoving and traffic accidents will be reported verbally and in writing directly to the Site Manager, immediately following the incident.

- Routine random checks on the waste handling practices will be undertaken by the Project Manager to ensure implementation and conformance to these procedures is being completed.

Corrective Action:

Minor traffic accidents are to be assessed and changes made to controls if applicable. Major accidents causing injury or death are to be reported to both 'Worksafe' and the Police.

3.4.2 Off-site soil handling management

Objective: To ensure that the transportation and handling of all soil materials off-site is undertaken in a safe and environmentally responsible manner.

Actions: The following actions are to be used for managing the off-site disposal of any material.

- Record and document the location of material that is deemed as requiring disposal off-Site. Such material will be stockpiled in designated areas as depicted in the site classification plan so that classification can be performed and remediation or disposal plan determined. If classified as needing disposal transportation will be arranged.
- Stockpiles of material designated for off-site disposal, as determined by the Project Manager or his representative, will be classified in accordance with Landfill Waste Classifications and Waste Definitions 1996 (As Amended) (Department of Environment, 2005)
- Material being loaded into trucks for off-site disposal will be verified and confirmed by the Project Manager or his representative as the material specified on the disposal forms, prior to removal from Site.
- All contaminated material is to be removed from Site in a damp condition to reduce the potential for dust generation and adverse air quality, as per the requirements of the Air Quality Management Plan detailed below.
- All truck loads are to be within legal weight limits when removed from site. Trucks are to be road worthy and operated in accordance with transport regulations.
- Roadways are to be kept clean and clear of soil and debris
- The Site Manager will continuously monitor the road condition at the entrance/exit to the work site and sweep/wash as deemed necessary.

Monitoring and Reporting:

Monitoring and reporting will include:

- With accidents involving the spillage of material from trucks, the corrective action undertaken will be reported in an Environmental Incident Report form.
- Traffic accidents are to be reported to the Police as well as verbally and in writing to the Site Manager immediately following the accident.
- Routine random checks of truck loading and security of material will be performed by the Site Manager to ensure conformance with procedures designated above. Such events will be noted in the site monitoring log book.

Corrective Action:

Contaminated Material that has been spilt off-site is to be cordoned off. A spill response team will be used to recover material immediately. Relevant authorities to be notified as soon as possible

3.5 ASBESTOS MANAGEMENT

Objective: To manage **all** **materials on-Site** as potentially containing asbestos or impacted with asbestos, as well as to prevent any incidents of unsafe contact with asbestos during work activities occurring on Site.

Target: Containment of asbestos materials and zero unsafe contact with potential asbestos containing / contaminated material by workers at the Site and residents beyond the Site.

Actions: Strategies for the prevention of asbestos contact and the containment of asbestos material will include:

- An assumption that the entire landfill rehabilitation area is potentially impacted with asbestos.
- All asbestos and asbestos-impacted soils are to be placed on-Site as deep fill to limit exposure opportunities and eliminate risks associated with offsite disposal

- Daily checking of excavation areas by the Project Manager to confirm the presence / absence of asbestos, so as to ensure adequate asbestos controls are being initiated.
- All workers will undergo a site induction, which informs them of the dangers of asbestos, how to recognise asbestos products and the procedures to follow should asbestos be uncovered.
- Asbestos fibre monitoring will be conducted in the Site vicinity, in accordance with the approved dust monitoring procedures established for the Site works
- Prevent dust emissions by constant wetting of the work area.
- Where asbestos is visibly encountered during remedial activities, the asbestos will be wet down, with dust-free excavation and handling and placement as deep fill on Site.

The following actions are to be undertaken to prevent the release of asbestos fibres:

- Soil will be wet with large volumes of low-pressure water and/or a suitable wetting agent for dust suppression. Any exposed asbestos will be covered with a suitable crushed rock barrier after placement in the deep fill area.
- The work area being excavated (recovery), will be cordoned off and declared as an exclusion zone at all times. A physical boundary surrounding the work area will be constructed with physical barriers and coloured warning tape defining the restricted entry status of the work area. The barriers will be at least 10m away from the location of any other active excavations, with warning signs placed at the boundary of the exclusion zone.
- Only personnel with the appropriate PPE and training will be allowed to work inside the exclusion zone. Any bulk asbestos sheeting encountered will be disposed on-Site in a nominated asbestos cell in accordance with the relevant guidelines. Asbestos fragments will be managed with the recycled materials as deep fill
- A decontamination facility is to be provided for personnel that may come into contact with asbestos contaminated material to provide wash-down and ensure safe removal of their PPE.

<u>Monitoring and Reporting</u>:

Monitoring and reporting will include:

- The presence of asbestos fibres will be monitored during all earthwork activities on site. Additional monitoring at the boundary of specified asbestos exclusion zones will be performed to ensure personnel working outside of the asbestos exclusion zone are not being exposed to levels in excess of the capacity of their PPE.

- All site personnel must inform the Project Manager immediately if works are not being undertaken according to the management plan and may have a likelihood of leading to an asbestos exposure incident at the site. The Project Manager will maintain records of any contamination incidents or discovery of any other contaminants, as well as the containment and remediation procedures employed.

Corrective Action:

The following is to be classified as an incident or failure to comply in relation to_asbestos contamination management:

- Failure to report a departure from the management plan which could lead to a potential asbestos exposure.
- Incorrect use of PPE in areas designated as asbestos exclusion zones.
- Other breaches of the management plan as detailed above.

3.6 TRUCKING MOVEMENT MANAGEMENT

Objective: To manage trucking movements during Site works and to minimise their impacts on the environment and possible sensitive receptors.

Target: No local complaints, no environmental damage and zero road accidents.

Actions: It is anticipated that up to 50 two-way truck movements could be expected each day of operation, with rigid and semi-trailer vehicles.

- Truck access to the site will be limited to the approved entrance at the commencement of site works with further entrances added in the future if site access in other areas is required. The speed of vehicles will be limited to 30 Km/h on Site tracks.
- Users of the Site will be notified in writing of these requirements. Any offending groups or individuals, after reasonable warning, will be banned from further use of the facility on a three strike warning basis. Warning signs alerting motorists that trucks are entering the road system will be erected at the adjoining road intersections.
- In accordance with Australian Safety Standards, all reversing vehicles are required to be fitted with audible warning signals.

- The hours of operation of the site will be 7.00 am to 5.30 pm Monday to Friday and 8.00 am to 4.00 pm Saturdays. Maintenance and cleaning of equipment is carried out between the hours of 7.00 am to 5.30 pm on Saturdays. The Site will not be open on Sundays and public holidays.

Monitoring and Reporting:

Monitoring and reporting will include:

- WRK will conduct regular internal auditing (weekly) of the site's trucking operations.
- The OHS Representative will report to the Project Manager on a weekly basis on any trucking movements that need to be addressed. External complaints will be dealt with *immediately* on a case by case basis.

3.7 WATER CONTAMINATION MANAGEMENT

Objective: The objective of water contamination management is to monitor water (ground and storm) quality to ensure that Site works are not impacting the environment through these receptors.

Target: To prevent the direct or indirect release of contaminated materials into the water receptors surrounding and included in the Site. The elimination or containment of any potential contamination sources created by the activities occurring on the site.

Actions: Actions relating specifically to water contamination management are:

- An earth bund will be constructed to the perimeter of the site to
  - prevent site storm water and litter from leaving the site
  - limit visual impact of the works on the adjoining properties
  - reduce noise and dust impacts on the adjacent community
- A groundwater monitoring program will be implemented to assess the groundwater quality prior to, during and post Site works. The monitoring will also be undertaken on a bi-annual basis following commencement of site works.
- Training of relevant personnel and implementation of safe work practices to minimize the risk of fuel, oil and hazardous goods spillage.
- Training of relevant personnel to include spill management and clean up procedures.

- Induction of employees, suppliers and contractors in their environmental protection responsibilities.

Should unacceptable groundwater quality be detected the following actions will be undertaken:

- Re-sampling of the particular well/wells identified as unacceptable to confirm initial result.
- Re-sampling of the well in 3 months time to confirm initial rounds of sampling.

Actions relating specifically to stormwater contamination management are:

- All stormwater will be retained on Site
- In order to ensure that the stormwater collection and treatment systems are achieving their objectives, an earth bund will be constructed to the perimeter of the site to contain all storm water within the site boundaries

Actions relating to all forms of water contamination management are:

- Provide bunded storage areas for fuels and dangerous goods required for construction equipment with spill cleanup kits in accordance with the requirements of AS 1940:1993 and AS 3780:1994.
- Implement controls to ensure all transfer of fuels and chemicals is managed to prevent spillage. Should a spill occur, it will be contained within the bunded areas.
- Diversion bunds or sediment traps will be installed downstream of all work areas draining to temporary storm water sumps on site
- Areas requiring such actions will be designated within the Site Classification Plan. Areas containing water receptors will be appropriately managed by depicting them within the site classification plan as "sensitive", restricting environmental harmful activities from occurring within the direct vicinity and constructing appropriate treatment systems around them.

<u>Corrective Action</u>:

The following is to be classified as an incident or failure to comply in relation to water contamination management:

- Any breach in the integrity of ponds, bunds or drains, including discharge of contaminated runoff; spilled fuel or wastes enter the stormwater drainage system, sedimentation ponds demonstrating significantly reduced available volume, insufficient general housekeeping to prevent general rubbish and contaminants entering the stormwater runoff from the site.

- Elevated contaminant levels identified above the adopted site assessment guidelines, separate from contamination levels identified prior to site works, that result from an incident related to demolition and construction works.

Such incidences should be remediated according to the following:

- Repair stormwater controls (e.g. ponds, bunds and drains). Contain and remediate or dispose of contaminated material/contaminants. Treat or dispose of contaminated stormwater. Clean out the sedimentation ponds. Undertake additional general housekeeping to minimise rubbish and contaminants entering the stormwater.
- If the elevated contaminant concentrations have been deemed as a direct result of works occurring on site, an appropriate remediation plan will be developed and implemented by the Project Manager.

Monitoring and Reporting:

Monitoring and reporting will include:

- The Project Manager will monitor water contamination levels continually until the completion of the site works. he will also monitor the proper prevention of contamination procedures related to water sources, thereby ensuring that environmental harm to water receptors is prevented.
- The results of each monitoring event are to be reported within three months of completion, with a full comprehensive report prepared after the competition of Site works.
- Any spills or suspected contamination near water receptors should be reported to the Project Manager immediately.

3.8 AIR QUALITY, DUST AND EMISSIONS MANAGEMENT

Objective: To minimise the release of dust and emissions to air from areas where Site works are occurring.

Target: In accordance with the draft - *Guideline for the Development and Implementation of a Dust Management Program* (Dec, 2008), dust management at the site will address dust from operations areas, access roads, stockpiles, cleared areas and the overall Site in accord with the approved Dust Management Plan.

Actions: Actions to be undertaken to control air quality during site works include the following:

- Reschedule earthworks to periods of low wind and/or employ other dust suppression techniques if visible dust is blowing off the site.
- Regular watering or other treatment of haul roads and exposed construction areas, subject to vehicle and machinery movements.
- Ensure that vehicles and equipment are appropriately maintained to minimise air emissions. All machinery operating at the site will have exhaust systems that comply with the appropriate Australian Standard(s).
- All machines operating on the site will have appropriate filtration systems for the air-conditioning system to meet asbestos filtration requirements
- Vehicle speeds in remediation areas will be limited to a maximum of 30 km/h.
- No open burning of wastes to be undertaken.
- Topsoil stockpiles will be stabilised with an appropriate surface cover. Other exposed surfaces and stockpiles will also be watered or sprayed as required.
- Water sprays will be used (as required) across work zones and unsealed areas to suppress dust. The water will be applied to ground surfaces whenever the surface has the potential to generate excessive levels of dust.
- Exposed areas will be minimised through progressive rehabilitation as soon as practicable.
- Major traffic routes into and around the site will be paved with either bitumen or crushed concrete to minimise dust and noise.

Monitoring and Reporting:

Monitoring and reporting will include:

- Visual inspections will be undertaken by the Site Manager to check for evidence of excessive dust generation.
- The Project Manager will prepare reports of dust and air emissions produced by construction activities.

Corrective Actions:

The following would constitute an incident or failure to comply in regards to air quality management:

- Proposed dust mitigation strategies not being implemented resulting in an observation of excessive dust levels generated on site
- Emission concentrations exceeding guideline levels.

- Receipt of a justifiable complaint about emissions or dust from site personnel or surrounding residents.

Should an incident or failure to comply occur, the Project Manager will:

- Identify the causes of the excessive air or dust emissions and implement the necessary procedures to control/reduce the emissions to an acceptable level as designated by the guidelines and, in the event that the complaint was from an external source, liaise with the source of the complaint to ensure good public relations

3.9 NOISE MANAGEMENT

Objective: To minimise the generation of noise emissions during the site works and to prevent any potential noise impacts that would result from exposure to noise emissions.

Target: Noise levels from site activities do not exceed 60 dB(A) at offsite locations. No personnel injuries to Site personnel relating to exposure to high levels of noise emissions from Site activities all generally in accord with the site Noise Management Plan.

Action: The following strategies will be implemented to aid in noise management throughout site works:

- Where possible, every effort will be made to minimize nuisance noise by restricting site activities to the following working hours: Monday to Friday between 07:00 and 17:30 hours, Saturday between 8:00 and 16:00. The site will not operate on Sundays or public holidays.
- Machinery will be maintained and operated in a manner that limits noise emissions. The Project Manager, will arrange to use properly maintained low noise emitting equipment to prevent noise emissions while completing site works. As well, turning equipment off when not in use and lowering throttle settings where possible will also help in reducing the amount of noise produced on site.
- Wherever possible the construction laydown area and designated site entrances will be located away from noise sensitive locations, such as residential areas. In general, the instance and duration of noisy works will be

minimized and the layout will be arranged to limit the need for truck reversing on site.

- An area away from residential dwellings will be nominated for offsite truck parking when vehicles arrive before site opening hours and thereby limit the exposure of nearby residents to noise outside the normal works hours.

Monitoring and Reporting:

Monitoring and reporting will include:

- Should justifiable noise complaints be received, sample testing will be carried out. If there is evidence of a need for ongoing monitoring, an appropriately designed monitoring program will be implemented by the Project Manager.

Corrective Actions:

The following represents an incident or failure to comply:

- Noise complaint received;
- Excessive noise levels at the site boundary; or
- Non-compliance with the above control actions.

Should a failure to comply occur, the following steps will be taken:

- Site activities will be investigated to determine the cause of the problem;
- Control measures will be reviewed to prevent recurrences and, where necessary, additional control and mitigation measures will be investigated and installed; or
- A permanent noise monitoring program will be considered if continual complaints are occurring.

3.10 RESOURCE RECOVERY AND GENERAL WASTE MANAGEMENT

Objective: Efficient use of resources and minimization of wastes requiring off-site disposal.

Target: Achieving cost effective and environmentally sustainable waste management by:

- Maximising resource recovery and re-use from old landfill waste and incoming recyclables;
- Maximising recycling, particularly of concrete brick and sand;
- Minimising waste generation and offsite disposal; and
- Safe management and disposal of all unsuitable and non-recyclables.

Actions:

The following resource recovery initiatives will be implemented:

- Identify and implement appropriate waste reduction strategies.
- Ensure appropriate re-use, storing, recycling and/or disposal of the following materials:
    - Concrete, Brick, sand, ferrous and non ferrous metals
    - Waste oil will be collected for transport and disposal off-site;
    - Batteries will be collected and transported off-site for disposal; and
    - Tyres will be stockpiled for regular disposal to a suitable facility.
- Identify and categorize all wastes produced across the site and designate specific storage areas, for each category of recovered resource or waste produced. Ensure appropriate maintenance of these designated areas to prevent unnecessary environmental harm due to exposure to potentially hazardous substances.
- Perform risk assessments on all storage, transport and disposal of all waste produced.

Monitoring and Reporting:

Monitoring and reporting will include:

- The following resource recovery initiatives will be measured and reported:
    - Resource recovery and re-use from old landfill wastes.
    - On-site soil amendment / remediation of various waste streams.
    - Waste disposal, including the off-site facilities receiving Site generated wastes.
    - Resource recovery from incoming industrial waste.
- During site works the Site Manager will report at quarterly intervals to the Project Manager on the results of the resource recovery monitoring program and other relevant waste management issues.

Corrective Actions:

The following constitute incidences or failures to comply in relation to waste management policies:

- Excessive volumes of waste being sent for offsite disposal.
- Wastes being disposed of rather than reused or recycled where possible.
- Other non-compliances with the waste management plan.

Should an incident or failure to comply occur, the Project Manager will:

- Take the necessary actions to identify the causes of non-conformance with the Resource Recovery Plan performance requirements and rectify the problem.
- Implement all actions necessary to ensure compliance.

3.11 CHEMICALS AND DANGEROUS GOODS MANAGEMENT

Objectives: To safely manage, purchase, store, handle and dispose of fuels and chemicals used on site and to prevent the uncontrolled release of chemicals into the environment.

Targets: Compliance with relevant Australian Standards (e.g. for the storage and handling of flammable and combustible liquids and dangerous goods) including:

- AS 4452 The Storage and Handling of Toxic Substances;
- AS 1940 The Storage and Handling of Flammable and Combustible Liquids; and
- AS 3740 The Storage and Handling of Corrosive Substances.

No spills of chemicals or release of chemicals to the environment.

Actions: The following actions will be implemented for chemical and dangerous goods management:

- Material Safety Data Sheets (MSDSs) of all chemicals used on site will be kept in an on-Site register by the Project Manager as well as records of the existing inventory, storage location, personnel training and disposal of waste instructions for all chemical and dangerous goods used on-site.
- The Project Manager will have procedures in place regarding emergencies relating to chemicals and dangerous goods consistent with WRK's Safety Management System and will implement controls to ensure all transfers of fuels and chemicals are managed to prevent spillage and, should any spill occur, that it is contained within a bunded area.
- All relevant construction and Site workers will be trained in appropriate handling, storage and containment practices for relevant chemicals and dangerous goods and chemicals that they may be in contact with on Site.
- All fuels and chemicals will be stored in accordance with the requirements of the relevant Australian Standard.

- Provide bunded storage areas for fuels and dangerous goods required for construction equipment with spill cleanup kits.
- Any spills to be cleaned up immediately. Contaminated runoff and contaminated soil will be collected and remediated or disposed of at a licensed facility as designated in the soils handling management procedures.

Monitoring and Reporting:

Monitoring and reporting will include:

- Inspections of storages tanks, bulk containers and the integrity of bunded areas, pavement and associated containment systems will be conducted on a monthly basis.
- The Project Manger will record and sign off on monthly inspections of containers, bund integrity, valves and storage and handling areas. Spills will be reported to the Project Manager including actions taken to minimise the impacts immediately.

Corrective Actions:

The following constitute an incident or failure to comply in relation to fuels and dangerous goods management:

- A fuel or chemical spill and possible release of fuel or chemicals to the environment.
- Storage areas not meeting Australian Standards.
- Storage areas not being suitably bunded.

Should an incident occur, a selection of the following corrective actions will be undertaken, as appropriate:

- Contain and clean up spilt material immediately and remediate or appropriately dispose of contaminated material. The Project Manager will determine the remediation plan following assessment of materials spilt.
- Repair containment systems.
- Relocate fuel or chemicals to appropriately bunded or approved storage areas.

3.12 OCCUPATIONAL HEALTH AND SAFETY

Objective: To ensure that the operation does not adversely affect the health of the employees, contractors or the general public.

Target: Zero reportable injuries and work-related illnesses.

Actions: The following actions will be implemented for health and safety management:

- Safety training will be implemented through both general Site safety induction as well as area-specific inductions.
- The Site will be fenced along the northern, eastern and southern sides, prior to commencement of operations. The fencing will restrict pedestrian and public access to the Site, in the interests of public safety. Fencing will be maintained at all times and incorporate lockable gates.
- Site workers access to the Site will be restricted by the time restrictions, site fencing, landscaping and designated points of entry as specified in the site plan.
- Signage on the roads approaching the Site entrances will be erected to warn other vehicles of entering and slow moving trucks in the area.
- Speed limits on Site will be restricted to 30 km per hour on tracks and 10 KPH elsewhere, with all other Western Australian traffic road rules to be adhered to when driving within the Site boundary.
- Authority to drive road vehicles on-Site is to be provided by the site supervisor or project manager.
- Job Safety Analyses (JSA) will be undertaken as required for specific tasks associated with the site and will be used to develop Standard Operating Procedures to ensure compliance with the Moltoni standards and site personnel safety.
- Health and Hygiene Programs and Illness and Injury Management Systems will be developed.

The list below details some of the site requirements to consider when completing a JSA:

- Personal protection equipment: wearing high visibility clothing, protective foot wear and glasses at all time whilst on site.
- Familiarisation with and adherence to site activities and site OHS procedures.
- Isolation and tagging, manual handling, confined spaces, and height safety.

Procedures that should be followed on site to ensure personal safety include:

- Inform the Site safety contact of proposed Site activities and barricade and sign work areas if necessary. Observe access authorisation/permission conditions and familiarisation self with emergency alarm system and procedures.
- Observe caution by carrying relevant MSDS when working on Site and avoiding exposure to soil and groundwater wherever possible.
- Ensure mobile phones are not used in the vicinity of on-Site flash points.
- Personnel should be instructed to report the presence of noxious or hydrocarbon/petroleum odours within soils or other materials on site to the Project Manager if identified.

All personnel are required to ensure that they maintain a high standard of hygiene maintenance at the Site. This includes:

- Avoiding contact with soils and removal of excess soils from clothing and boots should contact occur.
- Washing of hands prior to leaving site and or the consumption of food and drink.

Monitoring and Reporting:

Monitoring and reporting will include:

- The Project Manager will conduct regular internal auditing (weekly) of the site's health and safety health systems.
- Fencing will be regularly assessed (weekly) to monitor the need for repair.
- The OHS construction representative will report to the Project Manager on a weekly basis on any health and safety issues that need to be addressed. The results of all health and safety audits will be reported to the General Manager.

Corrective Actions:

The Project Manger and Wasterock Pty Ltd will investigate, respond to and take appropriate corrective action and preventive action following health and safety incident.

3.13 INCIDENTS AND COMPLAINTS

Objective: To manage environmental or social incidents and complaints.

Target: Immediate action undertaken as soon as possible and within 24 hours of receipt of a complaint. Investigations completed within 7 days of receipt of a complaint. All corrective actions implemented by the agreed due date.

Actions: The Project Manager will manage all incidents or complaints about either environmental or social issues. The following points must be followed up on complaint receipt:

- Take any necessary immediate action.
- Report the incident or complaint (including to Government if necessary).
- Undertake an investigation.
- Determine root causes.

This procedure requires the following actions to be undertaken:

- Undertake any necessary corrective or preventative actions.
- Monitor action implementation.
- Audit effectiveness of action.

Monitoring and Reporting:

Monitoring and reporting will include:

- The Project Manager shall monitor compliance against the targets.
- The Project Manager will record all incidents and complaints. Reports of all incidents and complaints will be submitted to Wasterock Pty Ltd. The complainant will be advised of what action, if any, is taken as a result of the complaint.

Corrective Actions:

Should further incidents occur or complaints be received in relation to previous occurrences, an appropriate selection of the following corrective actions will be undertaken:

- Additional environmental awareness training of the workforce with respect to the procedures to be followed for environmental incidents or complaints.
- Investigation into why the incident/complaint was not addressed within the specified time frame.
- Undertake incident/complaint follow-up according to the results of the investigation.

4 SMP REVIEW

The Project Manager along with the Site manager will review the SMP quarterly or following a failure of compliance, as detailed in the above tables, to ensure that it is:

- Up-to-date with design and associated, potential environmental impacts.
- Current with other organisational changes, such as changes to the construction contractor team.

Amendments to the SMP must be carried out in accordance with the document control procedure discussed in *Chapter 2*.

The owner and the manager may periodically audit the SMP in relation to any contemplated or current site construction. Such a review may result in a requirement for the Project Manager to initiate a review and update of the SMP.

5 REFERENCES

Relevant legislations, guidelines and standards used or referred to in preparation of the SMP are:

- *Environmental Protection Regulations 1987*
- *Environmental Protection (Noise) Regulations 1997*
- *Environmental Protection (Controlled Waste) Regulations 2004*
- Guidance Statement for Remediation Hierarchy for Contaminated Land (Environmental Protection Authority, 2000)
- The Use of Risk Assessment in Contaminated Site Assessment and Management (Department of Environment and Conservation, 2006)
- Development of Sampling and Analysis Programs (Department of Environmental Protection, 2001)
- Assessment Levels for Soil, Sediment and Water (Department of Environment, 2003)
- Reporting of Site Assessments (Department of Environmental Protection, 2001)
- Community Consultation Guideline (Department of Environment and Conservation, 2006)
- Landfill Waste Classifications and Waste Definitions 1996 (As Amended) (Department of Environment, 2005)
- Guidelines for the Assessment, Remediation and Management of Asbestos Contaminated Sites In Western Australia (Department of Health, 2009)
- Draft - A Guideline for the Development and Implementation of a Dust Management Program (Department of Environment and Conservation, 2008)
- Occupational Safety and Health Management and Contaminated Sites Work (Commission of Occupational Safety and Health, 2005)
- Australian Standard AS/NZS 4801-2001 Occupational health and safety management systems - Specification with guidance for use
- Australian Standard AS 1319-1994 Safety signs for the occupational environment
- Australian Standard AS 1940-2004 The storage and handling of flammable and combustible liquids
- Australian Standard AS 3780-2008 The storage and handling of corrosive substances

6. APPENDIX 1

NAME OF ORGANISATION PREPARING SHEET

Date: ______________
Job No: ____________

Project: ____

Owner: ____

Constructor: ____

Superintendent: ____

Level of engagement of geotechnical testing authority (see Appendix B, Paragraph B2)

____

Prior usage of project site: ____

____

Purpose of present development: ____

____

____

____

____

Broad description of earthworks undertaken, extent of fill, etc.: ______________________

____

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____

____

Observations on stripping and site preparation: ______________________________

____

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____

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Observations of fill materials:

Testing: Refer to attached result certificates, location plans, etc.

Location on site and type of earthworks	Estimated volume, m^3	Number of Tests				
		Material Quality		Field Density		Compaction
		Total	'Failed'	Total	'Failed'	

Action taken where tests failed.

Remarks – (Note: Unless engaged at Level 1 (see Appendix B, Paragraph B2), this authority is not in a position to express an opinion as to whether the works comply with the drawings or specification or are suitable for a particular purpose.)

Signed: ________________________________ (For G.T.A.)

moltoniinfratech

Business Management System

Form No:	MIT-029	Rev. No:

DATE: ____________________ **PROJECT NO:** ____________________

CLIENT: ____________________

PROJECT: ____________________ **LOCATION:** ____________________

	OUTPUT

Form Title	Form Number	Revision Number of Form					Author
Project Cost Report	MIT - 001	10/03	08/05				PM
Project Tender Template	MIT –002	10/03	08/05				PM
PPI	MIT - 003	10/03	08/05				PM
Project Lease Payment Calc	MIT - 004	10/03	08/05				PM
Commitment Summary	MIT - 005	10/03	08/05				PM
Minor Works Sub-contract	MIT - 006	10/03	08/05				PM
Major Sub-contract	MIT -007	11/03	08/05				PM
PSA	MIT - 008	11/03	08/05				PM
Labour Forecast Sheet	MIT - 009	12/03	08/05				PM
Purchase Order Template	MIT - 010						
Limits of Authority	MIT - 011						
Variation Calculation Sheet	MIT - 012		08/05				PM
Variation Authority	MIT - 013		08/05				PM
Progress Claim Schedule Template	MIT - 014						
Conversion Authority	MIT - 015						
Delivery Authority	MIT - 016						
Design Review Checklist	MIT - 017		08/05				WN
Project Review Summary	MIT - 018						
RFI	MIT - 019		08/05				WN
SI	MIT - 020		08/05				WN
CVI	MIT - 021		08/05				WN
Submission Review	MIT - 022						
Tender Review	MIT - 023						
Validation & Commissioning Check List	MIT - 024						
Handover Checklist	MIT - 025		08/05				WN
Order Amendment	MIT - 026		08/05				PM
Creditor Invoice Schedule	MIT - 027		08/05				PM

File Note	MIT - 028						NN
Calculation Sheet	MIT - 029						NN
Calculation Summary	MIT - 030						NN
Standard Conditions of Engagement	MIT - 031						NN
List of forms	MIT - 032						NN
Fax Form	MIT - 033						NN
Confirmation of Verbal Instruction	MIT - 034						NN
Employee Wage Record	MIT - 035						NN

Appendix D – Groundwater Modelling Report (NTEC Environmental Technology)

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Memorandum

To: Greg Watts, MDW Environmental Services

From: Lynn Reid

Subject: Groundwater modelling for the Wasterock Hazelland Landfill site in Hazelmere, Western Australia

Date: 24 September 2012

This memo describes groundwater modelling performed by NTEC Environmental Technology ("NTEC") for MDW Environmental Services ("MDWES") who are working on behalf of Wasterock Pty Ltd. Modelling of groundwater flow near the Hazelland Landfill site in Hazelmere has been performed as part of a hydrogeological investigation to support an application for a 5C Licence to Extract Groundwater. The objective of NTEC's work is to provide an estimate of the impact of proposed abstraction on nearby pre-existing groundwater users.

1. SITE BACKGROUND

The site is an industrial lot on Adelaide Street in Hazelmere, Western Australia, located approximately 6 km east of the Swan River and approximately 1 km west of the Darling Fault. The site is located in the Shire of Swan South groundwater subarea (Water Register, 2012), adjacent to the Shire of Kalamunda groundwater subarea. Detailed groundwater water quality investigations have been performed at the site by MDWES (MDW Environmental Services, 2012). The site is listed on the DEC Contaminated Sites Database (SLIP, 2012).

The site's surficial geology is Bassendean Sands (Perth Groundwater Atlas, 2012), with low-lying areas to the west near the Perth Airport having swamp and lacustrine deposits at the surface. Colluvium lies to the east, at the edge of the Darling Fault, and Precambrian basement rock exists to the east of the Fault. Further north and west, the surface geology is Guildford Clay.

Hydrogeologically at the site and nearby, the uppermost aquifer is the unconfined Superficial Swan (Water Register, 2012), with the Leederville and Yarragadee North aquifers underlying the Superficial. Ground elevations at the site are approximately 30 to 35 mAHD (Perth Groundwater Atlas, 2012), decreasing gently to the west-northwest and increasing rapidly to the east of the Darling Fault. The base of the Superficial Aquifer is mapped (Perth Groundwater Atlas, 2012) at approximately 5 to 7 mAHD at the site. The base slopes upward towards the Darling Fault, and downward towards the west. In the site region, the Superficial Aquifer has a thickness of between 10 and 25 m (Davidson & Wu, 2006).

The water table elevation with the Superficial Aquifer generally follows the topography but may intersect the land surface (Davidson & Wu, 2006) as evidenced by marshy conditions at the Perth Airport to the west of the site. Classified Multiple Use geomorphic wetlands are located less than 1 km west of the site. The Perth Groundwater Atlas suggests that the water table in the Superficial Aquifer at the site lies at approximately 15 mAHD. However, six surveyed monitoring bores (MDW Environmental Services, 2012) were measured in May 2012 and indicate water levels from 19.2 to 23.6 mAHD. Based on these measurements, the hydraulic gradient in the Superficial Aquifer at the site is approximately 0.01, with groundwater flux moving towards the northwest.

Regional studies (Davidson & Wu, 2006) suggest that the rate of groundwater flow through the Superficial Aquifer ranges from less than 50 m/yr to more than 1000 m/yr, with the lower value more likely in the site area.

The nearest WIN data site with historical groundwater monitoring data is 61610508, over 8 km away. Water levels fluctuate at this location by up to 2.8 m over the years 2000-2013, and are generally declining from 1970 onwards.

The Superficial Aquifer is recharged by rainfall. Modelling by the Department of Water (Xu et al., 2008) suggested that the net rainfall recharge to the Bassendean Sands is approximately 192 mm per year. At the site, the Superficial Aquifer is expected to be generally in equilibrium with the underlying aquifers (Davidson & Wu, 2006).

2. NEARBY GROUNDWATER USERS

A search was performed by MDWES on 16 April 2012 for existing groundwater abstraction licenses within a 5 km radius of the site. The Department of Water provided the list shown in the Appendix: Groundwater licensees. There are nine groundwater licenses granted with a 1.5 km radius of the centre of the site. Three licenses (GWL000061690(002), GWL000110971(002), and GWL000152680(003)) are north of Adelaide Street, while six locations (GWL000074457(003), GWL000153812(001), three under GWL 000158077 (005), GWL000167041(001), GWL169011(003)) are located south of Adelaide Street and north of Kalamunda Road. All of these licenses are for abstraction from the Perth – Superficial Swan Aquifer except for GWL000110971(002) which is drawing from the Perth – Leederville Aquifer.

A 10.3 ha conservation area (Bush Forever site 122, Government of Western Australia, 2000) is located adjacent to the property, south of Adelaide Street. While this site has not been identified as a groundwater dependent ecosystem, it is suggested to be a Flora conservation area for plant communities representative of the eastern Swan Coastal Plain.

The regional area of the site, nearby groundwater licenses, the site details, and the extent of the numerical model are shown in Figure 1. The proposed abstraction bore will be located within the site boundaries.

3. SIMPLIFIED GROUNDWATER MODEL

A simplified numerical model of the groundwater regime was developed to estimate drawdown caused by the proposed abstraction at the Site. As a full hydrogeologic assessment has not been performed, the numerical model produces differential results and estimates the impact of the proposed abstraction.

Conceptually, the model consists of the Superficial Aquifer in the region around the site. The unconfined aquifer is assumed to be homogeneous, with a horizontal ground surface at 27 mAHD, a horizontal water table at 22 mAHD, and a horizontal base of the Superficial Aquifer at 5 mAHD for a total model depth of 22 m and a saturated thickness of 17 m. No connection to the underlying aquifers is allowed, and all horizontal boundaries of the model are presumed impervious. No net rainfall recharge is added to the model, providing conservative over-estimates of the impact of the pumping.

The modelling was performed with FEFLOW (Diersch, 2005), a finite element groundwater modelling package. The model grid covers 11.6 km by 10.3 km horizontally and has three layers, with a total of 28908 mesh elements and 19860 mesh nodes. The triangular mesh has finer resolution around the site. Figure 2 shows the layout of the model with an area map superimposed.

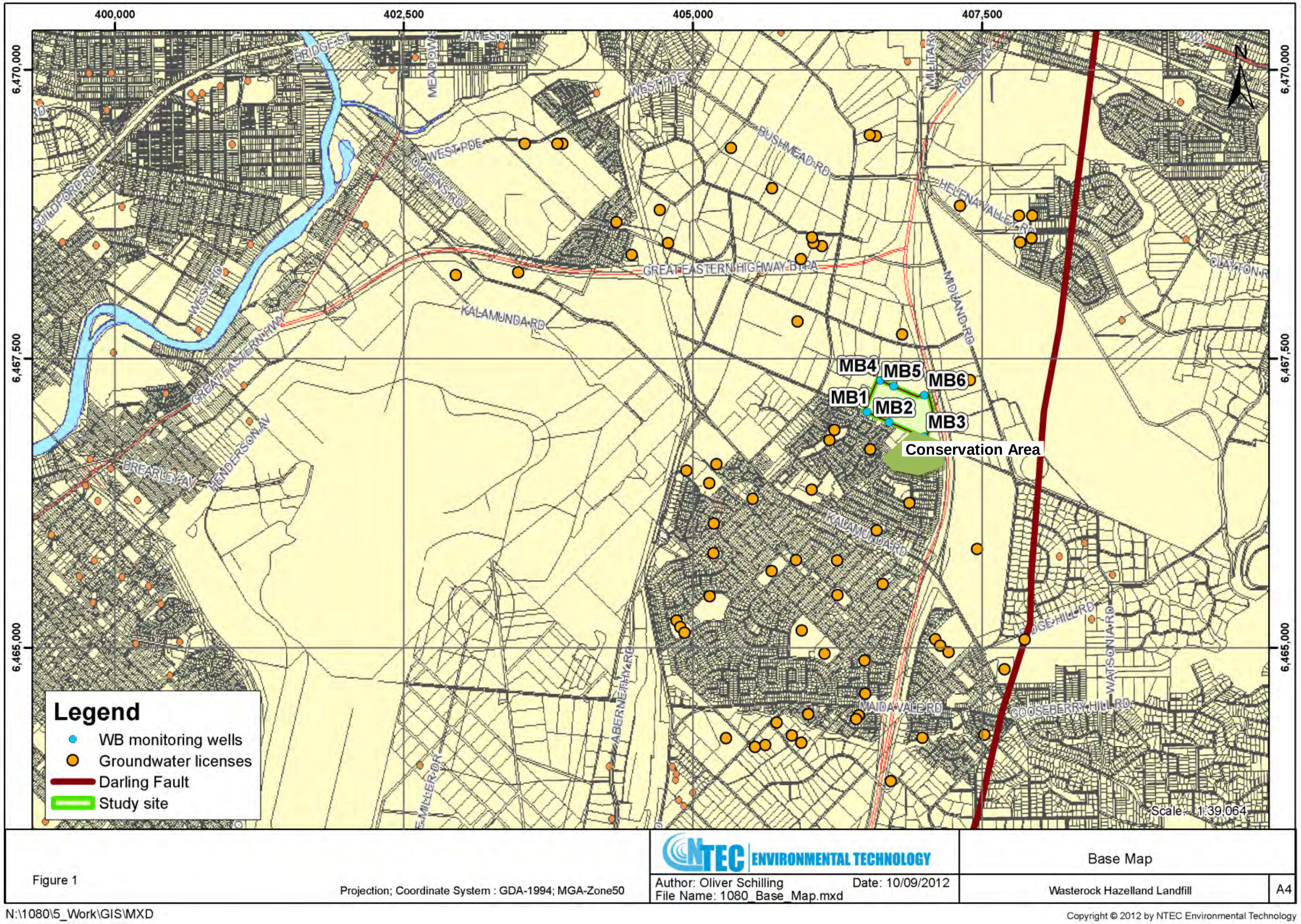

Figure 1: Location of the Wasterock Hazelland landfill site. The model area encompasses the entire map.

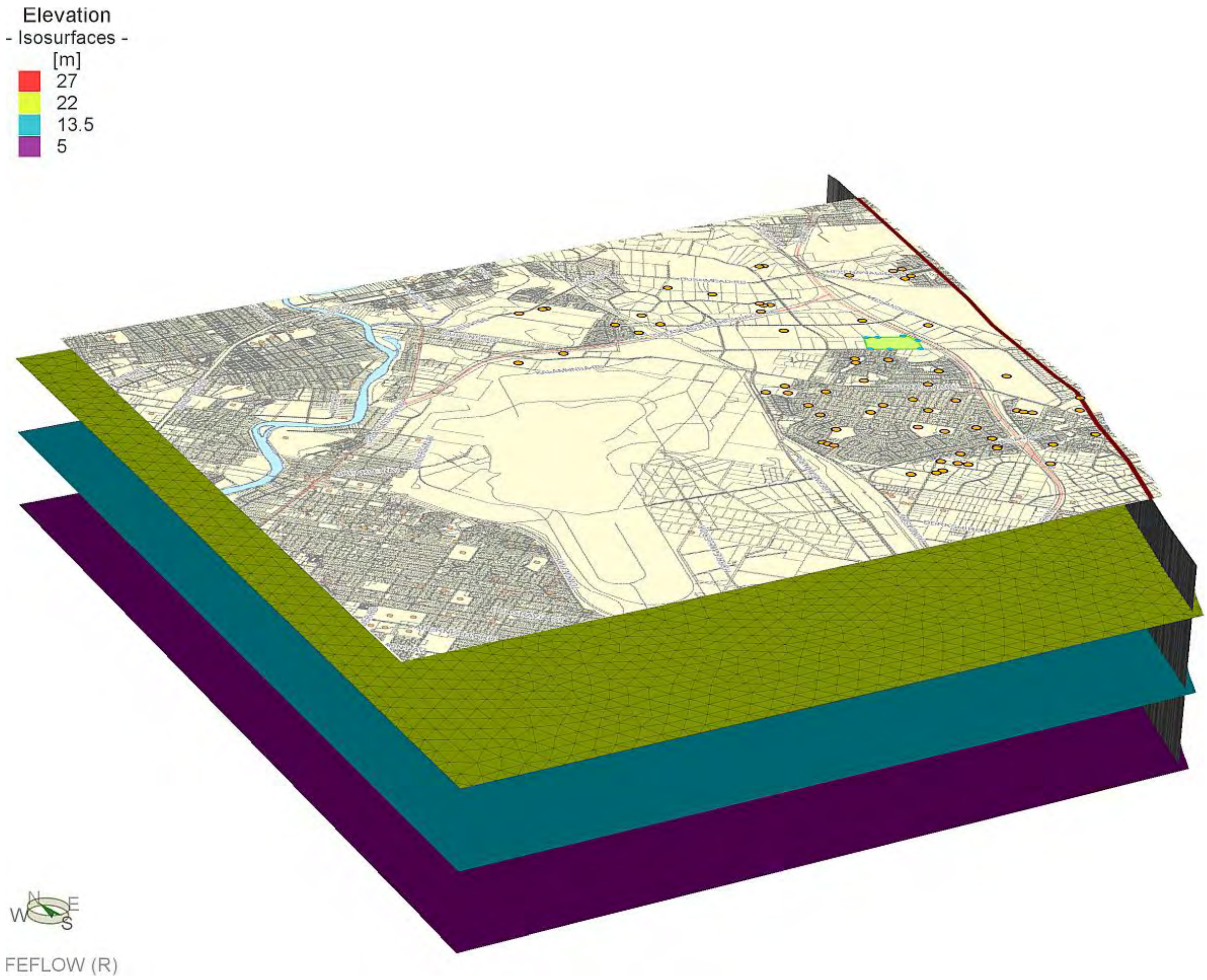

Figure 2: Initial layout of numerical model showing extent of domain and Darling Fault to the east. The Site is shown in green on the top map. The regional grid spacing is shown on the second slice; finer resolution exists near the Site. Vertical exaggeration 100x.

The model was populated with horizontal and vertical hydraulic conductivity and specific yield values derived from the PRAMS model (Davidson and Yu, 2006) for the region around the site. The values used and the data sources are noted below in Table 1.

Abstraction was represented with a single pumping bore located in the south-west corner of the site. Since the model is flat-lying, the location of the modelled bore will not significantly alter results, except where drawdown is impacted by the proximity of the Darling Fault. The bore was screened at the bottom of the model, representing pumping from near the base of the Superficial Aquifer. Pumping rates were 300 ML/yr, or 821.3 m^3/day. Pumping was assumed to continue for three years; the model was run for a further 10 years to simulate the results of groundwater recovery.

Table 1: Parameters used in Hazelland impact model. All data values derived from Cymod Systems Pty Ltd (2009).

Parameter	Units	Value	Source (see caption)
Hydraulic conductivity, horizontal	m/day	20.0	Average for Bassendean Sands, also Figure B1 near the Site.
Hydraulic conductivity, vertical	m/day	0.75	Figure B16 for Bassendean Sands near the site
Specific yield	-	0.20	Figure B27 for Bassendean Sands near the Site

4. MODELLING RESULTS

Modelled drawdown after 3 years pumping is shown at the water table in Figure 3. The monitoring bore closest to the pumping site, MB1, would experience a drawdown of 1.40 m. The drawdown contour of 0.2 m extends approximately 1.6 km from the modelled pumping bore.

Since the precise geographic locations for nearby groundwater users are not available, it is not possible to quantify impacts for these users. However, based on the Water Register (2012) map, twelve licensed groundwater bores may have drawdown impacts of up to 0.2 m. Three licensees will have impacts of more than 0.6 m, and five licensees will have impacts up to 0.3 m. An additional twenty-three licensed locations may have impacts of more than 0.1 m based on these modelling results.

The conservation area has monitoring bore MB3 near its northern boundary. At MB3, water table drawdown is predicted to be 0.56 m. All of the conservation area lies within the 0.4 m drawdown contour after three years of abstraction.

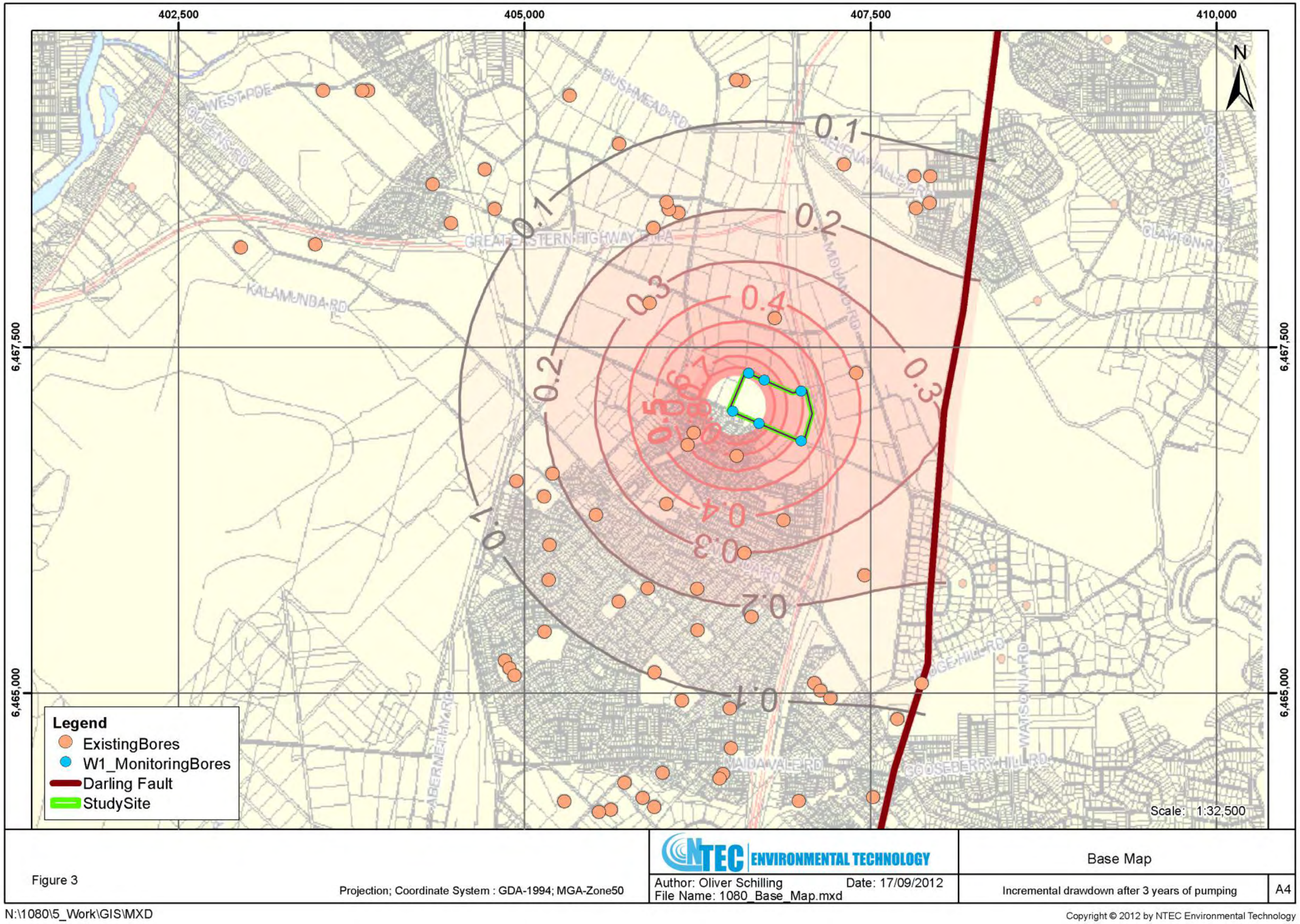

Figure 3: Drawdown after 3 years of abstraction.

Additional maps are shown for the recovery of the aquifer after pumping ceases. Figure 4 shows the drawdown 1, 2, 5, and 10 years after pumping ends. The rapid recovery of the aquifer after the cessation of pumping indicates that the aquifer is not significantly impacted in the long term by the proposed three years of abstraction. The water table recovers and the impact is negligible after ten years. However, because this simplified model does not include rainfall recharge, the numerical model can never reach equilibrium at the original water table height.

5. CONCLUSIONS

A three-dimensional numerical model of the region around the Wasterock Hazelland landfill site has been developed. The model is suitable for determining the incremental effect of the proposed 300 ML/yr abstraction, given the assumptions of simplified geometry and boundary conditions. No rainfall recharge has been assumed, which generates conservative “worst-case” assumptions for this model configuration.

Modelling results indicate that after three years, the proposed abstraction will induce up to 0.7 m of additional drawdown off the site at nearby previously existing licensed groundwater users or conservation areas. These results are dependent upon the assumed location of the pumping bore, and could be altered by modifying the location of this modelled bore. Groundwater levels would be expected to recover rapidly. Five years after the cessation of pumping, the modelled drawdown is less than 0.2 m at all locations.

The modelling efforts provide a “first look” at the projected effects of the proposed abstraction application, and could be made more precise by considering the effects of variable aquifer thickness, regional groundwater flux, and rainfall recharge.

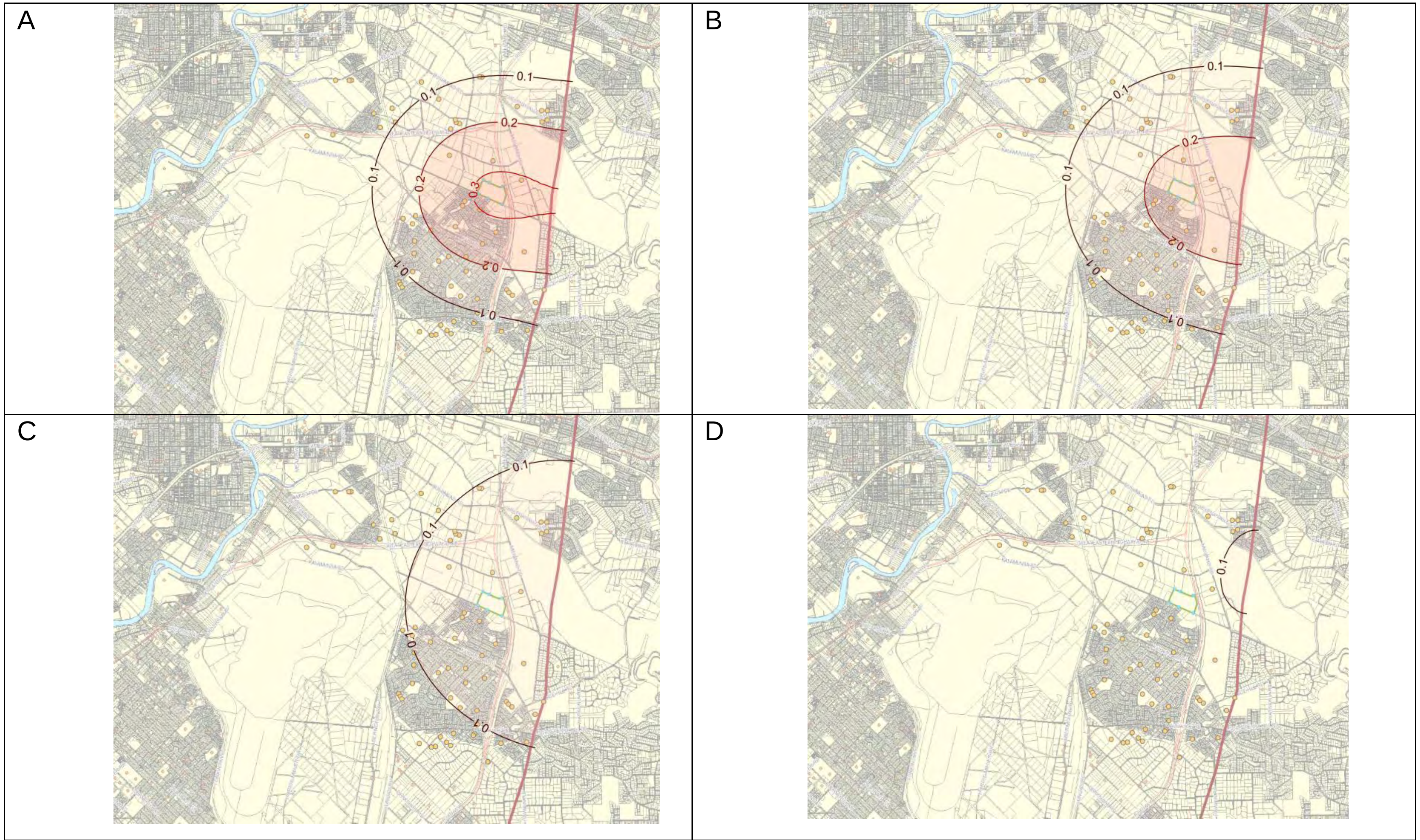

Figure 4: Drawdown recovery (A) one (B) two (C) five and (D) ten years after pumping ceases

6. REFERENCES

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APPENDIX: GROUNDWATER LICENSEES

Data in this appendix was provided to MDW Environmental Services by the Department of Water database at 13:45 hours on 16 April 201 by extracting licenses within a 5 kilometre radius of the Site. The properties nearest the Site are highlighted below, with green representing properties north of Adelaide Street and blue properties south of Adelaide Street and north of Kalamunda Road.

Instrument Version	Licence Allocation (kL)	GW Area	Sub Area	Aquifer	All Parties	Property	Issue Date	Expiry Date
GWL 000041225 (002)	3000	Perth	Shire of Kalamunda	Perth - Superficial Swan	Salama, Amir	6, SULTANA RD, FORRESTFIELD	2/06/2004	1/06/2014
GWL 000045890 (003)	97500	Perth	City of Belmont	Perth - Superficial Swan	Westralia Airports Corporation Pty Limited	0, Horrie Miller Drive, Cloverdale	2/06/2004	1/06/2014
GWL 000047420 (002)	3650	Swan	South Swan	Perth - Mirrabooka	Smith, Graeme McDonald	2, HAMERSLEY RD, CAVERSHAM	22/01/2004	21/01/2014
GWL 000048642 (003)	21000	Perth	Perth South Confined	Perth - Leederville.	La Salle College	14, MURIEL ST, MIDDLE SWAN	30/03/2010	25/03/2014
GWL 000048834 (003)	35550	Swan	South Swan	Perth - Mirrabooka	Bond, Robert James	10, HAMERSLEY RD, CAVERSHAM	6/07/2011	6/07/2021
GWL 000048834 (003)	35550	Swan	South Swan	Perth - Mirrabooka	Bond, Robert James	Lots 2976 & 10 Hamersley Road, Caversham.	6/07/2011	6/07/2021
GWL 000048839 (003)	33750	Perth	Shire of Swan South	Perth - Superficial Swan	Swan Tafe	Lot 50 Lloyd Street, Midland.	21/04/2010	1/06/2014
GWL 000051642 (002)	2250	Perth	Shire of Swan South	Perth - Superficial Swan	BGC (Australia) Pty Ltd	Lot 3 Bushmead Road Hazelmere	9/11/2004	9/11/2014
GWL 000053269 (002)	4800	Perth	Shire of Swan South	Perth - Superficial Swan	Swan Bowling & Recreation Club (Inc)	9, JAMES ST, GUILDFORD	3/02/2005	3/02/2015
GWL 000056782 (002)	6250	Perth	Shire of Kalamunda	Perth - Superficial Swan	Smith, S M; Smith, B	113, SULTANA RD, MAIDA VALE	21/04/2004	19/04/2014
GWL 000058650 (002)	27000	Perth	Shire of Kalamunda	Perth - Superficial Swan	Swanview Plant Farm Pty Ltd	Lot 399 Sorenson Road High Wycombe	2/11/2006	1/11/2016
GWL 000059059 (003)	15000	Perth	Shire of Swan South	Perth - Superficial Swan	St Brigid's School	67, TOODYAY RD, MIDDLE SWAN	30/03/2010	21/12/2016
GWL 000060942 (003)	46150	Perth	Shire of Kalamunda	Perth - Superficial Swan	Seventh-Day Adventist Church (Western Australian Conference) Limited	1, KALAMUNDA RD, MAIDA VALE	20/04/2010	13/03/2018
GWL 000060942 (003)	46150	Perth	Shire of Kalamunda	Perth - Superficial Swan	Seventh-Day Adventist Church (Western Australian Conference) Limited	1, KALAMUNDA RD, MAIDA VALE	20/04/2010	13/03/2018
GWL 000061690 (002)	20000	Perth	Shire of Swan South	Perth - Superficial Swan	Pioneer Road Services Pty Ltd	1, VALE RD, HAZELMERE	10/01/2008	10/01/2018
GWL 000062528 (003)	20625	Perth	Shire of Swan South	Perth - Superficial Swan	La Salle College	79, MURIEL ST, MIDDLE SWAN	30/03/2010	25/03/2014
GWL 000062635 (003)	15750	Perth	Shire of Swan South	Perth - Superficial Swan	The Roman Catholic Archbishop of Perth		20/05/2010	8/10/2018

GWL 000063196 (002)	3260	Perth	Shire of Kalamunda	Perth - Superficial Swan	Department of Agriculture and Food	11858, BOUGAINVILLEA AV, FORRESTFIELD	14/10/2008	14/10/2018
GWL 000063807 (003)	89390	Perth	Shire of Kalamunda	Perth - Superficial Swan	Bacchion, David	22, DUNDAS RD, HIGH WYCOMBE	15/10/2009	15/10/2019
GWL 000063807 (003)	89390	Perth	Shire of Kalamunda	Perth - Superficial Swan	Bacchion, David	23, MILNER RD, HIGH WYCOMBE	15/10/2009	15/10/2019
GWL 000063807 (003)	89390	Perth	Shire of Kalamunda	Perth - Superficial Swan	Bacchion, David	551, DUNDAS RD, HIGH WYCOMBE	15/10/2009	15/10/2019
GWL 000064694 (003)	24000	Perth	Shire of Kalamunda	Perth - Superficial Swan	Matthew Gibney Catholic Primary School; The Roman Catholic Archbishop of Perth	2, MUNDAY RD, HIGH WYCOMBE	30/03/2010	15/12/2018
GWL 000074457 (003)	196250	Perth	Shire of Kalamunda	Perth - Superficial Swan	Hillview Public Golf Course Pty Ltd	Location 7652 Kalamunda Road Maida Vale	4/05/2010	31/07/2019
GWL 000074457 (003)	196250	Perth	Shire of Kalamunda	Perth - Superficial Swan	Hillview Public Golf Course Pty Ltd	Location 7652 Kalamunda Road Maida Vale	4/05/2010	31/07/2019
GWL 000098956 (003)	15550	Perth	Shire of Swan South	Perth - Superficial Swan	Swick, Randal Lloyd	12, STIRLING CR, HAZELMERE	14/05/2010	14/05/2020
GWL 000099004 (008)	17250	Perth	Perth South Confined	Perth - Leederville.	Midland Redevelopment Authority	9011, YELVERTON DR, MIDLAND	12/04/2011	31/12/2014
GWL 000101500 (002)	66000	Perth	Perth South Confined	Perth - Leederville.	Derby Industries Pty Ltd	115, LAKES RD, HAZELMERE	11/11/2010	11/11/2020
GWL 000101500 (002)	66000	Perth	Perth South Confined	Perth - Leederville.	Derby Industries Pty Ltd	114, LAKES RD, HAZELMERE	11/11/2010	11/11/2020
GWL 000103034 (007)	28500	Perth	Shire of Swan South	Perth - Superficial Swan	Di Giuseppe, Antonio Giuseppe	25, STIRLING CR, HAZELMERE	2/08/2010	11/11/2012
GWL 000103896 (005)	8500	Perth	Shire of Swan South	Perth - Superficial Swan	Austral Bricks (WA) Pty Ltd	1, MILITARY RD, MIDLAND	4/03/2011	4/03/2021
GWL 000108239 (002)	16600	Perth	Shire of Swan South	Perth - Superficial Swan	Bynon, William John	2, ARUM LILY PL, HAZELMERE	3/07/2003	3/07/2013
GWL 000108850 (002)	1500	Perth	Shire of Kalamunda	Perth - Superficial Swan	Powell, Baden Jones	148, ALMONDTREE L, MAIDA VALE	9/09/2010	10/09/2020
GWL 000110971 (002)	29250	Perth	Perth South Confined	Perth - Leederville.	The Trustee For C & S Bucolo Family Trust	15, MIDLAND RD, HAZELMERE	10/05/2002	9/05/2012
GWL 000111079 (002)	4800	Perth	Shire of Mundaring	Perth - Superficial Swan	Shire of Mundaring	13293, , MIDVALE	30/03/2010	17/07/2012
GWL 000151552 (001)	15750	Perth	Shire of Swan South	Perth - Mirrabooka	Westrac Equipment Pty Ltd	50, GREAT EASTERN HWY, SOUTH GUILDFORD	26/11/2002	26/11/2012
GWL 000151578 (001)	7950	Perth	Shire of Kalamunda	Perth - Superficial Swan	Weissmann, P G & M C	1, BERKSHIRE RD, FORRESTFIELD	25/11/2002	25/11/2012
GWL 000151772 (001)	3000	Perth	Shire of Kalamunda	Perth - Superficial Swan	Rogan, Brett Norman	72, MULBERRY CT, MAIDA VALE	6/01/2003	6/01/2013
GWL 000151786 (001)	2000	Perth	Shire of Swan South	Perth - Superficial Swan	Watson, Debbie	508, NIRIMBA CL, SOUTH GUILDFORD	7/01/2003	6/01/2013
GWL 000151796 (002)	3500	Perth	Shire of Kalamunda	Perth - Superficial Swan	Howe & Carter, Richard & Lynette	3, SULTANA RD, FORRESTFIELD	7/07/2005	7/07/2015
GWL 000152091 (002)	3500	Perth	Shire of Kalamunda	Perth - Superficial Swan	Netherway, Trevor Noel	89, STEWART RD, HIGH WYCOMBE	9/09/2010	10/09/2020
GWL 000152097 (001)	4600	Perth	Shire of Kalamunda	Perth - Superficial Swan	Arnold, Jean Winifred	49, MILNER RD, HIGH WYCOMBE	12/02/2003	12/09/2013
GWL 000152099 (002)	3600	Perth	Shire of Kalamunda	Perth - Superficial Swan	Di Renzo, Giustina	5, HAWTIN RD, MAIDA VALE	9/09/2010	10/09/2020
GWL 000152102 (001)	30000	Perth	Shire of Kalamunda	Perth - Superficial Swan	Forrestfield Bible	525, BERKSHIRE RD, FORRESTFIELD	28/02/2003	20/01/2013

					Fellowship			
GWL 000152180 (003)	5000	Perth	Shire of Kalamunda	Perth - Superficial Swan	Disisto, Michael; Disisto, Lilliana	4, SULTANA RD, FORRESTFIELD	2/09/2010	1/09/2020
GWL 000152215 (001)	23120	Perth	Shire of Kalamunda	Perth - Superficial Swan	Fagnani, Antonio (Tony)	1, MILNER RD, HIGH WYCOMBE	28/02/2003	12/09/2013
GWL 000152244 (004)	25725	Perth	Shire of Swan South	Perth - Superficial Swan	Guildford Grammar School Inc	191, GREAT EASTERN HWY, GUILDFORD	30/03/2010	11/11/2017
GWL 000152515 (001)	9000	Perth	Shire of Kalamunda	Perth - Superficial Swan	Furfaro, M & A	415, PLOVER RD, HIGH WYCOMBE	25/03/2003	14/09/2013
GWL 000152680 (003)	27750	Perth	Shire of Swan South	Perth - Superficial Swan	Di Giuseppe, Antonio Giuseppe	147, TALBOT RD, HAZELMERE	8/11/2005	14/09/2015
GWL 000152817 (002)	4400	Perth	Shire of Kalamunda	Perth - Superficial Swan	Lush, Leonard James	26, BREWER RD, MAIDA VALE	9/09/2010	10/09/2020
GWL 000152906 (002)	80000	Perth	Shire of Swan South	Perth - Superficial Swan	BGC (Australia) Pty Ltd	80, BUSHMEAD RD, HAZELMERE	13/04/2005	15/04/2015
GWL 000153123 (001)	11450	Perth	Shire of Kalamunda	Perth - Superficial Swan	Ozanne, R.W. & J	1, RIDGE HILL RD, MAIDA VALE	12/06/2003	12/09/2013
GWL 000153231 (001)	7250	Perth	Shire of Kalamunda	Perth - Superficial Swan	Porges, Bruce	105, OXFORD CT, MAIDA VALE	21/05/2003	24/05/2013
GWL 000153592 (002)	6400	Perth	Shire of Kalamunda	Perth - Superficial Swan	Miles, Peter Leslie	82, BRAE RD, HIGH WYCOMBE	15/09/2010	15/09/2020
GWL 000153624 (001)	12000	Perth	Perth South Confined	Perth - Leederville.	Metalic Investments Pty Ltd	134, GREAT NORTHERN HWY, MIDDLE SWAN	10/07/2003	21/03/2013
GWL 000153641 (001)	13950	Perth	Shire of Swan South	Perth - Superficial Swan	Wilcox, Sidney Alexander; Wilcox, Lynley Jane	15, STIRLING CR, HAZELMERE	29/08/2003	31/12/2013
GWL 000153785 (002)	3375	Perth	Shire of Kalamunda	Perth - Superficial Swan	Leisure Time Pty Ltd	10, MAIDA VALE RD, HIGH WYCOMBE	1/09/2010	1/09/2012
GWL 000153812 (001)	5400	Perth	Shire of Kalamunda	Perth - Superficial Swan	TTN Pty Ltd	11, KALAMUNDA RD, HIGH WYCOMBE	23/07/2003	6/10/2012
GWL 000153889 (002)	10000	Perth	Shire of Kalamunda	Perth - Superficial Swan	Forrestfield Christian School	22, HAWTIN RD, FORRESTFIELD	30/03/2010	14/09/2013
GWL 000154050 (001)	4800	Perth	Shire of Kalamunda	Perth - Superficial Swan	Mattar, Shafik Ahmad	91, STEWART RD, HIGH WYCOMBE	25/08/2003	3/11/2013
GWL 000154091 (001)	4250	Perth	Shire of Kalamunda	Perth - Superficial Swan	Halse, O D	106, SADLER DR, GOOSEBERRY HILL	16/10/2003	25/10/2013
GWL 000154118 (001)	3750	Perth	Shire of Kalamunda	Perth - Superficial Swan	Hampson, William	11, SULTANA RD, FORRESTFIELD	23/09/2003	22/09/2013
GWL 000154241 (001)	250	Perth	Perth South Confined	Perth - Leederville.	Swick, Rosanne	5, RIVER BANK BVD, SOUTH GUILDFORD	30/09/2003	24/09/2013
GWL 000154518 (001)	4000	Perth	Shire of Kalamunda	Perth - Superficial Swan	Bennett, Stephen	8, BRUCE RD, MAIDA VALE	21/01/2004	19/01/2014
GWL 000154520 (001)	7740	Perth	Shire of Kalamunda	Perth - Superficial Swan	Avery, Vernon Bruce	50, MILNER RD, HIGH WYCOMBE	20/01/2004	19/01/2014
GWL 000154669 (001)	3500	Perth	Shire of Kalamunda	Perth - Superficial Swan	Patterson, N J	4, BRAND RD, HIGH WYCOMBE	6/01/2004	6/01/2014
GWL 000154688 (003)	4000	Perth	Shire of Swan South	Perth - Superficial Swan	Racing and Wagering Western Australia	22, Kalamunda Road, Guildford	15/06/2009	15/06/2019
GWL 000155224 (002)	100000	Perth	Shire of Kalamunda	Perth - Superficial Swan	Western Australian Fire Brigades Board	10261, DUNDAS RD, FORRESTFIELD	20/05/2010	25/03/2014
GWL 000155295 (003)	198225	Perth	Shire of Swan South	Perth - Superficial Swan	Department of Education	14189, ARCHER ST, WOODBRIDGE	16/08/2007	16/08/2017
GWL 000155295 (003)	198225	Perth	Shire of Swan South	Perth - Superficial Swan	Department of Education	7526, CROSBIE RD, WOODBRIDGE	16/08/2007	16/08/2017

GWL 000155295 (003)	198225	Perth	Shire of Swan South	Perth - Superficial Swan	Department of Education	6318, CLAYTON ST, KOONGAMIA	16/08/2007	16/08/2017
GWL 000155295 (003)	198225	Perth	Shire of Swan South	Perth - Superficial Swan	Department of Education	Crown reserve 8804; Swan Location 10355-Clayton Street Bellevue	16/08/2007	16/08/2017
GWL 000155429 (004)	162750	Perth	Shire of Kalamunda	Perth - Superficial Swan	Department of Education	8558, KALAMUNDA RD, MAIDA VALE	15/02/2012	28/02/2022
GWL 000155429 (004)	162750	Perth	Shire of Kalamunda	Perth - Superficial Swan	Department of Education	12500, NEWBURN RD, HIGH WYCOMBE	15/02/2012	28/02/2022
GWL 000155429 (004)	162750	Perth	Shire of Kalamunda	Perth - Superficial Swan	Department of Education	9109, BERKSHIRE RD, FORRESTFIELD	15/02/2012	28/02/2022
GWL 000155429 (004)	162750	Perth	Shire of Kalamunda	Perth - Superficial Swan	Department of Education	9101, BOUGAINVILLEA AV, FORRESTFIELD	15/02/2012	28/02/2022
GWL 000155448 (005)	376875	Perth	Perth South Confined	Perth - Leederville.	Department of Education	11688, WELLATON ST, MIDVALE	21/02/2012	28/02/2022
GWL 000155694 (001)	7625	Perth	Shire of Kalamunda	Perth - Superficial Swan	Noske, Jeffrey John	3, BRAND RD, HIGH WYCOMBE	25/05/2004	20/05/2014
GWL 000155696 (001)	2500	Perth	Shire of Kalamunda	Perth - Superficial Swan	De Haan, David; De Haan, Chrystine	5, SULTANA RD, FORRESTFIELD	26/05/2004	21/05/2014
GWL 000156446 (005)	19000	Perth	Shire of Swan South	Perth - Superficial Swan	Brighton, Anthony		23/02/2012	23/02/2022
GWL 000156453 (001)	10300	Perth	Perth South Confined	Perth - Leederville.	Shire of Kalamunda		19/07/2005	20/07/2015
GWL 000156772 (003)	103875	Perth	Perth South Confined	Perth - Leederville.	Guildford Grammar School Inc	191, GREAT EASTERN HWY, GUILDFORD	30/03/2010	11/12/2017
GWL 000157266 (002)	15000	Perth	Shire of Mundaring	Perth - Superficial Swan	Shire of Mundaring	123, GREAT EASTERN HWY, MIDVALE	22/06/2007	22/06/2017
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	11583, KALAMUNDA RD, MAIDA VALE	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	9462, MARKHAM RD, HIGH WYCOMBE	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	10427, SADDLEBACK CIR, MAIDA VALE	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	14651, BENSON WY, HIGH WYCOMBE	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	13987, FRUIT TREE CR, FORRESTFIELD	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	11887, WITTENOOM RD, HIGH WYCOMBE	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	13211, TREE FERN GRN, MAIDA VALE	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	7945, WITTENOOM RD, HIGH WYCOMBE	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	15426, BOWDEN DR, HIGH WYCOMBE	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	11072, NEWBURN RD, HIGH WYCOMBE	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	570, NEWBURN RD, HIGH WYCOMBE	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	15430, FRUIT TREE CR, FORRESTFIELD	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	15405, WARDA CR, FORRESTFIELD	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	601, HAWKEVALE RD, HIGH WYCOMBE	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	10295, DAWSON AV, FORRESTFIELD	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	11104, KOOKABURRA CR, HIGH WYCOMBE	3/02/2012	20/07/2015

GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	8295, NETHERWOOD RD, HIGH WYCOMBE	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	8927, BANDALONG WY, HIGH WYCOMBE	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	11956, WORRELL AV, HIGH WYCOMBE	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	11891, WYCOMBE RD, HIGH WYCOMBE	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	33, AGRAULIA CT, HIGH WYCOMBE	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	11856, O'CONNELL WY, HIGH WYCOMBE	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	28, SWAN RD, HIGH WYCOMBE	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	10430, AKEBIA WY, FORRESTFIELD	3/02/2012	20/07/2015
GWL 000158261 (002)	100500	Perth	Perth South Confined	Perth - Leederville.	Shire of Mundaring	85, STANHOPE GDNS, MIDVALE	8/12/2010	31/07/2012
GWL 000158261 (002)	100500	Perth	Perth South Confined	Perth - Leederville.	Shire of Mundaring	49, MUROS PL, MIDVALE	8/12/2010	31/07/2012
GWL 000159033 (003)	45300	Perth	Perth South Confined	Perth - Leederville.	Midland Redevelopment Authority		12/04/2011	31/12/2014
GWL 000159397 (002)	12408	Perth	Shire of Kalamunda	Perth - Superficial Swan	Mitchell, Maxwell John	22, BRUCE RD, MAIDA VALE	1/11/2007	1/11/2017
GWL 000159502 (003)	49900	Perth	Shire of Kalamunda	Perth - Superficial Swan	Hillview Lifestyle Village Pty Ltd		16/03/2010	16/03/2020
GWL 000161194 (001)	8000	Perth	Perth South Confined	Perth - Leederville.	Guildford Grammar School Inc	24, TERRACE RD, GUILDFORD	3/07/2006	13/12/2014
GWL 000161669 (003)	35250	Perth	Shire of Swan South	Perth - Superficial Swan	Domain Project Development PTY LTD; Guilford Grammer School Foundation Inc.	51, WEST PDE, SOUTH GUILDFORD	20/05/2010	12/02/2019
GWL 000162380 (003)	2325	Perth	Shire of Mundaring	Perth - Superficial Swan	Shire of Mundaring	207, HELENA VALLEY RD, HELENA VALLEY	30/03/2010	22/12/2018
GWL 000163872 (002)	2024	Perth	Shire of Kalamunda	Perth - Superficial Swan	Riley, Craig; Riley, Helen	111, SULTANA RD, MAIDA VALE	12/10/2009	12/10/2019
GWL 000164988 (003)	8700	Perth	Shire of Swan South	Perth - Superficial Swan	Rando, Stephen		26/11/2009	26/11/2019
GWL 000167016 (001)	7280	Perth	Shire of Kalamunda	Perth - Superficial Swan	Peters, Jennifer Ann	92, MILNER RD, HIGH WYCOMBE	17/10/2008	17/10/2018
GWL 000167041 (001)	3750	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	28, NOTTINGHAM GRN, HIGH WYCOMBE	17/10/2008	17/10/2018
GWL 000167337 (003)	11250	Perth	Perth South Confined	Perth - Leederville.	Shire of Mundaring	231, HELENA VALLEY RD, HELENA VALLEY	8/12/2011	2/11/2018
GWL 000167785 (001)	3000	Perth	Shire of Kalamunda	Perth - Superficial Swan	Andric, Ruzica	220, NARDINE CL, FORRESTFIELD	30/10/2008	30/10/2018
GWL 000167798 (001)	3740	Perth	Shire of Kalamunda	Perth - Superficial Swan	Miles, Peter Leslie	82, BRAE RD, HIGH WYCOMBE	16/04/2009	16/04/2019
GWL 000167932 (002)	1200	Perth	Shire of Kalamunda	Perth - Superficial Swan	Littlefield Development Pty Ltd	4, LITTLEFIELD RD, HIGH WYCOMBE	21/04/2010	19/02/2019
GWL 000168139 (002)	280775	Perth	Perth South Confined	Perth - Leederville.	City of Swan	98, HARPER ST, WOODBRIDGE	30/06/2011	30/06/2016
GWL 000168139 (002)	280775	Perth	Perth South Confined	Perth - Leederville.	City of Swan	144, HELENA ST, GUILDFORD	30/06/2011	30/06/2016
GWL 000168139 (002)	280775	Perth	Perth South Confined	Perth - Leederville.	City of Swan	9803, MORRISON RD, SWAN VIEW	30/06/2011	30/06/2016

GWL 000168139 (002)	280775	Perth	Perth South Confined	Perth - Leederville.	City of Swan	52, MORRISON RD, MIDLAND	30/06/2011	30/06/2016
GWL 000168139 (002)	280775	Perth	Perth South Confined	Perth - Leederville.	City of Swan	10174, GRAY DR, MIDVALE	30/06/2011	30/06/2016
GWL 000168139 (002)	280775	Perth	Perth South Confined	Perth - Leederville.	City of Swan	13421, EDDIE BARRON DR, MIDDLE SWAN	30/06/2011	30/06/2016
GWL 000168263 (002)	217225	Perth	Shire of Swan South	Perth - Superficial Swan	City of Swan	9963, WEST PDE, HAZELMERE	13/05/2010	31/05/2012
GWL 000168263 (002)	217225	Perth	Shire of Swan South	Perth - Superficial Swan	City of Swan	149, JAMES ST, GUILDFORD	13/05/2010	31/05/2012
GWL 000168263 (002)	217225	Perth	Shire of Swan South	Perth - Superficial Swan	City of Swan	4616, FORD ST, WOODBRIDGE	13/05/2010	31/05/2012
GWL 000168263 (002)	217225	Perth	Shire of Swan South	Perth - Superficial Swan	City of Swan		13/05/2010	31/05/2012
GWL 000168263 (002)	217225	Perth	Shire of Swan South	Perth - Superficial Swan	City of Swan	14641, FERGUSON ST, MIDLAND	13/05/2010	31/05/2012
GWL 000168263 (002)	217225	Perth	Shire of Swan South	Perth - Superficial Swan	City of Swan	266, CHARLES ST, MIDLAND	13/05/2010	31/05/2012
GWL 000168263 (002)	217225	Perth	Shire of Swan South	Perth - Superficial Swan	City of Swan	12224, WATERHALL RD, SOUTH GUILDFORD	13/05/2010	31/05/2012
GWL 000168263 (002)	217225	Perth	Shire of Swan South	Perth - Superficial Swan	City of Swan	10627, JOHN ST, MIDLAND	13/05/2010	31/05/2012
GWL 000168473 (001)	900	Perth	Shire of Kalamunda	Perth - Superficial Swan	O'Reilly, Peter Hamilton	32, HAWTIN RD, MAIDA VALE	28/07/2009	28/07/2019
GWL 000168841 (002)	15875	Perth	Shire of Swan South	Perth - Superficial Swan	Metropolitan Cemeteries Board		21/04/2010	11/11/2017
GWL 000169011 (003)	12750	Perth	Shire of Kalamunda	Perth - Superficial Swan	Sunstyle Holdings Pty Ltd	15401, ELMORE WY, HIGH WYCOMBE	10/09/2010	9/09/2012
GWL 000169609 (001)	2850	Perth	Shire of Mundaring	Combined - Fractured Rock West - Fractured Rock	Tiong, Mohamad	19, SAMSON PL, HELENA VALLEY	20/01/2010	19/01/2020
GWL 000170338 (001)	8500	Perth	Shire of Kalamunda	Perth - Superficial Swan	Quaker Oats Australia Pty Ltd	3, DUNDAS RD, FORRESTFIELD	3/03/2010	3/03/2020
GWL 000170681 (001)	30000	Perth	Shire of Mundaring	Combined - Fractured Rock West - Fractured Rock	Helena Valley Residential Resort Pty Ltd	237, HELENA VALLEY RD, HELENA VALLEY	20/10/2010	20/10/2020
GWL 000170758 (001)	3375	Perth	Shire of Kalamunda	Perth - Superficial Swan	Mulligan Nominees Pty Ltd	500, ABERNETHY RD, HIGH WYCOMBE	10/06/2010	10/06/2020
GWL 000171656 (001)	13500	Perth	Shire of Mundaring	Perth - Superficial Swan	Hemsley, Jeffrey	1, HELENA VALLEY RD, HELENA VALLEY	28/07/2010	28/07/2015
GWL 000172101 (001)	160500	Perth	Shire of Swan South	Perth - Superficial Swan	Gatti Investments Pty Ltd	9000, WEST PDE, SOUTH GUILDFORD	20/10/2010	20/10/2020
GWL 000172128 (002)	19500	Perth	Shire of Mundaring	Combined - Fractured Rock West - Fractured Rock	Department of Education	6714, INNAMINCKA RD, GREENMOUNT	21/02/2012	28/02/2022
GWL 000172312 (001)	13500	Perth	Shire of Kalamunda	Perth - Superficial Swan	Tyler , Donald	534, BERKSHIRE RD, FORRESTFIELD	30/11/2010	30/11/2020
GWL 000172423 (001)	96800	Perth	Perth South Confined	Perth - Leederville.	Macmahon Contractors Pty Ltd		4/01/2011	7/01/2013
GWL 000172427 (001)	9175	Perth	Shire of Mundaring	Combined - Fractured Rock West - Fractured Rock	ROMAN CATHOLIC ARCHBISHOP OF PERTH	200, INNAMINCKA RD, GREENMOUNT	2/12/2010	2/12/2020
GWL 000173475 (001)	15340	Perth	Shire of Mundaring	Perth - Superficial Swan	Whitehouse Nominees Pty Ltd	203, HELENA VALLEY RD, HELENA VALLEY	22/06/2011	22/06/2021
GWL 000174323 (001)	5200	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	527, BERKSHIRE RD, FORRESTFIELD	13/01/2012	13/01/2014

Appendix E – MDWES Groundwater Abstraction Operational Report (GWAP)

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OPERATING STRATEGY

Groundwater Abstraction for Dust Suppression and Surface Compaction

Lot 20 Adelaide Street, Hazelmere

PREPARED FOR:

Wasterock Pty Ltd

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Synopsis:	This document has been prepared to detail the management of proposed groundwater abstraction operations during proposed site works, of Acid Sulfate Soil treatment, remediation, waste excavation and inert fill importation at Adelaide Street, Hazelmere

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Table of Contents

1 Introduction 2
2 Objectives 2
3 ADMINISTRATIVE REQUIREMENTS 3
3.1 Site Water License 3
3.2 Development timeframe 3
3.3 Previous Investigations of the Water Source 3
3.4 Water Resource Management Plan 3
3.5 Responsible Contact for Implementing the Operating Strategy 3
3.6 Reporting Dates for Meters and Compliance 4
3.7 Major Review of Operating Strategy 4
4 WATER SOURCE DESCRIPTION 1
4.1 Site Location and Water Source Condition 1
4.2 Geology 3
4.3 Acid Sulfate Soils 3
4.4 Groundwater 6
4.5 Hydrogeology 8
4.6 Nearby Groundwater Users and Receptors 10
4.7 Previous Groundwater Monitoring 12
4.8 Groundwater Monitoring Criteria 13
4.9 Groundwater Monitoring Tables 14
4.10 Groundwater Monitoring Levels Summary 19
4.11 Groundwater Monitoring Results Summary 19
4.12 Groundwater Monitoring Discussion 22
4.13 Previous Groundwater Modelling 23
4.14 Groundwater Modelling Characteristics Adopted 23
4.15 Groundwater Modelling Results 23
4.16 Groundwater Modelling Discussion 27
5 IDENTIFYING AND MANAGING IMPACTS 28
5.1 Changes to Water Quality 29
5.2 Timeframe for Proposed Abstraction 29
5.3 Dewatering Rates 29
5.4 Radius of Influence 30
6 OPERATING RULES 31
6.1 Abstraction Bore Network 31
7 MONITORING AND REPORTING 32
7.1 Environmental Performance Indicators 35
8 CONTINGENCY PROGRAM 37
8.1 Groundwater Quality 37
8.2 Groundwater Drawdown 37
8.3 Destruction of Groundwater Wells or Damage to Infrastructure 37
8.4 Dust Suppression/Soil Compaction or Discharge Effluent Quality 37
9 STATUTORY REQUIREMENTS 38
10 COMMUNITY CONCERNS REPORTING 38
11 WATER USE EFFICIENCY 38
12 SUMMARY LIST OF COMMITTMENTS 38
Summary Monitoring Program 39
REFERENCES 40

List of Tables

Table 1 Regional Geological Summary ... 3
Table 2 Groundwater Source Description ... 7
Table 3 Groundwater Level Depths and Changes (May – August 2012) ... 14
Table 4 Groundwater Results for GME#1 ... 15
Table 5 Groundwater Results for GME#2 ... 17
Table 6 Issues and Management Strategies for Proposed Abstraction ... 28
Table 7 Rules for Operating Groundwater Abstraction bores ... 31
Table 8 Water Use Measurement ... 33
Table 9 Water Level Monitoring ... 33
Table 10 Water Quality Monitoring ... 34
Table 11 Summary of Assessment Criteria. ... 36

List of Figures

Figure 1 Regional Site Map ... 1
Figure 2 Site Map and Monitoring Well Locations ... 2
Figure 3 Acid Sulfate Soils Risk Map ... 5
Figure 4 Groundwater and Aquifer Depths. ... 9
Figure 5 Bush Forever and Wetlands Map. ... 11
Figure 6 Modelled Drawdown after 3 years of GW Abstraction ... 24
Figure 7 Drawdown Recovery: (A) One, (B) Two, (C) Five and (D) Ten - Years Following Abstraction ... 26

List of Appendices

Appendix A Bore Installation Logs and Geology
Appendix B DoW Online Search for Groundwater Licensees
Appendix C Survey Report following Monitoring Well Installation

1 Introduction

This Operating Strategy (OS) has been prepared to manage proposed groundwater abstraction, to obtain water for use in dust suppression and surface compaction during the development works taking place at Lot 20 Adelaide Street, Hazelmere (herein referred to as the Site). The proposed development involves the transformation of current land use at the Site - from a closed landfill facility into industrial / commercial use (lot subdivision).

The Site occupies an area of approximately 16.95 Ha. Surface and sub-soil consists of Bassendean sands, with limonite-cemented sand (coffee rock) occurring throughout most of the property near the water table. Groundwater abstraction will be required from three proposed abstraction bores planned for the south western corner of the Site. Groundwater levels obtained from existing site observation bores vary from approximately 5.8 to 11 mAHD. Groundwater abstraction of 300 ML/yr for a four to five year duration is required for dust suppression and surface compaction. Abstraction will be shared equally across the three locations, for storage in two 50,000 L tanks and discharge through a standpipe into water carts as needed.

Under Section 5C of the *Rights in Water and Irrigation Act 1914* (RIWI Act), the approval and granting of a groundwater abstraction licence is required from the Department of Water (DoW) before abstraction can commence from the new bores, and an OS must also be prepared, approved and implemented. MDWES was consequently engaged by Wasterock Pty Ltd (the Client) to prepare this report.

Reference is made to the following Groundwater Monitoring Events GME#1 and GME#2 undertaken by MDWES in May 2012 and September 2012 respectively. These reports should be read in conjunction with this operation strategy report.

2 Objectives

This OS has been prepared in order to minimise impacts to the local environment from dust suppression and surface compaction related activities, resulting in the abstraction and removal of groundwater from beneath the Site.

The objectives of this OS are to:

- Protect life and well-being of humans and other forms of life, aesthetic enjoyment and local amenity in the region of the Site;
- Ensure development is consistent with the principles of ecologically sustainable development and the rehabilitation schedule prescribed;
- Comply with relevant statutory environmental requirements; and,
- Provide strategies aimed at reducing avoidable environmental harm during site rehabilitation.

3 ADMINISTRATIVE REQUIREMENTS

3.1 Site Water License

There is currently no Section 5C (of the RWI Act) water license applicable to the Site. An application to acquire a water license to cover the proposed groundwater abstraction activities will accompany this OS for submission to the DoW for approval.

3.2 Development timeframe

There are no set stages for the remediation of the Site. It is anticipated that this will commence in early 2013. Construction and commission of abstraction bores (WRPB1, WRPB2 and WRPB3) is expected to take approximately 8 weeks, along with the equipping of bore head works, generators, pipes and water meters. Mobilisation of two 50,000 L storage tanks will also occur during this timeframe. Abstraction is assumed to be continuous for three (3) years.

3.3 Previous Investigations of the Water Source

In May 2012, six monitoring bores were installed by MDWES and two sampling rounds followed, as discussed in Section 2. A study of regional geology was completed by Davidson (1995) some of which is discussed in Section 2. A regional hydrogeological study by Davidson and Yu (2006) is referred to in Sections 2 and Section 3, along with a site investigation completed by Dames and Moore (2006). No hydrogeological investigation has been completed thus far for the Site. Groundwater modelling was completed by NTEC (2012).

3.4 Water Resource Management Plan

No plan is currently in place to manage abstracted water at the Site. This OS will be reviewed by the DoW following the approval of the Section 5C water license.

3.5 Responsible Contact for Implementing the Operating Strategy

Name:	Peter Moltoni
Position:	Director
Organisation:	Wasterock Pty Ltd
Phone:	0403569546
Email:	pmoltoni@moltoni.com.au

3.6 Reporting Dates for Meters and Compliance

At this stage, water quality data will be obtained monthly from monitoring bores and abstraction bores, as well as the storage tank outlet at the Site. Water meter totals will be captured monthly from the head works of the abstraction bores and also on the storage outlet line to the Standpipe. All results will be reported to the DoW within seven (7) days of the end to the annual groundwater licensing period. The water year is defined as 12 months from the last day in the month from when the water license is issued. Refer to Strategic policy 5.03: *Metering the taking of water* (2009) for further details. Monitoring/recording dates will be determined by the DoW.

Annual reports on compliance and commitments of the water license and the OS will be due within eight (8) weeks of the end to the annual groundwater licensing period. Refer to Operational Policy 5.12: *Hydrogeological reporting associated with a groundwater well licence (*2009) for further information. Reporting dates will be determined by the DoW.

3.7 Major Review of Operating Strategy

The review of the strategy is scheduled to occur three months before the end to the annual groundwater licensing term. Any changes to the OS approved by the DoW will be retained within the working file for the licence documentation. The exact details of the annual groundwater licensing term, expiry date and reporting date will be specified in the conditions of Section 5C water licence, once issued by the DoW.

4 WATER SOURCE DESCRIPTION

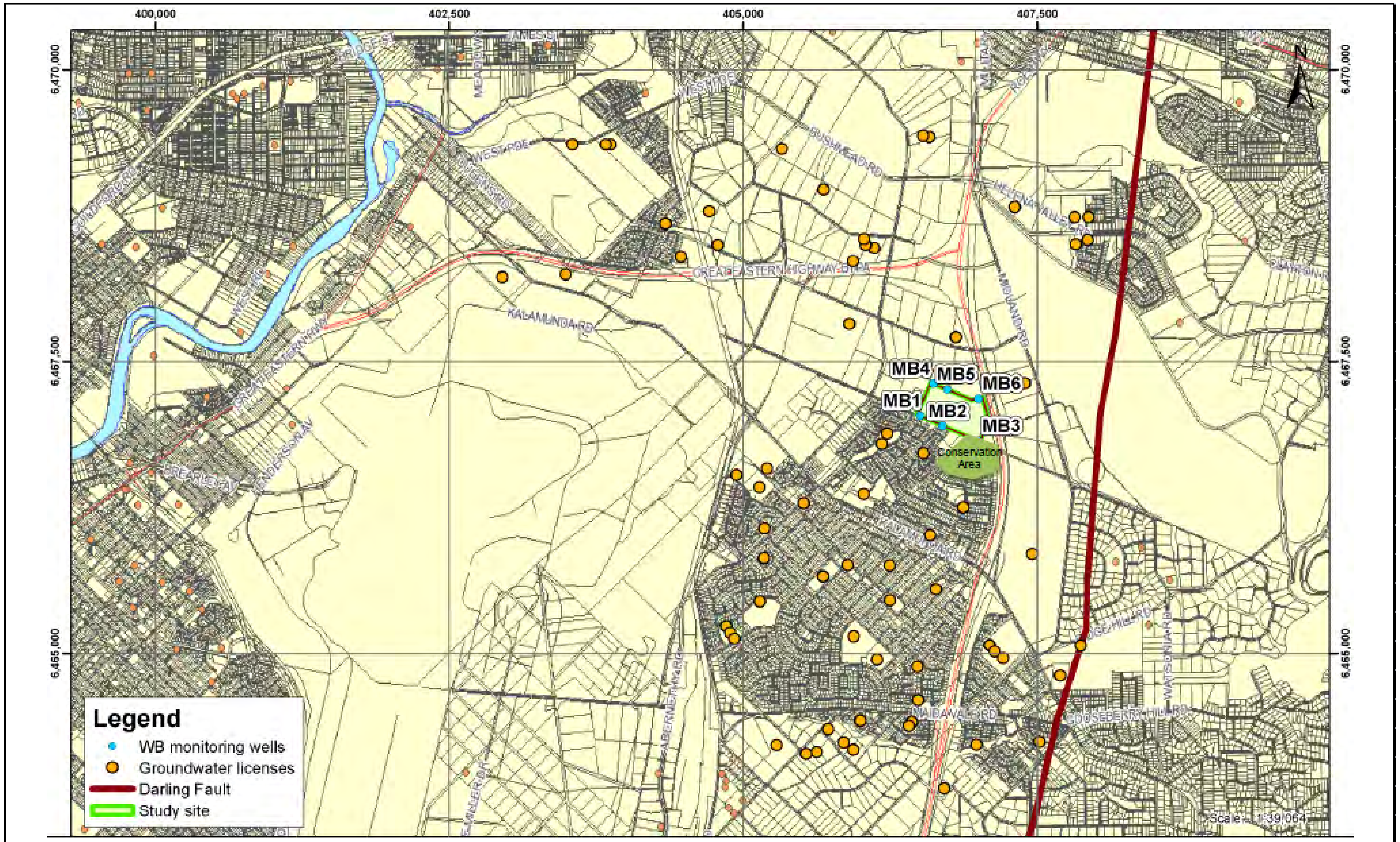
4.1 Site Location and Water Source Condition

The Site is located at Lot 20 Adelaide Street, Hazelmere within the City of Swan, approximately 14 km east north east of the Perth CBD, 6 km east of the Swan River and 1 km west of the Darling Fault (Figure 1). It is currently vested with Hazelland Pty Ltd and has been so since 2006 under the Land Title City of Swan Location Lot 20 Volume 2054 / Folio 299.

The Site covers an area of approximately 16.95 Ha, bounded by Adelaide Street to the south, and Roe Highway to the east (Figure 2). Semi-rural properties containing discarded farming, market gardens and horse trotting tracks/stables flank the Site to the north, with a small operational industrial site (ice works) functioning adjacent to the western boundary, adjacent to the newly proposed abstraction bores.

Current topography varies across the Site from approximately RL 33 mAHD at the top of the inert fill mounds in the north east sector, to approximately RL 27 mAHD at the south, adjacent to Adelaide Street.

Figure 1 Regional Site Map



MDW ENVIRONMENTAL SERVICES	Projection Coordinate System: GDA-1994: MGA Zone 50	N	Figure 1: Regional Site Map Project: Hazelland Landfill	Scale: 1 : 26,260
	Unit 1, 22 Elmsfield Road, Midvale 6056 Ph (08) 9250 6960 Fax (08) 9250 8269 www.environmentalservices.com.au		Job No: E2012-031 Date: 28/09/2012 Source NTEC Environmental Technologies	

Figure 2 Site Map and Monitoring Well Locations

4.2 Geology

According to the Geological Survey of Western Australia (1986) *Perth part sheets 2034 I and 2034 II, 1:50,000 Environmental Geology Series*, surface geology of the Site is made up of Quaternary aged Bassendean Sand, interlayered with bands of Guildford Clay. The regional geology is described below in Table 1.

Table 1 Regional Geological Summary

Geological Unit	Description	Expected Depth Interval
Bassendean Sand	• Colour is pale grey to white; • Grain size is fine to coarse but mostly medium grained, with an upward progression of fines; • Sorting is moderate; • Rounding is subrounded to rounded (quartz sand).	Surface to 80 mBGL

The superficial geology of the Site is Bassendean Sand, unconformably overlying the Cretaceous and Tertiary units. Bassendean Sands interfinger Guildford Clays in the east and conformably overlie Gnangara Sands. Colluvium exists to the east of the Site at the edge of the Darling Fault. The stratigraphic configuration of the Bassendean Sand with the Guildford Clay and Gnangara Sand suggests the formation was deposited under changing conditions, most likely alternating between fluvial, estuarine and shallow-marine environments (Davidson, 1995). To the north and west, surface geology comprises Guildford Clay.

An *Initial Contamination Assessment of Inert Landfill* was conducted for the Site by Dames and Moore (1992). The results of this investigation are compiled in the report entitled *"Site Investigation, Former Adelaide Street Landfill Lot 20 Adelaide St, Hazelmere, Western Australia"* (Parsons and Brinkerhoff, 2006).

Drilling logs from boreholes completed as part of the Dames and More investigation identified subsurface ground conditions that confirmed the following:

- Sand occurs within 1.2 m or less of the surface in the western and northern areas of the Site, extending to depths of up to 12 m, and;
- Sandy clays and clayey sands were observed near the surface towards the south eastern end of the Site, underlain by sand.

4.3 Acid Sulfate Soils

The DEC ASS Risk Map obtained from the WA Groundwater Atlas (DoW, 2004) indicates that the entire Site is located within a Class 2 zone – designated as moderate to low risk of ASS occurring in the first 3 m of natural soil surface, and high to moderate risk of ASS occurring beyond 3 m of natural soil. An area of high to moderate ASS risk exists approximately 370 m west of the Site (Figure 3).

Field results indicate that the groundwater beneath the site varies from fresh to mildly acidic, with pH ranging from 5.83 to 7.41 (MDWES, 2012). This is an acceptable range of pH in groundwater, present within this locality.

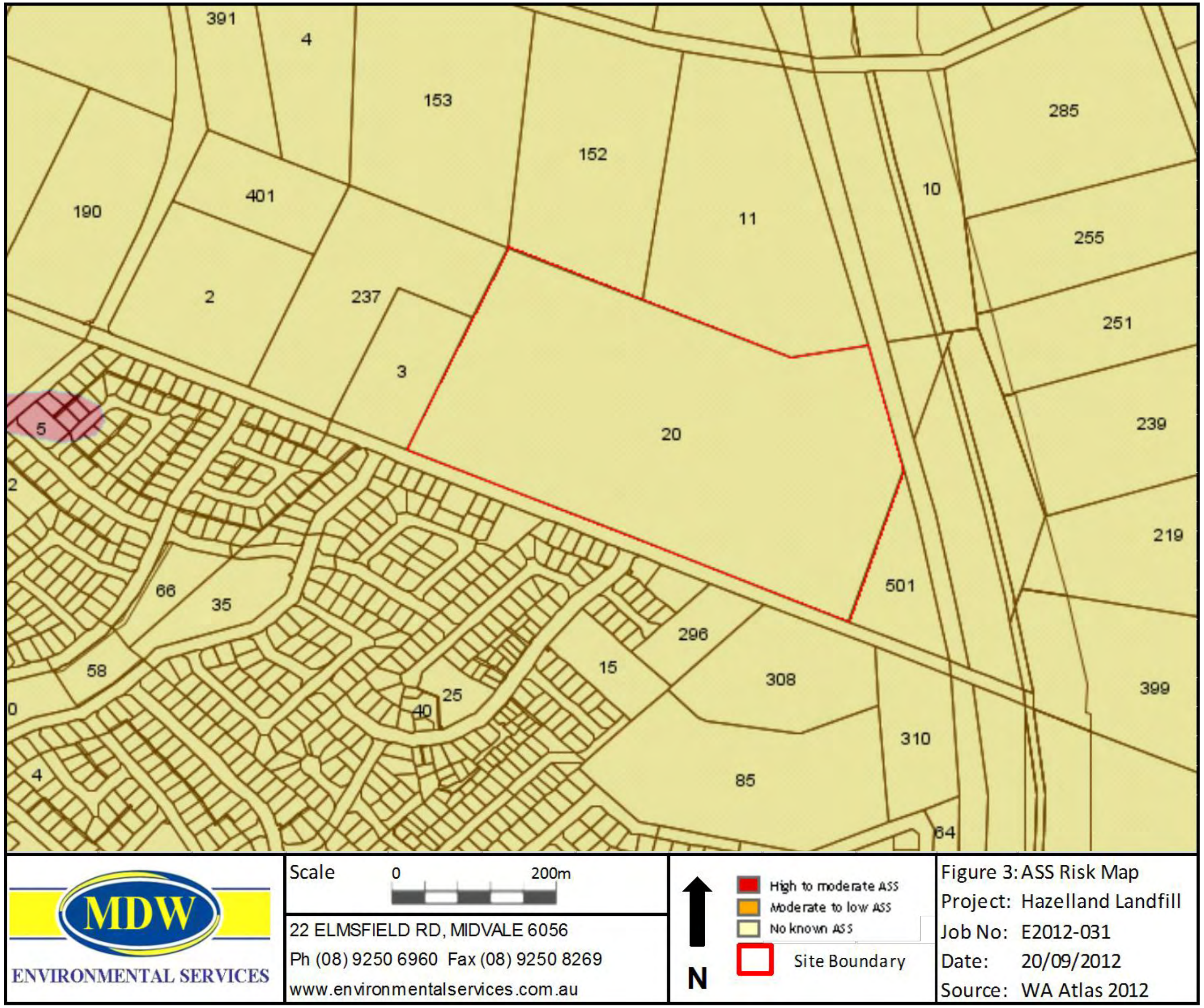


Figure 3 Acid Sulfate Soils Risk Map

4.4 Groundwater

Groundwater comprises the primary source of water at the Site as there are no intersecting streams or surface water bodies. The Perth Groundwater Atlas (2003 contours) indicate that groundwater is encountered on average at approximately RL 14 – 16 mAHD (DoE, 2004). Details of monitoring bore locations, proposed abstraction points, construction and geology are included in Table 2.

The water distribution network at the Site will comprise of the following components:

- Three (3) abstraction/pumping bores;
- Groundwater pumps (1.5 kW capacity) installed in each bore;
- Head works attached to each pumping bore, installed with water meters (with totaliser/rate) and outlets for groundwater quality/quantity monitoring if required;
- Individual generators for each head works - to provide power to each groundwater pump;
- Two (2) 50,000 L above groundwater storage tanks, with standpipe connected to an outlet junction from both, and;
- 150 mm pipe to direct abstracted water from bores to the storage tanks.

The abstracted groundwater is the only source of natural water at the Site.

Table 2 Groundwater Source Description

Bore name Monitoring Well (MW) or Production Bore (PB)	Locational Coordinates: Zone: GDA		Aquifer name	Elevation (mAHD) of TOC	Casing height (cm)	Depth to bottom (m)	Const. details (bore logs and geology attached in Appendix B)
	Easting	Northing					
1. WRM W1	406504.4	6467036.79	Superficial Swan Aquifer	27.281	45	6.650	Casing 0 – 3.0 mBGL Screen 3.0 – 6.0 mBGL
2. WRM W2	406693.90	6466947.24		30.607	68	10.443	Casing 0 – 6.0 mBGL Screen 6.0 – 9.5 mBGL
3. WRM W3	406997.15	6466823.95		34.622	51	14.580	Casing 0 – 6.0 mBGL Screen 6.0 – 14.5 mBGL
4. WRM W4	406617.75	6467311.73		27.751	64	11.122	Casing 0 – 6.0 mBGL Screen 6.0 – 10.0 mBGL
5. WRM W5	406731.40	6467262.78		29.034	56	12.162	Casing 0 – 6.0 mBGL Screen 6.0 – 12.0 mBGL
6. WRM W6	406998.45	6467183.20		31.611	65	9.895	Casing 0 – 6.0 mBGL Screen 6.0 – 10.0 mBGL
7. WRPB 1	TBA	TBA		TBA	TBA	TBA	TBA
8. WRPB 2	TBA	TBA		TBA	TBA	TBA	TBA
9. WRPB 3	TBA	TBA		TBA	TBA	TBA	TBA

Groundwater levels measured in monitoring bores WRMW1- WRMW6 were RL 19.2 - 23.6 mAHD in May, 2012, with levels potentially varying by 0.1 – 0.7 m from May to August (Table 3). The most proximate WIN data site with historical groundwater monitoring data is 61610508, located over 8 km from the Site. Water levels fluctuated at this location by over 2.8 m during the year period 2000 – 2013 and show a declining trend from around year 1970.

The natural topography of the Site is generally flat, with the lowest elevations in the west and north west, increasing in the east. Consequently, depths to water from the surface vary from 3.7 – 11.8 mBGL. Groundwater is predicted to flow in a north west direction, originating from the Darling Ranges to the east. It passes beneath the Site, heading towards two wetlands, located approximately 1.5 km to the north west (DoE, 2004) and eventually reaches the Swan River, the most proximate river system located about 6 km to the east.

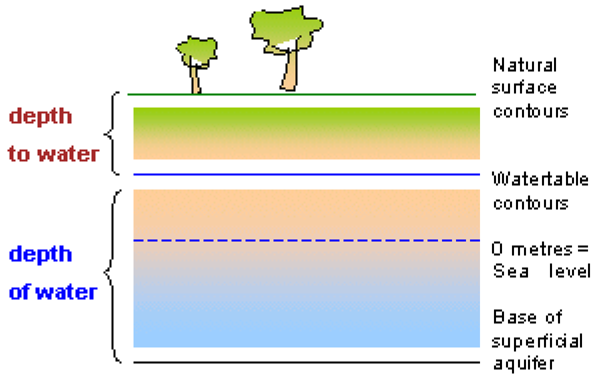
4.5 Hydrogeology

The uppermost aquifer underlying the region of the Site is the unconfined Superficial Swan Aquifer (Water Register, 2012). Leederville and Yarragadee North aquifers underlie the Superficial. The base of the Superficial Swan Aquifer is mapped (DoE, 2004) indicating a depth of 5 – 7 mAHD at the Site, sloping upwards towards the Darling Fault and downwards towards the Swan River in the west (NTEC, 2012) with an estimated thickness of 10 – 25 m (Davidson and Yu, 2006). The maximum thickness is around 26 m at the Site (Figure 4).

Figure 4 Groundwater and Aquifer Depths

Depth to water: 21.0 metres*

Depth of water: 10.0 metres



The above figures were calculated from the following values which were extracted from the three surfaces at location 116.01490 degrees East and 31.92901 degrees South **

Levels relative to ground level

Watertable:	21.0 metres
Base of Aquifer:	31.0 metres

Levels relative to AHD (Australian Height Datum)

Natural Surface Level:	36.0 metres
Watertable Level:	15.0 metres
Base of Aquifer Level:	5.0 metres

Based on the groundwater levels (Table 3), the hydraulic gradient of the Superficial Swan Aquifer at the Site is approximately 0.01 (NTEC, 2012) sloping downwards along a transect - that dips in the direction of the flux (to the north west corner of the Site). Regional investigations (Davidson and Yu, 2006) indicate that groundwater flow rate (or transmissivity) travelling through the Superficial Swan Aquifer ranges from 50 m/yr to over 1000 m/yr, with Site conditions likely to comprise the lower end of this range. Salinity in the Cloverdale area of the Superficial Aquifer beneath the surface, ranges from 500 to 1000 mg/L (DoE, 2004 and MDWES, 2012) which classifies groundwater quality as being fresh to mildly acidic at the Site.

The Superficial Swan Aquifer is recharged by natural rainfall, with 192 mm/yr being the net rainfall recharge to the Bassendean Sands according to DoW modelling (Xu et al., 2008). The Superficial Swan aquifer recharge rate is expected to be very similar or even the same as those of other underlying aquifers (Davidson and Yu, 2006).

Previous investigations indicate that prior to land use as a sand mine in the late 1970s and as a waste transfer station in the early 1980s, there may be two distinct aquifers occurring at the Site - an upper unconfined superficial aquifer, overlying a deeper aquifer that is potentially confined in parts. The aquifers may have been separated by naturally occurring clay layers from approximately RL 6 and RL 1 mAHD. It is understood that due to sand mining and landfill operations, the surface substrate was excavated to a depth of approximately RL -2 mBGL. This is likely to have removed the upper aquifer and confining clay layers, to expose the lower aquifer at surface level in the central portion of the Site.

In the area proposed for abstraction, clay is still present in the ground. The monitoring bore installations completed by MDWES in May, 2012 revealed some red clay banding at depths below the current site surface RL at WRMW1, from 4 – 6 mBGL. These bands may still be acting as confining or semi confining layers between the yellow sands, creating multiple aquifers.

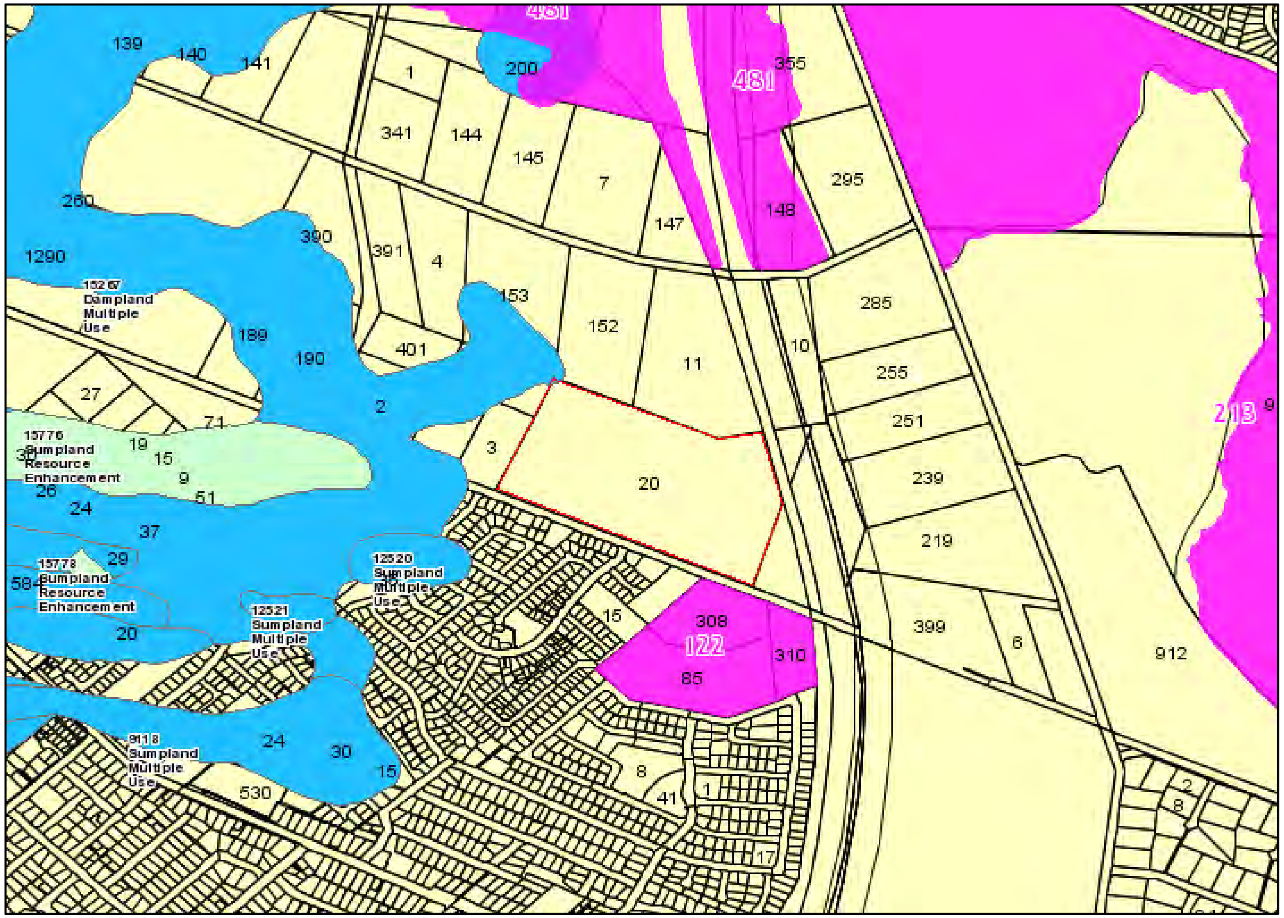
4.6 Nearby Groundwater Users and Receptors

A search was undertaken on 16th April, 2012 for existing groundwater abstraction licenses within a 5 km radius of the Site (Appendix C). Nine groundwater licenses were granted within 1.5 km of the Site:

- GWL 000061690(002), GWL 000110971(002) and GWL 000152680(003) are north of Adelaide Street, and;
- GWL 000074457(003), GWL 000153812(001), three under GWL 000158077(005), GWL 000167041(001) and GWL 169011(003) are south of Adelaide Street and north of Kalamunda Road.

Each of these licenses are for the purpose of abstraction from the Superficial Swan Aquifer except for GWL 000110971(002) which takes water from the Leederville Aquifer.

Bush Forever Site #122 (Government of Western Australia, 2000) is located south east of the Site that is outlined in red, beyond Adelaide Street (Figure 5). Despite not being identified as a groundwater dependent ecosystem, it is suggested to be a Flora Conservation Area for plant communities representative of the Swan Coastal Plain. Multiple Use Wetland (MUW) also intersects the north west corner of the Site (Figure 5) though this area has been largely modified by human activity and is not considered susceptible to the groundwater abstraction planned for the Site.



Scale: 1 : 7,660

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Figure 5:	Bush Forever and Wetlands Map
Project:	Hazelland Landfill
Job No:	E2012-031
Date:	28/09/2012
Source	WA Atlas 2012 - Landgate SLIP

KEY:
- Bush Forever 2012
- Muliple Use Wetland
- Resource Enhancement

MDW ENVIRONMENTAL SERVICES

Figure 5 Bush Forever and Wetlands Map

4.7 Previous Groundwater Monitoring

A groundwater investigation was completed by MDWES on 18th October, 2012 (GME#1), with sampling completed from six groundwater wells, WRMW1 – WRMW6, also installed by MDWES (results in Table 4). The results of this investigation are compiled in the report entitled *"Groundwater Investigation Report –Lot 20 Adelaide Street Hazelmere"* (MDWES, 2012).

A second round of groundwater sampling (GME#2) followed on 30th August, 2012 (results in Table 5). The locations of the groundwater monitoring wells are shown in Figure 2.

4.8 Groundwater Monitoring Criteria

To determine background groundwater quality at the Site, and indication of the likely condition of groundwater proposed for abstraction, dust suppression and soil compaction, water quality results for GME#1 and GME#2 were compared against criteria outlined within the DEC's *Contaminated Site Management Series - Assessment Levels for Soil, Sediment and Water* (DEC, 2010).

Laboratory results were compared against the following criteria;

- Freshwater Ecosystem Trigger Values, Marine Ecosystem Trigger Values, Short-term Irrigation Water and the Long-term Irrigation Water from the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* prepared by the Australian and New Zealand Environment and Conservation Council (ANZECC, 2000);
- Drinking Water Health Value and Drinking Water Aesthetic Value from the *Australian Drinking Water Guidelines* (NHMRC & ARMCANZ, 2004); and,
- Domestic Non-potable Groundwater Use from the Department of Health's (DoH) Contaminated Sites Reporting Guideline for Chemicals in Groundwater (DoH, 2006).

On 18th August, 2011, WRMW1 – WRMW6 were analysed for water quality, total metals, nutrients, Organophosphate and Organochlorine (OP and OC) pesticides, Volatile Organic Compounds (VOCs), Monocyclic Aromatic Hydrocarbons (MAHs), oxygenated compounds, sulfonated compounds, halogenated aliphatic and aromatic compounds, trihalomethanes, phenolic compounds, Polynuclear Aromatic Hydrocarbons (PAHs), and Total Petroleum Hydrocarbons (TPHs).

Following a number of artificial exceedences for total metals (due to high suspended solids values), dissolved metals were included for a more representative metals analysis in GME#2 on 26th August, 2012.

4.9 Groundwater Monitoring Tables

Table 3 Groundwater Level Depths and Changes (May – August 2012)

Well I.D.	Date	Ground Level	Water Level	
		RL mAHD	mBGL	RL mAHD
WRMW1	18/05/2012	-0.245	3.700	23.581
	30/08/2012		3.455	23.826
WRMW2	18/05/2012	-0.406	7.666	22.941
	30/08/2012		7.260	23.347
WRMW3	18/05/2012	-0.121	11.846	22.776
	30/08/2012		11.725	22.897
WRMW4	18/05/2012	-0.719	8.509	19.242
	30/08/2012		7.790	19.961
WRMW5	18/05/2012	-0.556	8.836	20.198
	30/08/2012		8.280	20.754
WRMW6	18/05/2012	0.456	8.759	22.852
	30/08/2012		9.215	22.396

Table 4 Groundwater Results for GME#1

Analyte grouping/Analyte	Units	ANZECC & ARMCANZ (2000)[1]		ADWG (2004)[2]		DOH (2006)[3]	ANZECC & ARMCANZ (2000)[1]		18/05/2012	18/05/2012	18/05/2012	18/05/2012	18/05/2012	18/05/2012
		Fresh Waters[4]	Marine Waters[4]	Drinking Water Health Value (HV)	Drinking Water Aesthetic Value (AV)	Domestic non-potable groundwater use	Short-term Irrigation Water	Long-term Irrigation Water[5]	WRMW1	WRMW2	WRMW3	WRMW4	WRMW5	WRMW6
pH Value	pH Unit	6.5-8.5	8.0-8.4		6.5-8.5			6.0-8.5	6.58	6.14	7.41	6.04	5.86	5.83
Electrical Conductivity	µS/cm								635	307	1070	354	449	808
Total Dissolved Solids	mg/L								434	244	704	226	341	492
Suspended Solids	mg/L								582	292	425	144	59	50
Turbidity	NTU								166	236	383	86.9	137	76.6
Total Alkalinity $CaCO_3$	mg/L								43	17	292	5	5	38
Acidity as $CaCO_3$	mg/L								15	26	16	8	13	22
Sulfate as SO_4^{2-}	mg/L			500	250	5000			105	13	40	17	19	173
Chloride	mg/L				250	2500			134	80	216	89	132	124
Total Metals														
Aluminium	mg/L	0.055			0.2	2	20	5	11.1	16.2	34.4	4.3	10	0.74
Arsenic	mg/L	0.013		0.01		0.07	2	0.1	<0.001	<0.001	0.01	0.001	0.001	<0.001
Cadmium	mg/L	0.0002	0.0007	0.002		0.02	0.05	0.01	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001
Chromium	mg/L						1	0.1	0.007	0.016	0.047	0.004	0.005	<0.001
Copper	mg/L	0.0014	0.0013	2	1	20	5	0.2	0.004	0.07	0.032	0.005	0.005	0.002
Lead	mg/L	0.0034	0.0044	0.01		0.1	5	2	0.013	0.017	0.087	0.011	0.015	0.007
Manganese	mg/L	1.9		0.5	0.1	5	10	0.2	0.006	0.026	0.191	0.016	0.01	0.034
Molybdenum	mg/L			0.05		0.5	0.05	0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	mg/L	0.011	0.02	0.02		0.2	2	0.2	0.002	0.005	0.014	0.001	0.003	0.002
Selenium	mg/L	0.005		0.01		0.1	0.05	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Silver	mg/L	0.00005	0.0014	0.1		1			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	mg/L	0.008	0.015		3	30	5	2	0.008	0.08	0.068	0.017	0.011	0.012
Iron	mg/L	0.3	1.0 / 0.35		0.33	3	10	0.2	0.29	4.82	11.9	0.88	0.49	10.4
Mercury	mg/L	0.00006	0.0001	0.001		0.01	0.002	0.002	0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nutrients														
Ammonia as N	mg/L	0.9	0.91						0.06	0.36	0.03	0.11	0.01	1.64
Nitrite as N	mg/L			3.0		30			0.03	0.02	<0.01	0.01	0.04	0.05
Nitrate as N	mg/L			50		500			5.15	0.62	0.17	3.75	0.45	0.17
Kjeldhal Nitrogen	mg/L								0.5	0.5	0.3	0.5	0.1	1.6
Total Nitrogen	mg/L	1.0 / 2.0[1]							5.7	1.1	0.5	4.3	0.6	1.8
Total Phosphorus	mg/L	0.1 / 0.2[1]							0.01	0.15	0.24	0.04	0.02	0.03
Reactive Phosphorus	mg/L								<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Sulfide	mg/L	0.001							0.1	<0.1	<0.1	<0.1	<0.1	<0.1
COD	mg/L								18	16	155	11	9	25
BOD	mg/L								<2	3	69	4	3	26
Organochlorine Pesticides (OC)														
alpha-BHC	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene (HCB)	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
beta-BHC	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
gamma-BHC	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
delta-BHC	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Heptachlor	µg/L	0.01							<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Aldrin	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Heptachlor epoxide	µg/L			0.05	0.3	3			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
trans-Chlordane	µg/L	0.03 [2]		0.01	1	10			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
alpha-Endosulfan	µg/L	0.03 [3]	0.005 [3]	0.05	30	30			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
cis-Chlordane	µg/L	0.03 [2]		0.01	1	10			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dieldrin	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDE	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Endrin	µg/L	0.01	0.004						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
beta-Endosulfan	µg/L	0.03 [3]	0.005 [3]						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDD	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Endrin aldehyde	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Endosulfan sulfate	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDT	µg/L	0.006		0.06	30	0.1			<2	<2	<2	<2	<2	<2
Endrin ketone	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Methoxychlor	µg/L								<2	<2	<2	<2	<2	<2
Aldrin plus dieldrin	µg/L			0.010	0.3	3			<1	<1	<1	<1	<1	<1
Organophosphorus Pesticides (OP)														
Dichlorvos	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Demeton-S-methyl	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Monocrotophos	µg/L								<2	<2	<2	<2	<2	<2
Dimethoate	µg/L	0.15			50	50			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Diazinon	µg/L	0.01		1	3	1			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos-methyl	µg/L	0.01	0.009		10	100			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Parathion-methyl	µg/L								<2	<2	<2	<2	<2	<2
Malathion	µg/L	0.05							<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fenthion	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos	µg/L	0.01	0.009						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Parathion	µg/L	0.004			10	10			<2	<2	<2	<2	<2	<2
Pirimphos-ethyl	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorfenvinphos	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromophos-ethyl	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fenamiphos	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Prothiofos	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethion	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Carbophenothion	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Azinphos Methyl	µg/L	0.02							<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Monocyclic Aromatic Hydrocarbons														
Benzene	µg/L	0.95	0.5	0.001		0.01			-	-	-	-	-	-
Toluene	µg/L			0.80	0.025	0.025			-	-	-	-	-	-
Ethylbenzene	µg/L			0.30	0.003	0.003			-	-	-	-	-	-
meta- & para-Xylene	µg/L	200							-	-	-	-	-	-
Styrene	µg/L			0.03	0.004	0.004			<5	<5	<5	<5	<5	<5
ortho-Xylene	µg/L	350							-	-	-	-	-	-
Isopropylbenzene	µg/L								<5	<5	<5	<5	<5	<5
n-Propylbenzene	µg/L								<5	<5	<5	<5	<5	<5
1.3.5-Trimethylbenzene	µg/L								<5	<5	<5	<5	<5	<5
sec-Butylbenzene	µg/L								<5	<5	<5	<5	<5	<5
1.2.4-Trimethylbenzene	µg/L								<5	<5	<5	<5	<5	<5
tert-Butylbenzene	µg/L								<5	<5	<5	<5	<5	<5
p-Isopropyltoluene	µg/L								<5	<5	<5	<5	<5	<5
n-Butylbenzene	µg/L								<5	<5	<5	<5	<5	<5
Oxygenated Compounds														
Vinyl Acetate	µg/L								<50	<50	<50	<50	<50	<50
2-Butanone (MEK)	µg/L								<50	<50	<50	<50	<50	<50
4-Methyl-2-pentanone (MIBK)	µg/L								<50	<50	<50	<50	<50	<50
2-Hexanone (MBK)	µg/L								<50	<50	<50	<50	<50	<50

Sulfonated Compounds														
Carbon disulfide	µg/L								<5	<5	<5	<5	<5	<5
Fumigants														
2.2-Dichloropropane	µg/L								<5	<5	<5	<5	<5	<5
1.2-Dichloropropane	µg/L								<5	<5	<5	<5	<5	<5
cis-1.3-Dichloropropylene	µg/L								<5	<5	<5	<5	<5	<5
trans-1.3-Dichloropropylene	µg/L								<5	<5	<5	<5	<5	<5
1.2-Dibromoethane (EDB)	µg/L								<5	<5	<5	<5	<5	<5
Halogenated Aliphatic Compounds														
Dichlorodifluoromethane	µg/L								<50	<50	<50	<50	<50	<50
Chloromethane	µg/L								<50	<50	<50	<50	<50	<50
Vinyl chloride	µg/L			0.0003		0.003			<50	<50	<50	<50	<50	<50
Bromomethane	µg/L								<50	<50	<50	<50	<50	<50
Chloroethane	µg/L								<50	<50	<50	<50	<50	<50
Trichlorofluoromethane	µg/L								<50	<50	<50	<50	<50	<50
1.1-Dichloroethene	µg/L			0.03		0.3			<5	<5	<5	<5	<5	<5
Iodomethane	µg/L								<5	<5	<5	<5	<5	<5
trans-1.2-Dichloroethene	µg/L								<5	<5	<5	<5	<5	<5
1.1-Dichloroethane	µg/L								<5	<5	<5	<5	<5	<5
cis-1.2-Dichloroethene	µg/L								<5	<5	<5	<5	<5	<5
1.1.1-Trichloroethane	µg/L								<5	<5	<5	<5	<5	<5
1.1-Dichloropropylene	µg/L								<5	<5	<5	<5	<5	<5
Carbon Tetrachloride	µg/L								<5	<5	<5	<5	<5	<5
1.2-Dichloroethane	µg/L			0.003		0.03			<5	<5	<5	<5	<5	<5
Trichloroethene	µg/L								<5	<5	<5	<5	<5	<5
Dibromomethane	µg/L								<5	<5	<5	<5	<5	<5
1.1.2-Trichloroethane	µg/L	6500	1900						<5	<5	<5	<5	<5	<5
1.3-Dichloropropane	µg/L								<5	<5	<5	<5	<5	<5
Tetrachloroethene	µg/L			0.05		0.5			<5	<5	<5	<5	<5	<5
1.1.1.2-Tetrachloroethane	µg/L								<5	<5	<5	<5	<5	<5
trans-1.4-Dichloro-2-butene	µg/L								<5	<5	<5	<5	<5	<5
cis-1.4-Dichloro-2-butene	µg/L								<5	<5	<5	<5	<5	<5
1.1.2.2-Tetrachloroethane	µg/L								<5	<5	<5	<5	<5	<5
1.2.3-Trichloropropane	µg/L								<5	<5	<5	<5	<5	<5
Pentachloroethane	µg/L								<5	<5	<5	<5	<5	<5
1.2-Dibromo-3-chloropropane	µg/L								<5	<5	<5	<5	<5	<5
Hexachlorobutadiene	µg/L								<5	<5	<5	<5	<5	<5
Halogenated Aromatic Compounds														
Chlorobenzene	µg/L			0.30	0.01	0.01			<5	<5	<5	<5	<5	<5
Bromobenzene	µg/L								<5	<5	<5	<5	<5	<5
2-Chlorotoluene	µg/L								<5	<5	<5	<5	<5	<5
4-Chlorotoluene	µg/L								<5	<5	<5	<5	<5	<5
1.3-Dichlorobenzene	µg/L	0.26			0.02	0.02			<5	<5	<5	<5	<5	<5
1.4-Dichlorobenzene	µg/L	0.06		0.04	0.003	0.003			<5	<5	<5	<5	<5	<5
1.2-Dichlorobenzene	µg/L	0.16		1.5	0.001	0.001			<5	<5	<5	<5	<5	<5
1.2.4-Trichlorobenzene	µg/L	0.085	80	0.03	0.005	0.005			<5	<5	<5	<5	<5	<5
1.2.3-Trichlorobenzene	µg/L	0.003		0.03	0.005	0.005			<5	<5	<5	<5	<5	<5
Trihalomethanes														
Chloroform	µg/L								<5	<5	<5	<5	<5	<5
Bromodichloromethane	µg/L								<5	<5	<5	<5	5	<5
Dibromochloromethane	µg/L								<5	<5	<5	**12**	**20**	<5
Bromoform	µg/L								<5	<5	<5	**13**	**22**	<5
Phenolic Compounds														
Phenol	µg/L	320	400						<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chlorophenol	µg/L	340		300	0.1	3000			<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Methylphenol	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
3- & 4-Methylphenol	µg/L								<2.0	**2.6**	<2.0	<2.0	<2.0	<2.0
2-Nitrophenol	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2.4-Dimethylphenol	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2.4-Dichlorophenol	µg/L	120		200	0.3	2000			<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2.6-Dichlorophenol	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
4-Chloro-3-Methylphenol	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2.4.6-Trichlorophenol	µg/L	3		20	2	200			<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2.4.5-Trichlorophenol	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Pentachlorophenol	µg/L	3.6	11						<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Polynuclear Aromatic Hydrocarbons														
Naphthalene	µg/L	16	50						<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthylene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Fluorene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Phenanthrene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Anthracene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Fluoranthene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Pyrene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benz(a)anthracene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chrysene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(b)fluoranthene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(k)fluoranthene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(a)pyrene	µg/L			0.01		0.1			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total Petroleum Hydrocarbons														
C6 - C9 Fraction	µg/L								<20	<20	<20	<20	<20	<20
C10 - C14 Fraction	µg/L								<50	<50	<50	<50	<50	<50
C15 - C28 Fraction	µg/L								<100	<100	<100	<100	<100	**260**
C29 - C36 Fraction	µg/L								<50	<50	**270**	<50	<50	**60**
C10 - C36 Fraction (sum)	µg/L	600 [4]							<50	<50	**270**	<50	<50	**320**

NOTES:
1. SRT Healthy Rivers Action Plan Long Term / Short Term Targets
2. pH > 6 / pH < 6
3. Average EC threshold for pastures in sandy soils
4. Lower guideline limit (upper = 125)
5. Lower guideline limit (upper = 12)

Table 5 Groundwater Results for GME#2

Analyte grouping/Analyte	Units	ANZECC & ARMCANZ		ADWG		DoH	ANZECC & ARMCANZ		30/08/2012	30/08/2012	30/08/2012	30/08/2012	30/08/2012	30/08/2012
		Fresh Waters	Marine Waters	Drinking Water Health Value (HV)	Drinking Water Aesthetic Value (AV)	Domestic non-potable groundwater use	Short-term Irrigation Water	Long-term Irrigation Water	WRMW1	WRMW2	WRMW3	WRMW4	WRMW5	WRMW6
pH Value	pH Unit	6.5-8.5	8.0-8.4		6.5-8.5			6.0-8.5	6.77	5.72	7.83	5.96	5.72	5.87
Electrical Conductivity	µS/cm								716	292	901	144	97	914
Total Dissolved Solids	mg/L								474	169	567	83	56	578
Suspended Solids	mg/L								950	106	1610	9	660	6
Turbidity	NTU								202	32	1120	10.8	854	4
Total Alkalinity $CaCO_3$	mg/L								36	3	157	1	<1	10
Acidity as $CaCO_3$	mg/L								35	42	18	21	11	39
Sulfate as SO_4^{2-}	mg/L			500	250	5000			123	11	18	2	7	203
Chloride	mg/L				250	2500			138	82	219	30	17	153
Dissolved Metals														
Aluminium	mg/L	0.055			0.2	2	20	5	0.09	0.03	0.02	0.06	1.48	0.15
Arsenic	mg/L	0.013		0.01		0.07	2	0.1	<0.001	<0.001	0.002	<0.001	0.001	<0.001
Cadmium	mg/L	0.0002	0.0007	0.00		0.02	0.05	0.01	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001
Chromium	mg/L						1	0.1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	1.9		0.50	0.1	5	10	0.2	0.004	0.003	0.108	0.005	0.005	0.032
Nickel	mg/L	0.011	0.02	0.02		0.2	2	0.2	0.002	0.006	0.003	0.003	0.004	0.004
Selenium	mg/L	0.005		0.01		0.1	0.05	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	mg/L	0.008	0.015		3	30	5	2	0.013	0.025	0.006	0.01	0.021	0.016
Iron	mg/L	0.3	1.0 / 0.3[5]		0.33	3	10	0.2	0.52	0.75	<0.05	<0.05	0.54	0.11
Ferrous Iron	mg/L								0.34	0.76	<0.05	<0.05	0.12	<0.05
Chromium VI	mg/L	0.001	0.0044	0.05		0.5			<0.010	<0.010	<0.010	<0.01	<0.010	<0.010
Total Metals														
Aluminium	mg/L	0.055			0.2	2	20	5	7.69	3.15	24.9	1.61	2.57	0.41
Arsenic	mg/L	0.013		0.01		0.07	2	0.1	<0.001	<0.001	0.007	<0.001	<0.001	<0.001
Cadmium	mg/L	0.0002	0.0007	0.002		0.02	0.05	0.01	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001
Chromium	mg/L						1	0.1	0.005	0.003	0.044	0.001	0.001	<0.001
Copper	mg/L	0.0014	0.0013	2	1	20	5	0.2	0.002	0.005	0.036	0.003	0.015	0.003
Lead	mg/L	0.0034	0.0044	0.01		0.1	5	2	0.015	0.003	0.079	0.005	0.002	0.009
Manganese	mg/L	1.9		0.5	0.1	5	10	0.2	0.004	0.004	0.129	0.006	0.002	0.034
Molybdenum	mg/L			0.05		0.5	0.05	0.01	<0.001	<0.001	0.001	<0.001	<0.001	<0.001
Nickel	mg/L	0.011	0.02	0.02		0.2	2	0.2	0.003	0.006	0.019	0.003	0.002	0.003
Selenium	mg/L	0.005		0.01		0.1	0.05	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Silver	mg/L	0.00005	0.0014	0.1		1			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	mg/L	0.008	0.015		3	30	5	2	0.007	0.079	0.079	0.011	0.007	0.011
Iron	mg/L	0.3	1.0 / 0.35		0.33	3	10	0.2	0.21	2.12	12.4	0.4	0.13	3.21
Mercury	mg/L	0.00006	0.0001	0.001		0.01	0.002	0.002	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nutrients														
Ammonia as N	mg/L	0.9	0.91						0.03	0.03	0.45	0.05	0.06	0.73
Nitrite as N	mg/L			3.0		30			0.02	0.01	0.02	<0.01	<0.01	0.02
Nitrate as N	mg/L			50		500			4.91	1.09	0.31	4.92	2.03	1.43
Kjeldhal Nitrogen	mg/L								1.4	0.3	1.4	1.1	1.5	1.1
Total Nitrogen	mg/L	1.0 / 2.0[1]							6.3	1.4	1.7	6	3.5	2.6
Total Phosphorus	mg/L	0.1 / 0.2[1]							0.19	0.03	0.51	0.12	0.23	0.02
Reactive Phosphorus	mg/L								<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Sulfide	mg/L	0.001							<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
COD	mg/L								14	<5	21	7	<5	30
BOD	mg/L								<2	<2	5	<2	3	2
Organochlorine Pesticides (OC)														
alpha-BHC	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene (HCB)	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
beta-BHC	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
gamma-BHC	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
delta-BHC	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Heptachlor	µg/L	0.01							<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Aldrin	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Heptachlor epoxide	µg/L			0.05	0.3	3			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
trans-Chlordane	µg/L	0.03 [2]		0.01	1	10			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
alpha-Endosulfan	µg/L	0.03 [3]	0.005 [3]	0.05	30	30			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
cis-Chlordane	µg/L	0.03 [2]		0.01	1	10			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dieldrin	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDE	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Endrin	µg/L	0.01	0.004						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
beta-Endosulfan	µg/L	0.03 [3]	0.005 [3]						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDD	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Endrin aldehyde	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Endosulfan sulfate	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDT	µg/L	0.006		0.06	30	0.1			<2	<2	<2	<2	<2	<2
Endrin ketone	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Methoxychlor	µg/L								<2	<2	<2	<2	<2	<2
Aldrin plus dieldrin	µg/L			0.010	0.3	3			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Organophosphorus Pesticides (OP)														
Dichlorvos	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Demeton-S-methyl	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Monocrotophos	µg/L								<2	<2	<2	<2	<2	<2
Dimethoate	µg/L	0.15			50	50			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Diazinon	µg/L	0.01		1	3	1			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos-methyl	µg/L	0.01	0.009		10	100			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Parathion-methyl	µg/L								<2	<2	<2	<2	<2	<2
Malathion	µg/L	0.05							<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fenthion	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos	µg/L	0.01	0.009						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Parathion	µg/L	0.004			10	10			<2	<2	<2	<2	<2	<2
Pirimphos-ethyl	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorfenvinphos	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromophos-ethyl	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fenamiphos	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Prothiofos	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethion	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Carbophenothion	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Azinphos Methyl	µg/L	0.02							<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Monocyclic Aromatic Hydrocarbons														
Benzene	µg/L	0.95	0.5	0.001		0.01			-	-	-	-	-	-
Toluene	µg/L			0.80	0.025	0.025			-	-	-	-	-	-
Ethylbenzene	µg/L			0.30	0.003	0.003			-	-	-	-	-	-
meta- & para-Xylene	µg/L	200							-	-	-	-	-	-
Styrene	µg/L			0.03	0.004	0.004			<5	<5	<5	<5	<5	<5
ortho-Xylene	µg/L	350							-	-	-	-	-	-
Isopropylbenzene	µg/L								<5	<5	<5	<5	<5	<5
n-Propylbenzene	µg/L								<5	<5	<5	<5	<5	<5
1.3.5-Trimethylbenzene	µg/L								<5	<5	<5	<5	<5	<5
sec-Butylbenzene	µg/L								<5	<5	<5	<5	<5	<5
1.2.4-Trimethylbenzene	µg/L								<5	<5	<5	<5	<5	<5
tert-Butylbenzene	µg/L								<5	<5	<5	<5	<5	<5
p-Isopropyltoluene	µg/L								<5	<5	<5	<5	<5	<5
n-Butylbenzene	µg/L								<5	<5	<5	<5	<5	<5

Oxygenated Compounds														
Vinyl Acetate	µg/L								<50	<50	<50	<50	<50	<50
2-Butanone (MEK)	µg/L								<50	<50	<50	<50	<50	<50
4-Methyl-2-pentanone (MIBK)	µg/L								<50	<50	<50	<50	<50	<50
2-Hexanone (MBK)	µg/L								<50	<50	<50	<50	<50	<50
Sulfonated Compounds														
Carbon disulfide	µg/L								<5	<5	<5	<5	<5	<5
Fumigants														
2.2-Dichloropropane	µg/L								<5	<5	<5	<5	<5	<5
1.2-Dichloropropane	µg/L								<5	<5	<5	<5	<5	<5
cis-1.3-Dichloropropylene	µg/L								<5	<5	<5	<5	<5	<5
trans-1.3-Dichloropropylene	µg/L								<5	<5	<5	<5	<5	<5
1.2-Dibromoethane (EDB)	µg/L								<5	<5	<5	<5	<5	<5
Halogenated Aliphatic Compounds														
Dichlorodifluoromethane	µg/L								<50	<50	<50	<50	<50	<50
Chloromethane	µg/L								<50	<50	<50	<50	<50	<50
Vinyl chloride	µg/L			0.0003		0.003			<50	<50	<50	<50	<50	<50
Bromomethane	µg/L								<50	<50	<50	<50	<50	<50
Chloroethane	µg/L								<50	<50	<50	<50	<50	<50
Trichlorofluoromethane	µg/L								<50	<50	<50	<50	<50	<50
1.1-Dichloroethene	µg/L			0.03		0.3			<5	<5	<5	<5	<5	<5
Iodomethane	µg/L								<5	<5	<5	<5	<5	<5
trans-1.2-Dichloroethene	µg/L								<5	<5	<5	<5	<5	<5
1.1-Dichloroethane	µg/L								<5	<5	<5	<5	<5	<5
cis-1.2-Dichloroethene	µg/L								<5	<5	<5	<5	<5	<5
1.1.1-Trichloroethane	µg/L								<5	<5	<5	<5	<5	<5
1.1-Dichloropropylene	µg/L								<5	<5	<5	<5	<5	<5
Carbon Tetrachloride	µg/L								<5	<5	<5	<5	<5	<5
1.2-Dichloroethane	µg/L			0.003		0.03			<5	<5	<5	<5	<5	<5
Trichloroethene	µg/L								<5	<5	<5	<5	<5	<5
Dibromomethane	µg/L								<5	<5	<5	<5	<5	<5
1.1.2-Trichloroethane	µg/L	6500	1900						<5	<5	<5	<5	<5	<5
1.3-Dichloropropane	µg/L								<5	<5	<5	<5	<5	<5
Tetrachloroethene	µg/L			0.05		0.5			<5	<5	<5	<5	<5	<5
1.1.1.2-Tetrachloroethane	µg/L								<5	<5	<5	<5	<5	<5
trans-1.4-Dichloro-2-butene	µg/L								<5	<5	<5	<5	<5	<5
cis-1.4-Dichloro-2-butene	µg/L								<5	<5	<5	<5	<5	<5
1.1.2.2-Tetrachloroethane	µg/L								<5	<5	<5	<5	<5	<5
1.2.3-Trichloropropane	µg/L								<5	<5	<5	<5	<5	<5
Pentachloroethane	µg/L								<5	<5	<5	<5	<5	<5
1.2-Dibromo-3-chloropropane	µg/L								<5	<5	<5	<5	<5	<5
Hexachlorobutadiene	µg/L								<5	<5	<5	<5	<5	<5
Halogenated Aromatic Compounds														
Chlorobenzene	µg/L			0.30	0.01	0.01			<5	<5	<5	<5	<5	<5
Bromobenzene	µg/L								<5	<5	<5	<5	<5	<5
2-Chlorotoluene	µg/L								<5	<5	<5	<5	<5	<5
4-Chlorotoluene	µg/L								<5	<5	<5	<5	<5	<5
1.3-Dichlorobenzene	µg/L	0.26			0.02	0.02			<5	<5	<5	<5	<5	<5
1.4-Dichlorobenzene	µg/L	0.06		0.04	0.003	0.003			<5	<5	<5	<5	<5	<5
1.2-Dichlorobenzene	µg/L	0.16		1.5	0.001	0.001			<5	<5	<5	<5	<5	<5
1.2.4-Trichlorobenzene	µg/L	0.085	80	0.03	0.005	0.005			<5	<5	<5	<5	<5	<5
1.2.3-Trichlorobenzene	µg/L	0.003		0.03	0.005	0.005			<5	<5	<5	<5	<5	<5
Trihalomethanes														
Chloroform	µg/L								<5	<5	<5	<5	<5	<5
Bromodichloromethane	µg/L								<5	<5	<5	<5	<5	<5
Dibromochloromethane	µg/L								<5	<5	<5	<5	<5	<5
Bromoform	µg/L								<5	<5	<5	<5	<5	<5
Phenolic Compounds														
Phenol	µg/L	320	400						<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chlorophenol	µg/L	340		300	0.1	3000			<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Methylphenol	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
3- & 4-Methylphenol	µg/L								<2.0	<2.0	**3.3**	<2.0	<2.0	<2.0
2-Nitrophenol	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2.4-Dimethylphenol	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2.4-Dichlorophenol	µg/L	120		200	0.3	2000			<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2.6-Dichlorophenol	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
4-Chloro-3-Methylphenol	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2.4.6-Trichlorophenol	µg/L	3		20	2	200			<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2.4.5-Trichlorophenol	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Pentachlorophenol	µg/L	3.6	11						<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Polynuclear Aromatic Hydrocarbons														
Naphthalene	µg/L	16	50						<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthylene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Fluorene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Phenanthrene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Anthracene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Fluoranthene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Pyrene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benz(a)anthracene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chrysene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(b)fluoranthene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(k)fluoranthene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(a)pyrene	µg/L			0.01		0.1			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total Petroleum Hydrocarbons														
C6 - C9 Fraction	µg/L								<20	<20	<20	<20	<20	<20
C10 - C14 Fraction	µg/L								<50	<50	<50	<50	<50	<50
C15 - C28 Fraction	µg/L								<100	<100	<100	<100	<100	**380**
C29 - C36 Fraction	µg/L								<50	<50	<50	<50	<50	<50
C10 - C36 Fraction (sum)	µg/L	600 [4]							<50	<50	<50	<50	<50	**380**

NOTES:
1. SRT Healthy Rivers Action Plan Long Term / Short Term Targets
2. pH > 6 / pH < 6
3. Average EC threshold for pastures in sandy soils
4. Lower guideline limit (upper = 125)
5. Lower guideline limit (upper = 12)

4.10 Groundwater Monitoring Levels Summary

For the purposes of the OS, WRMW1 was the major location of focus considering that groundwater abstraction bores WRPB1, WRPB2 and WRPB3 are proposed for construction in the adjacent area.

Groundwater was intercepted for WRMW1 at a depth of 23.581 mAHD in GME#1, following the installation of the bore and logging of subsurface geology. In GME#2, some three months later, groundwater was recorded at 23.836 mAHD, a rise of some 0.255 m.

WRMW1 was installed to a depth of 6 m, constructed with screen from 3.0 – 6.0 mBGL and had a recorded stickup height of 0.45 mAGL. The mTOC RL surveyed was 27.281 m (Appendix D). The screened interval extends from approximately 3.0 mBGL to 6.0 mBGL (RL 23.831 to 20.831 mAHD), which consists of yellow sands/brown clay at 3.0 mBGL, tending to red clay at 5.0 – 6.0 mBGL.

4.11 Groundwater Monitoring Results Summary

The following notes are the summaries of laboratory results and the comparison to assessment criteria for GME#1 and GME#2:

Total Petroleum Hydrocarbons (TPH)
Laboratory results for GME#1 indicate the presence of TPHs in WRMW3 and WRMW6, however detections are below assessment criteria.

Results for GME#2 reveal presence of TPHs in WRMW6 only, and detections are also below assessment criteria.

Monocyclic Aromatic Hydrocarbons (MAH)
MAHs were not detected in any of the samples analysed for GME#1 or GME#2.

Polycyclic Aromatic Hydrocarbons
PAHs were not detected in any of the samples analysed for GME#1 or GME#2.

Phenols
Laboratory results for GME#1 indicate the presence of 3-&4-Methylphenol within WRMW2. All other sample detects were below laboratory detection limits.

Results for GME#2 revealed a detection of 3-&4-Methylphenol within WRMW3, with WRMW2 and all other samples being below laboratory detection limits.

Total Metals
The following total metals exceedances were detected:

- Aluminium exceeded the following assessment criteria at the associated locations in GME#1;
    - WRMW3 exceeded all assessment criteria;

    - WRMW1, WRMW2 and WRMW5 exceeded all assessment criteria excluding the Short-term Irrigation levels;
    - WRMW4 exceeded the Domestic Non-potable groundwater use, Drinking Water Aesthetic Values, Fresh Waters criteria, and;
    - WRMW6 exceeded Drinking Water Aesthetic Values and Fresh Waters criteria.

- Aluminium exceeded the following assessment criteria at the associated locations in GME#2;
    - WRMW3 exceeded all assessment criteria;
    - WRMW1 exceeded all assessment criteria excluding the Short-term Irrigation levels;
    - WRMW2 and WRMW5 exceeded all assessment criteria excluding both Short-term Irrigation and Long-term Irrigation levels, and;
    - WRMW4 and WRMW6 exceeded Drinking Water Aesthetic Values and Fresh Waters criteria.
- Copper exceeded the Fresh Waters and Marine Waters criteria for all locations in GME#1 and GME#2;
- Lead was exceeded for the following assessment criteria at the associated locations in GME#1;
    - WRMW1 – WRMW5 exceeded Drinking Water Health Values, Fresh Waters and Marine Waters criteria, and;
    - WRMW6 exceeded Marine Waters and Fresh Waters criteria.
- Lead was exceeded for the following assessment criteria at the associated locations in GME#2;
    - WRMW1 and WRMW3 exceeded Drinking Water Health Values, Fresh Waters and Marine Waters criteria, and;
    - WRMW4 and WRMW6 exceeded Marine Waters and Fresh Waters criteria.
- Manganese exceeded Drinking Water Aesthetic Values, Drinking Water Health Values, and Fresh Waters criteria at WRMW3 for GME#1 and GME#2;
- Nickel exceeded Fresh Waters criteria in WRMW3 in GME#1 and for GME#2;
- Zinc exceeded the following assessment criteria at the following locations in GME#1;
    - Fresh Waters and Marine Waters criteria was exceeded at WRMW2, WRMW3 and WRMW4, and;
    - Fresh Waters criteria were exceeded at WRWRMW5 and WRWRMW6.
- Zinc exceeded the following assessment criteria at the following locations in GME#2;
    - Marine Waters and Fresh Waters criteria was exceeded at WRMW2 and WRMW3, and;
    - Fresh Waters criteria was exceeded at WRMW4 and WRMW6.

- Iron exceeded assessment criteria at the following locations for the associated locations in GME#1;
    - WRMW3 and WRMW6 exceeded all assessment criteria,
    - WRMW2 exceeded all assessment criteria with the exception of Short-term Irrigation criteria;
    - Drinking Water Aesthetic Values, Long-term Irrigation, Fresh Waters and Marine waters criteria was exceeded at WRMW4 and WRMW5, and;
    - WRMW1 exceeded Short-term Irrigation criteria.
- Iron exceeded assessment criteria at the following locations for the associated locations in GME#2;
    - WRMW3 exceeded all assessment criteria;
    - WRMW6 exceeded all assessment criteria, excluding Short-term Irrigation;
    - WRMW2 and WRMW4 exceeded all assessment criteria, with the exception of Short-term Irrigation Water and Domestic non-potable groundwater use, and;
    - WRMW1 exceeded Long-term Irrigation Water criteria.
- Mercury exceeded Fresh Waters criteria at WRMW1 and WRMW2 in GME 1

Mercury was not detected in any locations during GME#2. Nickel exceeded Fresh Waters criteria in GME#2 but did not exceed it during GME#1. Total metals concentrations that exceeded relevant criteria in general were less in GME#2 than in GME#1.

Dissolved Metals
In GME#2, dissolved metals were selected for analysis in consideration of the elevated number of detects for total metals during GME#1. There was thought that higher than expected Total Suspended Solids (TSS) may have artificially increased these background results for total metals. The following dissolved metals exceeded assessment criteria in GME#2:

- Aluminium in WRMW5 exceeded Drinking Water Aesthetic Value and Fresh Waters criteria, with WRMW1, WRMW4 and WRMW6 exceeding Fresh Waters criteria only;
- Zinc in WRMW2, WRMW5 and WRMW6 exceeded Marine Waters criteria, whilst WRMW1 and WRMW4 exceeded Fresh Waters criteria only, and;
- Iron in WRMW1, WRMW2 and WRMW5 exceeded Fresh Waters criteria.

OC Pesticides
OC pesticides were below laboratory assessment criteria for all laboratory samples during GME#1 and GME#2.

OP Pesticides
OP pesticides were not detected in any of the samples analysed. It is noted that the primary laboratory detection limits were not low enough to detect methyl parathion at DNPGW trigger values during both GME#1 and GME#2.

Major Anions and Cations
No exceedances were identified in GME#1 or GME#2.

Nutrients
Ammonia (NH_3-N) exceeded Fresh and Marine Water criteria for WRWRMW6 in GME#1 but did not exceed any criteria in GME#2.

Total Nitrogen exceeded Fresh Waters assessment criteria for WRMW1, WRMW2, WRMW4 and WRMW6 in GME#1, with WRMW1 – WRMW6 all exceeding Fresh Waters criteria for GME#2.

Total Phosphorus exceeded Fresh Waters criteria at WRMW2 and WRMW3 in GME#1, with WRMW1, WRMW3, WRMW4 and WRMW5 all exceeding Fresh Waters criteria in GME#2.

WRMW1 exceeded Fresh Waters criteria for Sulphide in GME 1, with no exceedences reported for GME 2.

4.12 Groundwater Monitoring Discussion

Conductivity results from WRMW1 – WRMW6 indicate that water beneath the Site is Fresh, as does the regional salinity data (DoW, 2004). These results indicate that the clay layer between aquifers may not be complete, and there may be a connection between a shallow aquifer across the Site and the Superficial Swan Aquifer below.

pH levels are considered fresh to mildly acidic. pH was in the Fresh Waters and Drinking Water Aesthetic Value ranges for WRMW1 but values were below these ranges and also marginally below the range for Long-term Irrigation in WRMW2, WRMW4, WRMW5 and WRMW6. However this is considered to be an acceptable range for pH values for groundwater within this locality.

Metalloid results (dissolved) were considered more representative of the Site in GME#2 and of the water quality proposed for abstraction, as these may have been artificially elevated by suspended solids in total metals results for GME#1. Levels are considered suitable for groundwater abstraction.

Despite that nutrient levels were slightly elevated above ANZECC criteria, surface waters are not located in the immediate vicinity of the Site and downstream receptors of the groundwater flux are likely to be more significantly impacted by land uses to the north.

4.13 Previous Groundwater Modelling

A simplified numerical model of the groundwater conditions and abstraction regime proposed was constructed by NTEC (2012) to estimate drawdown at the Site. Differential results and estimates for environmental impacts were obtained, as a hydrogeological study has not yet been completed for the Site.

4.14 Groundwater Modelling Characteristics Adopted

The model consisted of the Superficial Swan Aquifer in the region of the site, consisting of the following characteristics:

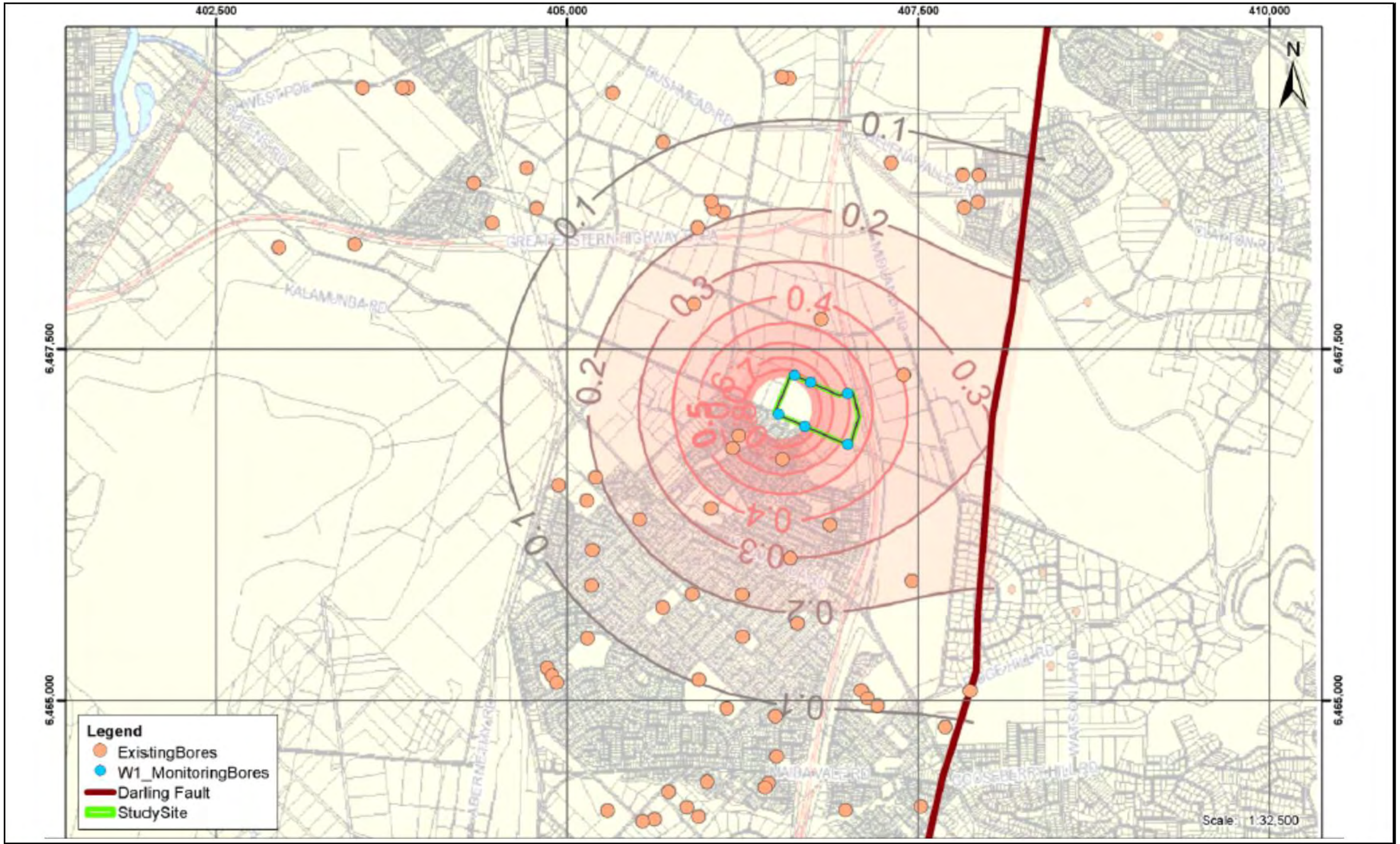
- An unconfined homogeneous aquifer (as water quality results and well logs have suggested that this is most likely to be the case);
- Horizontal ground surface at 27 mAHD;
- Horizontal water table at 22 mAHD;
- Horizontal base of aquifer at 5 mAHD for total depth of 22 m;
- Saturated thickness of 17 m;
- No connection to underlying aquifers;
- No net rainfall recharge (to provide conservative over-estimate of pumping impact); and,
- Horizontal and vertical hydraulic conductivity through the aquifer, and adopted yield values based on the PRAMS model.

Abstraction was represented with a single pumping bore located in the south west corner of the Site, although three separate bores will be used for the proposed abstraction, pumping simultaneously within 30 m of each other. The bore was screened at the bottom of the Superficial Swan Aquifer. Pumping rates were 300 ML/yr (or 821.3 m^3/day). Pumping was assumed to be continuous for three years in the scenario, with the model run for an additional 10 years in order to simulate the rates of groundwater recovery/aquifer recharge.

4.15 Groundwater Modelling Results

Figure 6 demonstrates the drawdown affect after three years of pumping from the water table. The monitoring bore adjacent to the pumping bore, WRMW1 experiences 1.40 m of drawdown, with a drawdown contour of 0.2 m stretching to a radius of approximately 1.6 km from the modelled pumping bore. Drawdown does not occur beyond the Darling Fault.

Figure 6 Modelled Drawdown after 3 years of GW Abstraction



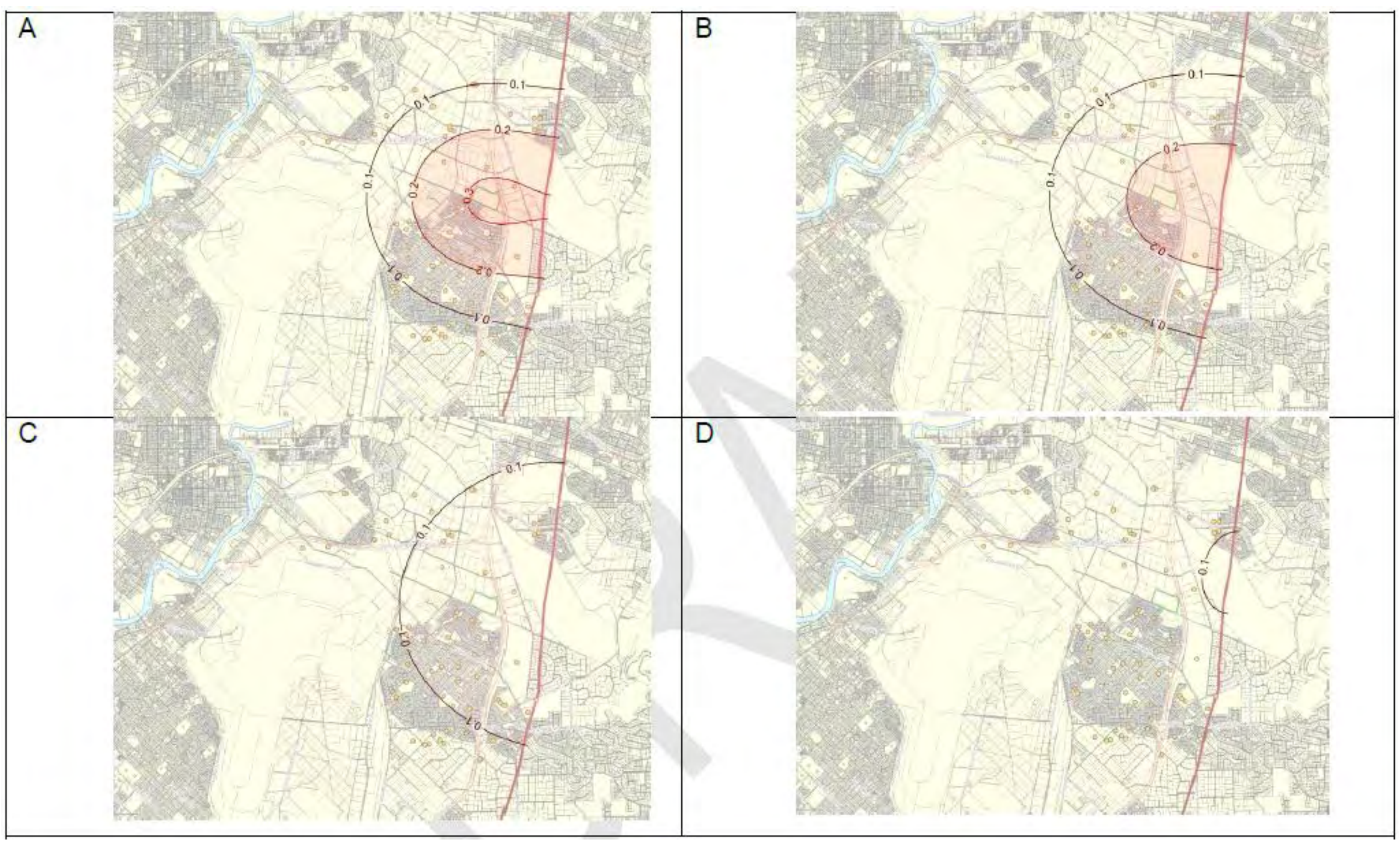
MDW ENVIRONMENTAL SERVICES	0 1 km	N	Figure 6: Modelled Drawdown after 3 years of GW Abstraction
	Unit 1, 22 Elmsfield Road, Midvale 6056		Project: Hazelland Landfill
	Ph (08) 9250 6960 Fax (08) 9250 8269		Job No: E2012-031
	www.environmentalservices.com.au		Date: 28/09/2012
			Source NTEC Environmental Technologies

Since the precise geographic locations for nearby users are not available, it is not possible to quantify impacts. Twelve (12) licensed groundwater bores may encounter drawdown impacts of up to 0.2 m. Three (3) licensees will have impacts exceeding 0.6 m drawdown and five (5) licensees will sustain impacts up to 0.3 m. Twenty three (23) other licensed locations may have impacts exceeding 0.1 m of drawdown.

The conservation area has WRMW3 situated adjacent to the north. Drawdown of the water table at this bore is expected to be 0.56 m, with all of the conservation area lying within the 0. m drawdown contour, following three years of groundwater abstraction.

Figure 7 shows the drawdown from one, two, five and ten years after pumping ceases.

Figure 7 Drawdown Recovery: (A) One, (B) Two, (C) Five and (D) Ten - Years Following Abstraction



MDW ENVIRONMENTAL SERVICES	Scale: 1 : 74,000 Unit 1, 22 Elmsfield Road, Midvale 6056 Ph (08) 9250 6960 Fax (08) 9250 8269 www.environmentalservices.com.au	N	Figure 7: Groundwater Recovery after abstraction: (A) 1 year (B) 2 years (C) 5 years (D) 10 years Project: Hazelland Landfill Job No: E2012-031 Date: 28/09/2012 Source NTEC Environmental Technologies

4.16 Groundwater Modelling Discussion

Modelling results indicated that after three years, proposed abstraction induced up to 0.7 m of additional drawdown from nearby licensed groundwater users or conservation areas. This was dependent on the location of the three proposed pumping bores, in relation to the one used in the model. Groundwater levels are expected to recover quickly, with a drawdown of less than 0.2 m at all locations, following cessation of pumping. Variable aquifer thickness, groundwater flux in the region and rainfall recharge could be additional variables to consider, for a more representative outcome.

5 IDENTIFYING AND MANAGING IMPACTS

The anticipated impacts and risks likely to evolve from the proposed abstraction - to local groundwater, nearby users and local ecology are identified, discussed and addressed with management responses in Table 6.

Consultation with the DoW about each management objective will take place, before the groundwater license is issued. Any amendments to issues and strategies included in Table 6 will be included in the 5C water license and an amended version of this OS.

Table 6 Issues and Management Strategies for Proposed Abstraction

Issue	Management Objective	Measurement	Management Response
Reliable water supply for abstraction	• Maintain a supply of water that satisfies 300 ML/yr whilst not drawing down the groundwater level excessively	• Monthly groundwater level measurement of site monitoring wells	• Reduce the need for continuous groundwater abstraction once the water storage tanks are filled to a safe but sustainable level for site works • Only abstract 821.3 m3/day (across WRPB1, WRPB2 and WRPB3) to avoid excess drawdown of the aquifer, especially during drier months. • Abstract less water during rain periods and also if water storage tanks have a large surplus of water not being allocated for site use
Salinity and Water Quality	• Salinity of water abstracted to remain less than 1000 mg/L TDS • Groundwater quality to remain unchanged from the background readings obtained by MDWES (no additional exceedences of sampling criteria)	• Monitoring bores WRMW1 - WRMW6 and abstraction bores WRPB1 – WRPB3 sampled monthly for water quality • Monitoring of the standpipe water/outlet from Storage Tanks monthly to avoid stored water becoming stagnant	• Notify the DoW as specified in the water license - if any changes to groundwater are detected • Re-sample from the groundwater location where the change in water quality is detected, and consult the DoW for further recommendations
Other users	• Do not impact on neighbouring water availability • Keep drawdown to a minimum for neighbouring users	• Water level measured monthly from WRMW1 – WRMW6 • WRMW1-WRMW6 will be considered as observation bores for the abstraction	• Make other users aware of abstraction proposal • Reduce abstraction rate/frequency if drawdown exceeds those amounts anticipated to occur from modelling outcomes

Risk of flooding during abstraction	• Keep watertable below a specific level if possible • Have capacity to extract additional water or install additional production bores if required to lower groundwater RL	• Water levels measured monthly in monitoring bores (WRMW1 – WRMW6) but this can be increased to weekly if flooding or groundwater recharge becomes a concern	• Contact DoW in the event of flooding for approval to abstract additional groundwater or to install additional production bores if required, also if to monitor water levels more frequently
Disturbance to Flora	• Abstraction does not impact on the health of natural flora, especially in Bush Forever Site #122 • No natural flora remains at the Site	• Flora surveys, and water level monitoring monthly - for the Bush Forever Site #122	• Ecologist to examine trends in groundwater abstraction, comparing it to flora health • Abstraction volumes/frequency to be reduced if flora surveys reveals species declination as a result of site abstraction

5.1 Changes to Water Quality

Any alterations to the pH, salinity and chemistry of the groundwater during abstraction, may have an adverse impact on the quality of groundwater used for dust suppression and soil compaction within the vicinity of the Site. This will be monitored in monthly sampling rounds for monitoring (or observation) bores at the Site, and a monitoring well present in Bush Forever Site #122 to the south east.

The Client has been advised that these abstraction activities on Site will require a formal licence (according to Section 5C of the RWI Act) to take groundwater from the three newly proposed production bores, issued by the DoW. An application for this licence accompanies this OS.

5.2 Timeframe for Proposed Abstraction

Commencement of the abstraction proposal is expected in early 2013. Production bore installation and commissioning, as well as the mobilisation of bore head works, generators, piping and two (2) groundwater storage tanks for sustaining three (3) production bores is expected to take about 8 weeks. It is assumed that groundwater abstraction for dust suppression and soil compaction activities will be continuous for three years and pumping shared across each production bore, although this may change to an intermittent pumping schedule, based on weather conditions and the amount of drawdown/recharge experienced at the Site and surrounds once pumping commences.

5.3 Dewatering Rates

Groundwater abstraction rates for the duration of pumping are expected to be in the order of 300 ML/year, or 821.3 m3/day. Pumping may be allocated across either one, two or all three of WRPB1, WRPB2 and WRPB3 at any given time. A pumping schedule may be adopted to reprieve any tired or damaged bores and continue pumping others that are in more suitable working condition, but this is yet to be decided.

5.4 Radius of Influence

Based on the outcomes of NTEC (2012) the estimated ***maximum*** radius of influence is roughly 1.95 km meters for a maximum drawdown of 0.1 m, and estimated ***maximum*** drawdown for the proposal is approximately 1.2 m in WRMW2, the most proximate bore to the area on Site that is proposed for abstraction.

A search of the DoW online Water Register was conducted by MDWES to identify groundwater bores surrounding the Site (Appendix C). Twelve licensed groundwater bores may encounter drawdown impacts of up to 0.2 m. Three licensees will have impacts exceeding 0.6 m drawdown and five licensees will sustain impacts up to 0.3m. Twenty-three other licensed locations may have impacts exceeding 0.1 m drawdown. Levels in WRMW3 adjacent to Bush Forever Site number #122, are projected to fall by 0.4 m over the full 4 to 5 years of pumping.

Despite being within the radius of influence; no adverse environmental drawdown effects (for flora or water quality) are anticipated to be observed in the neighbouring licensee bores surrounding the Site, due to the minimal drawdown of the Superficial Swan Aquifer during abstraction and the rapid recharge anticipated to follow once pumping is complete. Even for the location revealing the greatest amount of drawdown (shown in the modelling), the quantity is considered representative of seasonal groundwater level change and may be offset by increased rainfall during winter months.

6 OPERATING RULES

6.1 Abstraction Bore Network

Most of the operating controls for this proposal are to govern the operation of the abstraction bore network. These will vary seasonally and under different operating conditions. One production bore may operate as a primary source, with secondaries or back-up bores on standby, but all are expected to operate simultaneously – at least for the commencement of groundwater abstraction at the Site.

Table 7 Rules for Operating Groundwater Abstraction bores

Bore name	Installed pumping capacity (L/sec)	Operating protocols	Bore abstraction strategy
WRPB1, WRPB2 and WRPB3	Max 15 L/sec	• Each bore is designed to pump at 3 x the rate required when all three abstraction bores are pumping simultaneously • Based on the number of bores utilised at a time, a rate of 9.505 L/sec, 821.3 m3/day or 300 ML/year is to be maintained under normal pumping conditions	• Bores may be turned on or off depending on amount of abstraction required and this could vary based on seasonal weather conditions, flood occurrence, if storage water supply reaches capacity, or if one or multiple bores go offline at once • Continuous abstraction is best suited to occur in winter and spring, so that water can be stored up for Summer and Autumn (when groundwater levels are anticipated to be at the lowest annually, and when aquifer stresses are considered to be the highest annually) • Winter is the period where an equilibrium could be met between natural drawdown and abstraction, meaning little change in water levels at the Site may result for continuous pumping at that time of the year

7 MONITORING AND REPORTING

Metering of all water abstracted, stored and used at the Site will be completed monthly for the duration of rehabilitation (Table 8). From 1st July 2010, the DoW specified that for sites abstracting 50 ML/year or greater must be metered at all abstraction points, in this case WRPB1, WRPB2 and WRPB3. The conditions of the future water license will specify the recording dates for totals, calibration of meters and forwarding dates for information to the DoW. Meters will be installed prior to groundwater abstraction commencing, with date and serial number noted. Meters approved for use in Western Australia are gazetted as the *Rights in Water and Irrigation (Approved Meters) Order* (2009).

Water level monitoring in the groundwater monitoring wells (WRMW1 – WRMW6) will also occur monthly (Table 9). Water quality monitoring will be completed for the duration of abstraction and in accordance with monitoring schedules detailed in Table 10. All monitoring of water quality will be completed by a suitably qualified person, using calibrated equipment, of samples that are representative of the aquifer, water stored or used.

At the conclusion of all required groundwater abstraction, a laboratory sample will be collected from each of the six monitoring wells - for comparison to background water quality readings obtained in the initial GME#1 investigation completed by MDWES.

Table 8 Water Use Measurement

Draw point	Meter description	Meter maintenance/calibration schedule	Frequency of recording meter data
WRPB1	ABB (Totaliser, rate) Run hours (headworks)	Bi-annually (At the start of May and November)	Monthly (last day of the month)
WRPB2	ABB (Totaliser, rate) Run hours (headworks)	Bi-annually (At the start of May and November)	Monthly (last day of the month)
WRPB3	ABB (Totaliser, rate) Run hours (headworks	Bi-annually (At the start of May and November)	Monthly (last day of the month)
Storage outlet	ABB (Totaliser, rate)	Bi-annually (At the start of May and November)	Monthly (last day of the month)
Standpipe	ABB (Totaliser, rate)	Bi-annually (At the start of May and November)	Monthly (last day of the month)

Table 9 Water Level Monitoring

Monitoring bore	Location		Frequency
	Easting	Northing	
WRMW1	406504.4	6467036.79	Monthly (around the 15th)
WRMW2	406693.90	6466947.24	Monthly (around the 15th)
WRMW3	406997.15	6466823.95	Monthly (around the 15th)
WRMW4	406617.75	6467311.73	Monthly (around the 15th)
WRMW5	406731.40	6467262.78	Monthly (around the 15th)
WRMW6	406998.45	6467183.20	Monthly (around the 15th)

Table 10 Water Quality Monitoring

Water quality sampling	Location		Parameters	Frequency
	Easting	Northing		
WRMW1	406504.4	6467036.79	**Field:** pH, EC, DO, Temperature, Redox, TTA, TALK **Laboratory:** pH, EC, TDS, TSS, Acidity, Alkalinity, SO_4^{-2}, S^{-2}, Cl^- Dissolved Al, As, Cd, Cr, Fe, Mn, Ni, Se, Zn TP, TN, FRP	Monthly (around the 15th)
WRMW2	406693.90	6466947.24		Monthly (around the 15th)
WRMW3	406997.15	6466823.95		Monthly (around the 15th)
WRMW4	406617.75	6467311.73		Monthly (around the 15th)
WRMW5	406731.40	6467262.78		Monthly (around the 15th)
WRMW6	406998.45	6467183.20		Monthly (around the 15th)
WRPB1	TBA	TBA	**Field:** pH, EC, DO, Temperature, Redox, TTA, TALK, Standing water level (from dip tube) **Laboratory:** pH, EC, TDS, TSS, Acidity, Alkalinity, SO_4^{2-}, S^{2-}, Cl^- Dissolved Ag, Al, As, Cd, Cr, Fe, Hg, Mo, Ni, Pb, Se, Zn, TP, TN, FRP	Monthly (around the 15th)
WRPB2	TBA	TBA		
WRPB3	TBA	TBA		
Storage Outlet	TBA	TBA	**Field:** pH, EC, DO, Temperature, Redox, TTA, TALK **Laboratory:** pH, EC, TDS, TSS, Acidity, Alkalinity, SO_4^{2-}, S^{2-}, Cl^- Dissolved Ag, Al, As, Cd, Cr, Fe, Hg, Mo, Ni, Pb, Se, Zn, TP, TN, FRP	Monthly (around the 15th)
Standpipe	TBA	TBA	**Field:** pH, EC, DO, Temperature, Redox, TTA, TALK **Laboratory:** pH, EC, TDS, TSS, Acidity, Alkalinity, SO_4^{2-}, S^{2-}, Cl^- Dissolved Ag, Al, As, Cd, Cr, Fe, Hg, Mo, Ni, Pb, Se, Zn, TP, TN, FRP, Nitrate and Iron	Monthly (around the 15th)

7.1 Environmental Performance Indicators

As the groundwater monitoring indicated in GME#1 that the water beneath the Site is fresh to mildly acidic, groundwater field and laboratory analysis results will be compared against the Freshwater and Marine Ecosystem Trigger Values for the duration of groundwater abstraction.

Although no ASS have been identified at the Site, areas of high risk are present to the west of the Site. Therefore groundwater field and laboratory results will be monitored against the DEC's treatment and ASS disturbance trigger values in the event that pH levels increase in acidity levels and drop outside the range acceptable for Freshwater criteria and Marine Ecosystem values.

Groundwater laboratory analysis results will also be compared against the background results from GME#1 - to monitor potential changes in groundwater quality due to drawdown effects from abstraction. A change in background concentrations of 10% will be used as a trigger value to prompt investigation into the cause of the results.

Table 11 summarises the assessment criteria that will be used as environmental performance indicators.

Table 11 Summary of Assessment Criteria

Application	Assessment Criteria	Source
Monitoring Wells Field Analysis	Freshwater and Marine Ecosystem Trigger Values	DEC (2010) *Contaminated Site Management Series - Assessment Levels for Soil, Sediment and Water*
	DEC Treatment Trigger Values (pH and TTA)	DEC (2011) *Treatment and Management of Soils and Water in Acid Sulfate Soil Landscapes.* S5.3.6
	Chemical Indicators of ASS Disturbance (pH)	DEC (2011) *Treatment and Management of Soils and Water in Acid Sulfate Soil Landscapes.* S5.3.1
Monitoring Well Laboratory Analysis	Freshwater and Marine Ecosystem Trigger Values	DEC (2010) *Contaminated Site Management Series - Assessment Levels for Soil, Sediment and Water*
	DEC Treatment Trigger Values (pH and TTA)	DEC (2011) *Treatment and Management of Soils and Water in Acid Sulfate Soil Landscapes.* S5.3.6
	Chemical Indicators of ASS Disturbance (pH, Dissolved Aluminium, Alkalinity:Sulfate, Sulfate:Chloride)	DEC (2011) *Treatment and Management of Soils and Water in Acid Sulfate Soil Landscapes.* S5.3.1
	10% Change in Background groundwater quality results	Golders (2011b) and MDWES sampling 5/7/12

8 CONTINGENCY PROGRAM

8.1 Groundwater Quality

In the event that groundwater quality of groundwater (either abstracted, stored or used) significantly breaches the environmental performance indicators, the relevant location will be re-sampled. If results indicate a continued breach, abstraction pumping rates and monitoring schedules will be revised.

If water quality results continue to indicate an impact on abstracted, stored or used groundwater – as a result of abstraction, pumping will be reduced (if safe to do so) and alternative management options explored.

8.2 Groundwater Drawdown

In the event that the groundwater levels in monitoring bores (WRMW1 – WRMW6) indicate possible offsite drawdown or potential impact on other users greater than those outcomes determined in the groundwater modelling by (NTEC 2012), the abstraction/water distribution network and bore abstraction rate will be revised.

8.3 Destruction of Groundwater Wells or Damage to Infrastructure

Should any groundwater monitoring wells or groundwater abstraction wells be destroyed during the Site works, replacement wells will be installed immediately.

It is recommended that the Site maintains a backlog supply of replacement groundwater pumps in the event that any working ones burn out or go offline. A supply of water meters, additional piping, gensets and headworks is also recommended, given the continuous regime of abstraction. Regular inspections of the water distribution network, storage tanks and standpipe are advised, to ensure no water abstracted is lost or wasted.

8.4 Dust Suppression/Soil Compaction or Discharge Effluent Quality

In the event that water quality from the storage tanks significantly exceeds the environmental performance indicators, an investigation will be conducted to determine the cause. The Storage Outlet or Standpipe will then be sampled to confirm compliance.

The following reporting will be undertaken:

- Monthly Monitoring Reports will be submitted by Wasterock.
- At the completion of site works, a Closure Report will be submitted to Wasterock. This report will summarise the management measures undertaken at the Site, the results of all monitoring programs and provide a discussion of the effectiveness of management strategies employed at the Site and of any potential risks to human health or the environment.

9 STATUTORY REQUIREMENTS

All construction personnel associated with the project are required to comply with provisions of this OS and the requirements of all applicable environmental legislation, regulations, codes of practice and standards. These include, but are not limited to:

- Rights in Water and Irrigation Act (1914);
- Environmental Protection Act (1986);
- WA DEC Acid Sulfate Soil Guideline Series “Treatment and Management of Soils and Water in Acid Sulfate Soil Landscapes” (2011).

10 COMMUNITY CONCERNS REPORTING

Wasterock or MDWES will manage and document a Community Concerns Reporting procedure. Where concerns are raised by the community or other third parties in relation to the redevelopment, these concerns will be immediately forwarded to the Project Manager and if of an environmental nature, be immediately forwarded to MDWES. The community concerns will be registered and documented, and where possible, an acknowledgement of the receipt of the community concern will be made.

11 WATER USE EFFICIENCY

A number of water use efficiency measures are proposed for the abstraction proposal:

- Weekly inspections of abstraction bores WRPB1, WRPB2 and WRPB3;
- Ongoing maintenance of water pipes and monitoring of any leaks between the abstraction points and storage tanks as required;
- Monitoring of valves at the Standpipe and around the Storage Outlet;
- Monthly recording of water use totals, abstraction totals/rates and portions stored and used – to track the water balance across the water distribution network and identify any loss of abstracted water - to the environment.

12 SUMMARY LIST OF COMMITMENTS

Wasterock (the proposed licensee) will comply with this OS as a condition that is to be specified in Section 5C Water Resource Licence.

The licensee will undertake and report to the DoW, concerning the monitoring program:

Summary Monitoring Program

Parameter measured	Sampling site	Frequency	Time
Water use measurement	WRPB1, WRPB2, WRPB3, Standpipe outlet, Discharge outlet (if required)	Monthly	By 3pm each day (or at the beginning and end of any water discharge event)
Water level monitoring	WRMW1, WRMW2, WRMW3, WRMW4, WRMW5 and WRMW6	Monthly	Monthly (around the 15th)
Water quality monitoring	WRMW1, WRMW2, WRMW3, WRMW4, WRMW5 and WRMW6, Storage Outlet and Standpipe	Monthly	Monthly (around the 15th)

Any breach in commitments of the OS, or implementation of any contingency response, must be reported to the DoW within fourteen (14) days of the breach becoming aware or contingency response being made.

An annual water use (meter totals) report along with a compliance (monitoring/water level) report will be submitted to the DoW within seven (7) days and twenty eight (28) days (respectively) of the end to the annual water year. Strategic Policy 5.03 and Operating policy 5.1.2 detail the required formats for compilation of these reports.

The OS is to be re-submitted to the DoW for review three (3) months prior to the expiry date.

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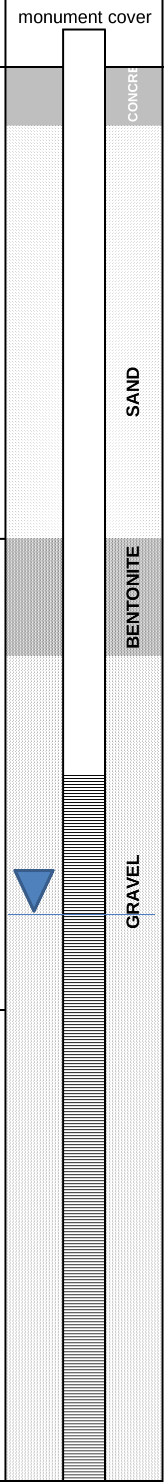
Appendix A – Soil Bore Logs

Bore Completion Details: MW1

Lithology

Depth	Lithology
0 m	
1 m	Yellow Sand
2 m	
3 m	Yellow Sand/ Brown Clay
4 m	
5 m	Red Clay
6 m	End of Hole 6.0 m

Monitoring Bore



General Information

Standpipe - 0.45m

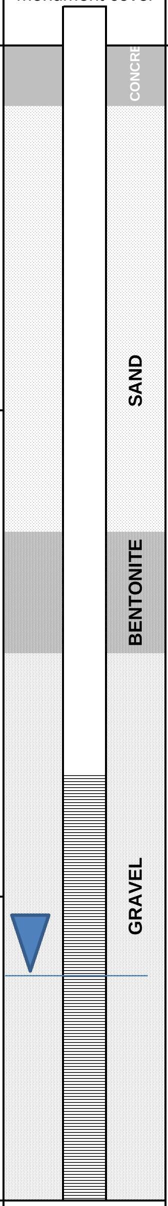
Date: 7/5/12 - 10/5/12

Driller: Bannister Drilling & Irrigation

Location: 20 Adelaide Street, Hazelmere

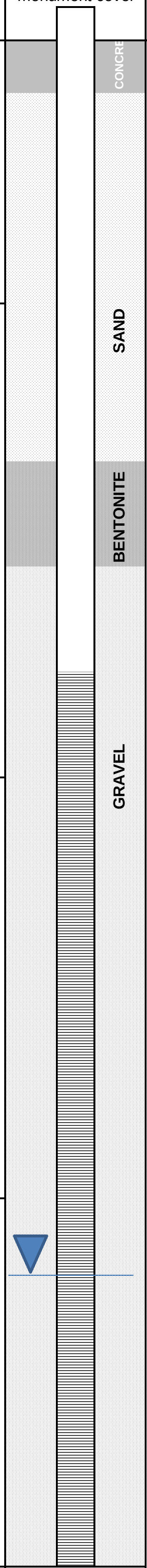
Depth to Water

Bore Completion Details: MW2

Lithology		Monitoring Bore	General Information
0 m		monument cover	Standpipe - 0.68 m
	Yellow Sand		Date: 7/5/12 - 10/5/12 Driller: Bannister Drilling & Irrigation Location: 20 Adelaide Street, Hazelmere
2 m			
	Red Clay		
4 m			
6 m			
	Coarse Sand		Depth to Water
8 m			
	End of Hole 9.5 m		
10 m			

Bore Completion Details: MW3

Depth	Lithology	Monitoring Bore	General Information
		monument cover	Standpipe - 0.51 m
0 m	Yellow Sand		Date: 7/5/12 - 10/5/12
			Driller: Bannister Drilling & Irrigation
			Location: 20 Adelaide Street, Hazelmere
2 m			
4 m	Brown Clay		
6 m			
8 m	Red Clay		
10 m			
12 m	Coarse Sand		Depth to Water
14 m			
	End of Hole 14.5 m		

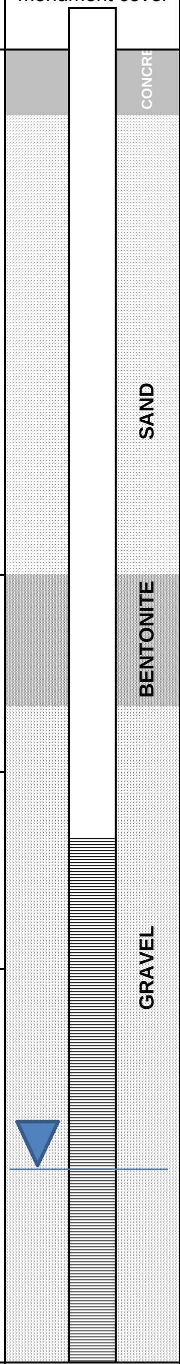


Bore Completion Details: MW4

Depth	Lithology
0 m – 4 m	Brown Clay
4 m – 5.5 m	Fine Sand
5.5 m – 7 m	Coarse Sand
7 m – 10 m	Red Clay
10 m	End of Hole 10.0 m

Monitoring Bore

monument cover



General Information

Standpipe - 0.64 m

Date: 7/5/12 - 10/5/12

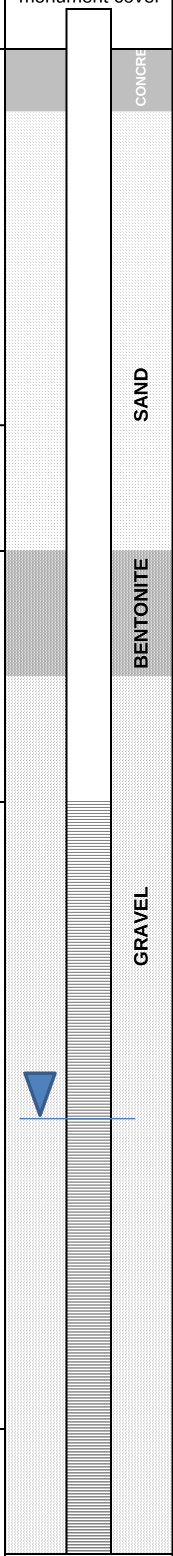
Driller: Bannister Drilling & Irrigation

Location: 20 Adelaide Street, Hazelmere

Depth to Water

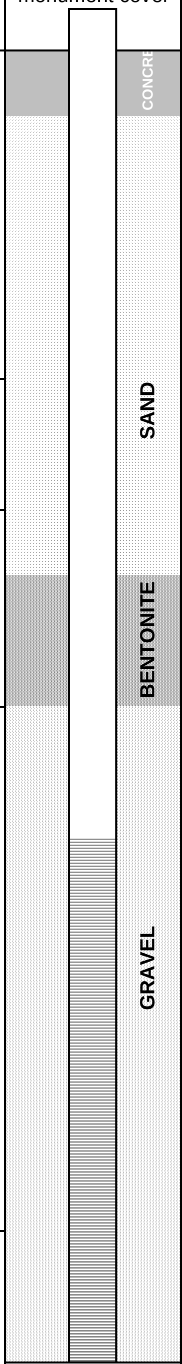
Bore Completion Details: MW5

Depth	Lithology	Monitoring Bore	General Information
0 m		monument cover	Standpipe -
	Brown Clay		Date: 7/5/12 - 10/5/12 Driller: Bannister Drilling & Irrigation Location: 20 Adelaide Street, Hazelmere
2 m			
	Fine Sand		
4 m			
	Coarse Sand		
6 m			
	Red Clay		
8 m			
10 m			
	End of Hole 11.0 m		
12 m			



Bore Completion Details: MW6

Depth	Lithology	Monitoring Bore	General Information
		monument cover	Standpipe - 0.65 m
0 m	Brown Clay		Date: 7/5/12 - 10/5/12 Driller: Bannister Drilling & Irrigation Location: 20 Adelaide Street, Hazelmere
2 m	Fine Sand		
4 m	Coarse Sand		
6 m	Red Clay		
8 m	End of Hole 9.0 m		
10 m			



BANNISTER DRILLING & IRRIGATION

ABN 59 776 488 257

LITHOLOGY & CONSTRUCTION REPORT

DRILLER: Phillip DRILLER LICENCE NUMBER: 183

JOB LOCATION: Adelaide St Hazelmere

DATE COMMENCED: 7-5-12 DATE COMPLETED: 10-5-12

DRILLING METHOD: Mud AIR DEVELOPMENT: Yes (1hr) GRAVEL PACK: Yes

STRATA DESCRIPTION

FROM | TO |

Bore no 1.

0mts - 2 mts Yellow Sand

2mts - 4 mts Yellow Sand / Brown Clay

4mts - 6 mts Red Clay

Bore no. 2

0mts - 3mts Yellow Sand

3mts - 7mts Red Clay

7mts - 9.5mts Coarse Sand

Bore no. 3

0mts - 2.5 mts Yellow Sand

2.5mts - 7mts Brown Clay

7mts - 11mts Red Clay

11mts - 14.5mts Coarse Sand

18 DORNOCH WAY CANNINGVALE 6155 PH/FAX 92564460 MOB 0410 422 006

0892564460

BANNISTER DRILLING & IRRIGATION

ABN 59 776 488 257

LITHOLOGY & CONSTRUCTION REPORT

DRILLER: Philip DRILLER LICENCE NUMBER: 183

JOB LOCATION: Adelaide St Hazelmere

DATE COMMENCED: 7-5-12 DATE COMPLETED: 10-5-12

DRILLING METHOD: Mud AIR DEVELOPMENT: Yes (1hr) GRAVEL PACK: Yes

STRATA DESCRIPTION

FROM | TO |

Bore no. 4

0mts - 4mts	Brown Clay
4mts - 5.5mts	fine Sand
5.5mts - 7mts	Coarse Sand
7mts - 10mts	Red Clay

Bore no 5

0mts - 3mts	Brown Clay
3mts - 4mts	fine Sand
4mts - 6mts	Coarse Sand
6mts - 11mts	Red Clay

Bore no. 6

0mts - 2.5mts	Brown Clay
2.5mts - 3.5mts	fine Sand
3.5mts - 5mts	Coarse Sand
5mts - 9mts	Red Clay

18 DORNOCH WAY CANNINGVALE 6155 PH/FAX 92564460 MOB 0410 422 006

Appendix B – DoW Online Search for Groundwater Licenses

REGISTER EXTRACT INFORMATION

The Department of Water is committed to quality service to its customers and makes every attempt to ensure accuracy, currency and reliability of the data contained in this document. However changes in circumstances after time of publication may impact the

Information extracted from the Department of Water database at 13:45hrs on 16 April 2012

Instrument Version	Licence Allocation	GW Area	Sub Area	Aquifer	All Parties	Property	Licence Address	Issue Date	Expiry Date
GWL 000110971 (002)	29750	Perth	Perth South Confined	Perth - Leederville.	The Trustee For C & S Bucolo Family Trust	15, MIDLAND RD, HAZELMERE	Portion of Helena Location 20a and being Lot 15 the subject of Diagram 69921 and being the whole of the land comprised in Certificate of Title Volume 1777 Folio 497 Lot 15 Midland Road Hazelmere	10/05/2007	9/05/2017
GWL 000155295 (003)	198225	Perth	Shire of Swan South	Perth - Superficial Swan	Department of Education	14189, ARCHER ST, WOODBRIDGE	Lot 14189 On Plan 189860 Volume/Folio Lr3124/293 Lot 14189 Archer St Woodbridge Woodbridge Primary School	16/08/2007	16/08/2017
GWL 000155295 (003)	198225	Perth	Shire of Swan South	Perth - Superficial Swan	Department of Education	7576, CROSBIE RD, WOODBRIDGE	Crown Reserve 24092 - Lot 7576 Crosbie Rd Woodbridge and Lot 571 On Plan 70657 - Volume/Folio Lr3161/343 - Lot 571 Third Av Woodbridge - Governor Stirling Senior High School, Crown Reserve 29493 - Lot 570 On Plan 70657 - Volume/Folio Lr3161/342 - Lot 570	16/08/2007	16/08/2017
GWL 000155295 (003)	198225	Perth	Shire of Swan South	Perth - Superficial Swan	Department of Education	6318, CLAYTON ST, KOONGAMIA	Crown Reserve 31321 - Lot 6665 Kalara Wy Koongamia - Clayton View Primary School	16/08/2007	16/08/2017
GWL 000155295 (003)	198225	Perth	Shire of Swan South	Perth - Superficial Swan	Department of Education	Crown reserve 8804; Swan Location 10355- Clayton Street Bellevue	Crown reserve 8804; Swan Location 10355- Clayton Street Bellevue	16/08/2007	16/08/2017
GWL 000168263 (002)	217225	Perth	Shire of Swan South	Perth - Superficial Swan	City of Swan	9963, WEST PDE, HAZELMERE	Lot 9963 On Plan 4539 - Volume/Folio Lr3128/733 - Lot 9963 West Pde Hazelmere - Bruce Elliott Reserve (Hazelmere Reserve)	16/08/2007	16/08/2017
GWL 000168263 (002)	217225	Perth	Shire of Swan South	Perth - Superficial Swan	City of Swan	149, JAMES ST, GUILDFORD	Crown Reserve 21168 - Lot 149 James St Guildford	13/05/2010	31/05/2012
GWL 000168263 (002)	217225	Perth	Shire of Swan South	Perth - Superficial Swan	City of Swan	4616, FORD ST, WOODBRIDGE	Lot 6390 On Plan 165354 - Volume/Folio Lr3045/107 - Lot 6390 Ford St Woodbridge	13/05/2010	31/05/2012
GWL 000168263 (002)	217225	Perth	Shire of Swan South	Perth - Superficial Swan	City of Swan		Road Reserve - Terrace Road Guildford	13/05/2010	31/05/2012
GWL 000168263 (002)	217225	Perth	Shire of Swan South	Perth - Superficial Swan	City of Swan	14641, FERGUSON ST, MIDLAND	Lot 14641 On Plan 35576 - Volume/Folio Lr3129/491 - Lot 14641 Ferguson St Midland	13/05/2010	31/05/2012
GWL 000168263 (002)	217225	Perth	Shire of Swan South	Perth - Superficial Swan	City of Swan	266, CHARLES ST, MIDLAND	Lot 267 On Plan 1236 - Volume/Folio 1868/23 - Lot 267 Charles St Midland Lot 255 On Plan 1236 - Volume/Folio 1868/21 - Lot 255 Keith St Midland	13/05/2010	31/05/2012
GWL 000168263 (002)	217225	Perth	Shire of Swan South	Perth - Superficial Swan	City of Swan	12224, WATERHALL RD, SOUTH GUILDFORD	Lot 12224 On Plan 20182 - Volume/Folio Lr3120/368 - Lot 12224 Waterhall Rd South Guildford	13/05/2010	31/05/2012
GWL 000168263 (002)	217225	Perth	Shire of Swan South	Perth - Superficial Swan	City of Swan	10627, JOHN ST, MIDLAND	Lot 10627 On Plan 6074 - Volume/Folio Lr3146/714 - Lot 10627 John St Midland - John Street Playground	13/05/2010	31/05/2012
GWL 000041225 (002)	3000	Perth	Shire of Kalamunda	Perth - Superficial Swan	Salama, Amir	6, SULTANA RD, FORRESTFIELD	Lot 6 On Plan 13574 Volume/Folio 1595/554 Lot 6 Sultana Rd Forrestfield	13/05/2010	31/05/2012
GWL 000045890 (003)	97500	Perth	City of Belmont	Perth - Superficial Swan	Westralia Airports Corporation Pty Limited	0, Horrie Miller Drive, Cloverdale	Lot 0 on Plan 6619 and being the whole of the land comprised in Certificate of Title Volume 2124 Folio 980 - Perth International Airport Horrie Miller Drive, Cloverdale	2/06/2004	1/06/2014
GWL 000017120 (002)	3630	Swan	South Swan	Perth - Mirrabooka	Smith, Graeme McDonald	2, HAMERSLEY RD, CAVERSHAM	Lot 2 on Diagram 14007; Certificate of Title Volume 1717 Folio 476 - Lot 2 Hamersley Road Caversham	2/06/2004	1/06/2014
GWL 000048642 (003)	21000	Perth	Perth South Confined	Perth - Leederville.	La Salle College	14, MURIEL ST, MIDDLE SWAN	Lot 10 on Diagram 39841; Certificate of Title Volume 1370 Folio 101; Lot 14 on Diagram 18328; Certificate of Title Volume 1169 Folio 518 - Lots 10 & 14 Muriel Street Viveash	22/01/2004	21/01/2014
GWL 000048834 (003)	35550	Swan	South Swan	Perth - Mirrabooka	Bond, Robert James	10, HAMERSLEY RD, CAVERSHAM	Lot 10 On Diagram 80707 - Volume/Folio 1913/961 - Lot 10 Hamersley Rd Caversham	30/03/2010	25/03/2014
GWL 000048834 (003)	35550	Swan	South Swan	Perth - Mirrabooka	Bond, Robert James	Lots 297b & 10 Hamersley Road, Caversham.	Lots 297b & 10 Hamersley Road, Caversham.	6/07/2011	6/07/2021
GWL 000048839 (003)	33750	Perth	Shire of Swan South	Perth - Superficial Swan	Swan Tafe	Lot 50 Lloyd Street, Midland.	Lot 50 Lloyd Street, Midland.	6/07/2011	6/07/2021
GWL 000051642 (002)	2250	Perth	Shire of Swan South	Perth - Superficial Swan	BGC (Australia) Pty Ltd	Lot 8 Bushmead Road Hazelmere	Lot 3 Bushmead Road Hazelmere	21/04/2010	1/06/2014
GWL 000053269 (002)	4800	Perth	Shire of Swan South	Perth - Superficial Swan	Swan Bowling & Recreation Club (Inc)	9, JAMES ST, GUILDFORD	Lot 9 On Plan 2237 Volume/Folio 1093/229 Lot 9 James St Guildford	9/11/2004	9/11/2014
GWL 000056782 (002)	6250	Perth	Shire of Kalamunda	Perth - Superficial Swan	Smith, S M; Smith, R	113, SULTANA RD, MAIDA VALE	Lot 113 on Diagram 85719; Certificate of Title Volume 1993 Folio 316 - Lot 113 Sultana Road Forrestfield	3/02/2005	3/02/2015
GWL 000058650 (002)	27000	Perth	Shire of Kalamunda	Perth - Superficial Swan	Swanview Plant Farm Pty Ltd	Lot 399 Sorenson Road High Wycombe	Lot 399 Sorenson Road High Wycombe	21/04/2004	19/04/2014
GWL 000059059 (003)	15000	Perth	Shire of Swan South	Perth - Superficial Swan	St Brigid's School	67, TOODYAY RD, MIDDLE SWAN	67, TOODYAY RD, MIDDLE SWAN	2/11/2006	1/11/2016
GWL 000060942 (003)	46150	Perth	Shire of Kalamunda	Perth - Superficial Swan	Seventh-Day Adventist Church (Western Australian Conference) Limited	1, KALAMUNDA RD, MAIDA VALE	Lot 1 On Diagram 35591 - Volume/Folio 89/7a - Lot 1 Kalamunda Rd Maida Vale	30/03/2010	21/12/2016
GWL 000060942 (003)	46150	Perth	Shire of Kalamunda	Perth - Superficial Swan	Seventh-Day Adventist Church (Western Australian Conference) Limited	1, KALAMUNDA RD, MAIDA VALE	Lot 1 On Diagram 35591 - Volume/Folio 89/7a - Lot 1 Kalamunda Rd Maida Vale	20/04/2010	13/03/2018
GWL 000061690 (002)	20000	Perth	Shire of Swan South	Perth - Superficial Swan	Pioneer Road Services Pty Ltd	1, VALE RD, HAZELMERE	1, VALE RD, HAZELMERE	20/04/2010	13/03/2018
GWL 000062528 (003)	20625	Perth	Shire of Swan South	Perth - Superficial Swan	La Salle College	79, MURIEL ST, MIDDLE SWAN	Lot 79 on Diagram 1577; Certificate of Title Volume 1706 Folio 327 - Lot 79 Muriel Street Viveash	10/01/2008	10/01/2018
GWL 000062635 (003)	15750	Perth	Shire of Swan South	Perth - Superficial Swan	The Roman Catholic Archbishop of Perth		Lot 501 On Plan 35367 - Volume/Folio 2190/518 - Lot 501 Guildford	30/03/2010	25/03/2014
GWL 000063196 (002)	3260	Perth	Shire of Kalamunda	Perth - Superficial Swan	Department of Agriculture and Food	11858, BOUGAINVILLEA AV, FORRESTFIELD	11858, BOUGAINVILLEA AV, FORRESTFIELD	20/05/2010	8/10/2018
GWL 000063807 (003)	89350	Perth	Shire of Kalamunda	Perth - Superficial Swan	Bacchion, David	22, DUNDAS RD, HIGH WYCOMBE	Lot 22 On Diagram 71134 - Volume/Folio 1791/535 - Lot 22 Dundas Rd High Wycombe	14/10/2008	14/10/2018
GWL 000063807 (003)	89350	Perth	Shire of Kalamunda	Perth - Superficial Swan	Bacchion, David	23, MILNER RD, HIGH WYCOMBE	Lot 23 On Diagram 71134 - Volume/Folio 1791/536 - Lot 23 Milner Rd High Wycombe	15/10/2009	15/10/2019
GWL 000063807 (003)	89350	Perth	Shire of Kalamunda	Perth - Superficial Swan	Bacchion, David	551, DUNDAS RD, HIGH WYCOMBE	Lot 551 On Plan 4684 - Volume/Folio 365/181a - Lot 551 Dundas Rd High Wycombe	15/10/2009	15/10/2019
GWL 000064694 (003)	24000	Perth	Shire of Kalamunda	Perth - Superficial Swan	Matthew Gibney Catholic Primary School; The Roman Catholic Archbishop of Perth	2, MUNDAY RD, HIGH WYCOMBE	Lot 2 On Plan 16340 - Volume/Folio 1922/2 - Lot 2 Munday Rd High Wycombe	15/10/2009	15/10/2019
GWL 000074457 (003)	196250	Perth	Shire of Kalamunda	Perth - Superficial Swan	Hillview Public Golf Course Pty Ltd	Location 7652 Kalamunda Road Maida Vale	Location 7652 Kalamunda Road Maida Vale	30/03/2010	15/12/2018
GWL 000074457 (003)	196250	Perth	Shire of Kalamunda	Perth - Superficial Swan	Hillview Public Golf Course Pty Ltd	Location 7652 Kalamunda Road Maida Vale	Location 7652 Kalamunda Road Maida Vale	4/05/2010	31/07/2019
GWL 000080956 (003)	15550	Perth	Shire of Swan South	Perth - Superficial Swan	Swick, Randal Lloyd	12, STIRLING CR, HAZELMERE	Lot 12 on Plan 4556 - Volume/Folio 1827/283 - Lot 12 Stirling Cr Hazelmere	4/05/2010	31/07/2019
GWL 000090004 (002)	17250	Perth	Perth South Confined	Perth - Leederville.	Midland Redevelopment Authority	9011, YELVERTON DR, MIDLAND	Lot 9011 On Plan 46323 - Volume/Folio Lr3156/160 - Lot 9011 Yelverton Dr Midland	14/05/2010	14/05/2020
GWL 000101500 (002)	66000	Perth	Perth South Confined	Perth - Leederville.	Derby Industries Pty Ltd	115, LAKES RD, HAZELMERE	Lot 115 On Plan 4553 Volume/Folio 1754/573 Lot 115 Lakes Road Hazelmere	12/04/2011	31/12/2014
GWL 000101500 (002)	66000	Perth	Perth South Confined	Perth - Leederville.	Derby Industries Pty Ltd	114, LAKES RD, HAZELMERE	Lot 114 On Plan 4553 - Volume/Folio 1754/572 - Lot 114 Lakes Rd Hazelmere	11/11/2010	11/11/2020
GWL 000103034 (002)	28500	Perth	Shire of Swan South	Perth - Superficial Swan	Di Giuseppe, Antonio Giuseppe	25, STIRLING CR, HAZELMERE	Lot 25 On Plan 4556 - Volume/Folio 2123/703 - Lot 25 Stirling Cr Hazelmere	11/11/2010	11/11/2020
GWL 000103896 (005)	8500	Perth	Shire of Swan South	Perth - Superficial Swan	Austral Bricks (WA) Pty Ltd	1, MILITARY RD, MIDLAND	1, MILITARY RD, MIDLAND	2/08/2010	11/11/2012
GWL 000108239 (002)	16600	Perth	Shire of Swan South	Perth - Superficial Swan	Byron, William John	2, ARUM LILY PL, HAZELMERE	Lot 2 on Diagram 58229; Certificate of Title Volume 2130 Folio 641 - Lot 2 Arum Lily Place Hazelmere	4/03/2011	4/03/2021
GWL 000108850 (002)	1500	Perth	Shire of Kalamunda	Perth - Superficial Swan	Powell, Baden Jones	148, ALMONDTREE L, MAIDA VALE	148, ALMONDTREE L, MAIDA VALE	3/07/2003	3/07/2013
GWL 000111079 (002)	4800	Perth	Shire of Mundaring	Perth - Superficial Swan	Shire of Mundaring	13293, , MIDVALE	Reserve No. 34196 of Swan Location 9502 - Lot 9502 Reserve 34196 Moir Place, Midvale	9/09/2010	10/09/2020
GWL 000151552 (001)	15750	Perth	Shire of Swan South	Perth - Mirrabooka	Westrac Equipment Pty Ltd	50, GREAT EASTERN HWY, SOUTH GUILDFORD	Portion of each of Swan Locations 22 and 23 and being Lot 50 on Diagram 61884 and being the whole of the land comprised in Certificate of Title Volume 2133 Folio 699 - Lot 50 Great Eastern Highway South Guildford	30/03/2010	17/07/2012
GWL 000151578 (001)	7930	Perth	Shire of Kalamunda	Perth - Superficial Swan	Weissmann, P G & M C	1, BERKSHIRE RD, FORRESTFIELD	Portion of Swan Location 28 and being Lot 1 on Diagram 62944, and being the whole of the land comprised in Certificate of Title Volume 1661 Folio 472 - Lot 1 Berkshire Road, Forrestfield	26/11/2002	26/11/2012
GWL 000151772 (001)	3000	Perth	Shire of Kalamunda	Perth - Superficial Swan	Rogan, Brett Norman	72, MULBERRY CT, MAIDA VALE	Portion of Swan Location 2089 and being Lot 72 on Plan 23169 and being the whole of the land comprised in Certificate of Title Volume 2171 Folio 24 - Lot 72 Mulberry Court Maida Vale	25/11/2002	25/11/2012
GWL 000151786 (001)	2000	Perth	Shire of Swan South	Perth - Superficial Swan	Watson, Debbie	508, NIRIMBA CL, SOUTH GUILDFORD	Lot 508 on Diagram 89700 and being the whole of the land comprised in Certificate of Title Volume 2067 Folio 988 - Lot 508 Nirimba Close South Guildford	6/01/2003	6/01/2013
GWL 000151796 (002)	3500	Perth	Shire of Kalamunda	Perth - Superficial Swan	Howe & Carter, Richard & Lynette	3, SULTANA RD, FORRESTFIELD	Lot 3 On Plan 13574 - Volume/Folio 1595/551 - Lot 3 Sultana Rd Forrestfield	7/01/2003	6/01/2013
GWL 000152091 (002)	3500	Perth	Shire of Kalamunda	Perth - Superficial Swan	Netherway, Trevor Noel	89, STEWART RD, HIGH WYCOMBE	Lot 89 on Plan 13420; Certificate of Title Volume 1581 Folio 996 - Lot 89 on Stewart Road High Wycombe	7/07/2005	7/07/2015
GWL 000152097 (001)	4600	Perth	Shire of Kalamunda	Perth - Superficial Swan	Arnold, Jean Winifred	49, MILNER RD, HIGH WYCOMBE	Lot 49 on Plan 13420; Certificate of Title Volume 2208 Folio 549 - Lot 49 Milner Road High Wycombe	9/09/2010	10/09/2020
GWL 000152099 (002)	3600	Perth	Shire of Kalamunda	Perth - Superficial Swan	Di Renzo, Giustina	5, HAWTIN RD, MAIDA VALE	Lot 5 on Diagram 20510; Certificate of Title Volume 1214 Folio 316 - Lot 5 on Hawtin Road Forrestfield	17/07/2003	17/07/2013
GWL 000152102 (001)	30000	Perth	Shire of Kalamunda	Perth - Superficial Swan	Forrestfield Bible Fellowship	525, BERKSHIRE RD, FORRESTFIELD	Lot 525 on Plan 4684; Certificate of Title Volume 1244 Folio 38 - Lot 525 Berkshire Road Forrestfield	9/09/2010	10/09/2020
GWL 000152180 (001)	5000	Perth	Shire of Kalamunda	Perth - Superficial Swan	Disisto, Michael; Disisto, Lilliana	4, SULTANA RD, FORRESTFIELD	Lot 4 on Plan 13574; Certificate of Title Volume 1595 Folio 552 - Lot 4 Sultana Road Forrestfield	28/02/2003	20/01/2013
GWL 000152215 (001)	23120	Perth	Shire of Kalamunda	Perth - Superficial Swan	Fagnani, Antonio (Tony)	1, MILNER RD, HIGH WYCOMBE	Lot 1 on Diagram 17430; Certificate of Title Volume 1324 Folio 130 - Lot 1 Milner Road High Wycombe	2/09/2010	1/09/2020
GWL 000152244 (004)	25725	Perth	Shire of Swan South	Perth - Superficial Swan	Guildford Grammar School Inc	191, GREAT EASTERN HWY, GUILDFORD	Lot 191 On Diagram 4819 - Volume/Folio 1375/236 - Lot 191 Great Eastern Hwy Guildford - Guildford Grammar School	28/02/2003	12/09/2013
GWL 000152515 (001)	9000	Perth	Shire of Kalamunda	Perth - Superficial Swan	Farfaro, M & A	415, PLOVER RD, HIGH WYCOMBE	Lot 415 on Plan 16088; Certificate of Title Volume 1789 Folio 22 - Lot 415 Plover Road High Wycombe	30/03/2010	11/11/2017
GWL 000152680 (003)	27750	Perth	Shire of Swan South	Perth - Superficial Swan	Di Giuseppe, Antonio Giuseppe	147, TALBOT RD, HAZELMERE	Lot 147 On Plan 4553 - Volume/Folio 2164/776 - Lot 147 Talbot Rd Hazelmere	25/03/2003	14/09/2013
GWL 000152617 (002)	4400	Perth	Shire of Kalamunda	Perth - Superficial Swan	Lush, Leonard James	26, BREWER RD, MAIDA VALE	Lot 26 on Plan 13588; Certificate of Title Volume 1597 Folio 415 - Lot 26 Brewer Road Forrestfield	8/11/2005	14/09/2015
GWL 000152906 (002)	30000	Perth	Shire of Swan South	Perth - Superficial Swan	BGC (Australia) Pty Ltd	80, BUSHMEAD RD, HAZELMERE	Lot 80 On Plan 4539 - Volume/Folio 1374/513 - Lot 80 Bushmead Rd Hazelmere	9/09/2010	10/09/2020
GWL 000153124 (001)	11450	Perth	Shire of Kalamunda	Perth - Superficial Swan	Ozanne, R.W. & J	1, RIDGE HILL RD, MAIDA VALE	Lot 1 on Plan 4326; Certificate of Title Volume 1436 Folio 461 - Lot 1 Ridge Hill Road Maida Vale	13/04/2005	15/04/2015
GWL 000153231 (001)	7250	Perth	Shire of Kalamunda	Perth - Superficial Swan	Porges, Bruce	105, OXFORD CT, MAIDA VALE	Lot 105 on Diagram 90357; Certificate of Title Volume 2114 Folio 155 - Lot 105 Oxford Court Maida Vale	12/06/2003	12/09/2013
GWL 000153592 (002)	6400	Perth	Shire of Kalamunda	Perth - Superficial Swan	Miles, Peter Leslie	82, BRAE RD, HIGH WYCOMBE	Lot 82 on Diagram 60280; Certificate of Title Volume 1591 Folio 203 - Lot 82 Brae Road High Wycombe	21/05/2003	24/05/2013
GWL 000153624 (001)	12000	Perth	Perth South Confined	Perth - Leederville.	Metalic Investments Pty Ltd	134, GREAT NORTHERN HWY, MIDDLE SWAN	Lot 134 on Diagram 35619; Certificate of Title Volume 1987 Folio 606 Lot 134 Great Northern Highway Middle Swan	15/09/2010	15/09/2020
GWL 000153641 (001)	13950	Perth	Shire of Swan South	Perth - Superficial Swan	Wilcox, Sidney Alexander; Wilcox, Lynley Jane	15, STIRLING CR, HAZELMERE	Lot 15 on Plan 4556; Certificate of Title Volume 2002 Folio 816 - Lot 15 Stirling Crescent Hazelmere	10/07/2003	21/03/2013
GWL 000153785 (002)	3375	Perth	Shire of Kalamunda	Perth - Superficial Swan	Leisure Time Pty Ltd	10, MAIDA VALE RD, HIGH WYCOMBE	Lot 10 on Diagram 32130; Certificate of Title Volume 2023 Folio 709 - Lot 10 Maida Vale Road High Wycombe	29/08/2003	31/12/2013
GWL 000153812 (001)	5400	Perth	Shire of Kalamunda	Perth - Superficial Swan	TTN Pty Ltd	11, KALAMUNDA RD, HIGH WYCOMBE	Lot 11 on Diagram 13889; Certificate of Title Volume 1670 Folio 694 Lot 11 Kalamunda Road High Wycombe	1/09/2010	1/09/2012
GWL 000153889 (002)	10000	Perth	Shire of Kalamunda	Perth - Superficial Swan	Forrestfield Christian School	22, HAWTIN RD, FORRESTFIELD	Lot 22 on Diagram 70988; Certificate of Title Volume 1751 Folio 739 - Lot 22 Hawtin Road Forrestfield - Forrestfield Christian School Inc	23/07/2003	6/10/2012
GWL 000154050 (001)	4000	Perth	Shire of Kalamunda	Perth - Superficial Swan	Mattar, Shafik Ahmad	91, STEWART RD, HIGH WYCOMBE	Lot 91 on Plan 13420; Certificate of Title Volume 1581 Folio 968 - Lot 91 Stewart Road High Wycombe	30/03/2010	14/09/2013
GWL 000154091 (001)	4250	Perth	Shire of Kalamunda	Perth - Superficial Swan	Halse, O D	106, SADLER DR, GOOSEBERRY HILL	Lot 106 on Plan 13566; Certificate of Title Volume 1596 Folio 421 - Lot 106 Sadler Drive Gooseberry Hill	25/08/2003	3/11/2013
GWL 000154118 (001)	3750	Perth	Shire of Kalamunda	Perth - Superficial Swan	Hampson, William	11, SULTANA RD, FORRESTFIELD	Lot 11 on Plan 13574; Certificate of Title Volume 1595 Folio 558 - Lot 11 Sultana Road Forrestfield	16/10/2003	25/10/2013
GWL 000154241 (001)	250	Perth	Perth South Confined	Perth - Leederville.	Swick, Rosanne	5, RIVER BANK BVD, SOUTH GUILDFORD	Lot 5 on Plan 19995; Certificate of Title Volume 2017 Folio 838 Lot 5 River Bank Bvd South Guildford	23/09/2003	22/09/2013
GWL 000154518 (001)	4000	Perth	Shire of Kalamunda	Perth - Superficial Swan	Bennett, Stephen	8, BRUCE RD, MAIDA VALE	Lot 8 on Diagram 16758; Certificate of Title Volume 1865 Folio 502 - Lot 8 Bruce Road Forrestfield	30/09/2003	24/09/2013
GWL 000154520 (001)	7740	Perth	Shire of Kalamunda	Perth - Superficial Swan	Avery, Vernon Bruce	50, MILNER RD, HIGH WYCOMBE	Lot 50 on Plan 13420; Certificate of Title Volume 1584 Folio 959 - Lot 50 Milner Road High Wycombe	21/01/2004	19/01/2014
GWL 000154669 (001)	3500	Perth	Shire of Kalamunda	Perth - Superficial Swan	Patterson, N J	4, BRAND RD, HIGH WYCOMBE	Lot 4 on Diagram 69590; Certificate of Title 1723, Folio 473 - Lot 4 Brand Road High Wycombe	20/01/2004	19/01/2014
GWL 000154688 (003)	4000	Perth	Shire of Swan South	Perth - Superficial Swan	Racing and Wagering Western Australia	22, Kalamunda Road, Guildford	Swan Location 22 on Part Lot 2 on Diagram 26301; Certificate of Title Volume 1800 Folio 163 - Lot 22 Kalamunda Road Guildford	6/01/2004	6/01/2014
GWL 000155224 (002)	100000	Perth	Shire of Kalamunda	Perth - Superficial Swan	Western Australian Fire Brigades Board	10261, DUNDAS RD, FORRESTFIELD	Reserve 37260 on Plan 215367; Certificate of Title Volume LR3119 Folio 71 Reserve 37260 Dundas Road Forrestfield	15/06/2009	15/06/2019
GWL 000155429 (004)	162750	Perth	Shire of Kalamunda	Perth - Superficial Swan	Department of Education	8558, KALAMUNDA RD, MAIDA VALE	Crown Reserve 18689 - Lot 8558 Kalamunda Rd Maida Vale - Maida Vale Primary School	20/05/2010	25/03/2014
GWL 000155429 (004)	162750	Perth	Shire of Kalamunda	Perth - Superficial Swan	Department of Education	12500, NEWBURN RD, HIGH WYCOMBE	Crown Reserve 25959; Lot 12500 Newburn Road High Wycombe - High Wycombe Primary School	15/02/2012	28/02/2022
GWL 000155429 (004)	162750	Perth	Shire of Kalamunda	Perth - Superficial Swan	Department of Education	9109, BERKSHIRE RD, FORRESTFIELD	Crown Reserve 32845; Lot 9109 Berkshire Road Forrestfield - Darling Range Sports College	15/02/2012	28/02/2022
GWL 000155429 (004)	162750	Perth	Shire of Kalamunda	Perth - Superficial Swan	Department of Education	9101, BOUGAINVILLEA AV, FORRESTFIELD	Crown Reserve 29061; Lots 9101 & 10295 Dawson Avenue Forrestfield - Dawson Park Primary School	15/02/2012	28/02/2022
GWL 000155448 (005)	276875	Perth	Perth South Confined	Perth - Leederville.	Department of Education	11688, WELLATON ST, MIDVALE	Lot 11688 On Plan 190653 Lot 11688 Wellaton St Midvale Midvale Primary School	15/07/2012	28/07/2022
GWL 000155694 (001)	7625	Perth	Shire of Kalamunda	Perth - Superficial Swan	Noske, Jeffrey John	3, BRAND RD, HIGH WYCOMBE	Lot 3 On Diagram 69590 - Volume/Folio 1723/472 - Lot 3 Brand Rd High Wycombe	21/02/2012	28/02/2022
GWL 000155696 (001)	2500	Perth	Shire of Kalamunda	Perth - Superficial Swan	De Haan, David; De Haan, Chrystine	5, SULTANA RD, FORRESTFIELD	Lot 5 On Plan 13574 - Volume/Folio 1595/553 - Lot 5 Sultana Rd Forrestfield	25/05/2004	20/05/2014
GWL 000156446 (005)	19000	Perth	Shire of Swan South	Perth - Superficial Swan	Brighton, Anthony		Lot 7 On Plan 30344 - Volume/Folio 2034/646 - Lot 7 Hazelmere	26/05/2004	21/05/2014
GWL 000156453 (001)	10300	Perth	Perth South Confined	Perth - Leederville	Shire of Kalamunda		Lot 2002 On Plan 26877 Volume/Folio 2213/141 Lot 2002 Forrestfield	23/02/2012	23/02/2022
GWL 000156772 (003)	103875	Perth	Perth South Confined	Perth - Leederville.	Guildford Grammar School Inc	191, GREAT EASTERN HWY, GUILDFORD	Lot 191 On Diagram 4819 Volume/Folio 1375/236 Lot 191 Great Eastern Hwy Guildford Guildford Grammar School	19/07/2005	20/07/2015
GWL 000157266 (002)	15000	Perth	Shire of Mundaring	Perth - Superficial Swan	Shire of Mundaring	123, GREAT EASTERN HWY, MIDVALE	Lot 123 On Diagram 68478 - Volume/Folio 1712/10 - Lot 123 Great Eastern Hwy Midvale and Road verges on Great Eastern Hwy, Stanhope Gardens & Farrall Road Midvale	30/03/2010	11/12/2017
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	11583, KALAMUNDA RD, MAIDA VALE	Lot 11583 On Plan 217852 Volume/Folio Lr3122/450 Lot 11583 Kalamunda Rd Maida Vale Maida Vale Reserve/Tennis Club	22/06/2007	22/06/2017
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	9462, MARKHAM RD, HIGH WYCOMBE	Crown Reserve 36299 - Lot 9462 Markham Rd High Wycombe - High Wycombe Library	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	10127, SADDLEBACK CIR, MAIDA VALE	Crown Reserve 38271 - Lot 10127 Saddleback Cir Maida Vale - Saddleback Circle	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	14651, BENSON WY, HIGH WYCOMBE	Lot 14651 On Plan 33710 - Lot 14651 Benson Wy High Wycombe - Jacaranda 1 Lot 14650 On Plan 33710 - Volume/Folio Lr3130/410 - Lot 14650 Hatton Bvd High Wycombe - Jacaranda 1	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	13987, FRUIT TREE CR, FORRESTFIELD	Crown Reserve 45496 Volume/Folio Lr3122/5 Lot 13987 Fruit Tree Cr Forrestfield Fruit Tree Way Lot 14509 On Plan 31502 - Volume/Folio Lr3128/106 - Lot 14509 Fruit Tree Cr Forrestfield - Fruit Tree Way	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	11887, WITTENOOM RD, HIGH WYCOMBE	Lot 11687 On Plan 18576 - Volume/Folio Lr3101/112 - Lot 11687 Wittenoom Rd High Wycombe - Viv Robinson Park	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	13211, TREE FERN GRN, MAIDA VALE	Lot 13211 On Plan 22311 - Volume/Folio Lr3112/823 - Lot 13211 Tree Fern Grn Maida Vale - Pinker Reserve	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	7945, WITTENOOM RD, HIGH WYCOMBE	Crown Reserve 27815 - Lot 7945 Wittenoom Rd High Wycombe - Emms Reserve	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	15426, BOWDEN DR, HIGH WYCOMBE	Lot 15426 On Plan 38202 - Volume/Folio Lr3137/878 - Lot 15426 Bowden Dr High Wycombe - Jacaranda 2	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	11072, NEWBURN RD, HIGH WYCOMBE	Lot 11072 On Plan 188672 - Lot 11072 Newburn Rd High Wycombe - Fleming Reserve	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	570, NEWBURN RD, HIGH WYCOMBE	Lot 570 On Plan 15368 - Volume/Folio 1764/820 - Lot 570 Newburn Rd High Wycombe - Lot 570 Newburn Rd	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	15430, FRUIT TREE CR, FORRESTFIELD	Lot 15430 On Plan 40810 - Volume/Folio Lr3134/620 - Lot 15430 Fruit Tree Cr Forrestfield - Lot 15430 Fruit Tree Cres	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	15405, WARDA CR, FORRESTFIELD	Lot 15405 On Plan 38797 Volume/Folio Lr3133/445 Lot 15405 Warda Cr Forrestfield Warda Est	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	601, HAWKEVALE RD, HIGH WYCOMBE	Lot 601 On Plan 24621 - Volume/Folio Lr3131/506 - Lot 601 Hawkevale Rd High Wycombe - Hawkevale Rd	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	10295, DAWSON AV, FORRESTFIELD	Crown Reserve 29061 - Lot 10295 Dawson Av Forrestfield - Dawson Park Crown Reserve 35618 - Lot 9685 Dawson Av Forrestfield - Dawson Park	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	11104, KOOKABURRA CR, HIGH WYCOMBE	Lot 11104 On Plan 16087 - Lot 11104 Kookaburra Cr High Wycombe - Peter Hegney Park Crown Reserve 29104 - Lot 8562 Netherwood Rd High Wycombe - Mackenzie Park	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	8295, NETHERWOOD RD, HIGH WYCOMBE	Crown Reserve 29104 - Lot 8295 Netherwood Rd High Wycombe - Mackenzie Park	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	8927, DANDALONG WY, HIGH WYCOMBE	Crown Reserve 31571 Lot 8927 Dandalong Wy High Wycombe Progress Reserve	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	11956, WORRELL AV, HIGH WYCOMBE	Lot 11956 On Diagram 82220 - Volume/Folio Lr3103/241 - Lot 11956 Worrell Av High Wycombe - Ollie Worrell Reserve	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	11891, WYCOMBE RD, HIGH WYCOMBE	Lot 11891 On Plan 191250 - Volume/Folio Lr3101/184 - Lot 11891 Wycombe Rd High Wycombe - Scott Reserve	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	33, AGRAULIA CT, HIGH WYCOMBE	Lot 33 On Plan 49415 - Volume/Folio Lr3155/246 - Lot 33 Agraulia Ct High Wycombe - High Wycombe	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	11856, O'CONNELL WY, HIGH WYCOMBE	Lot 11856 On Plan 14310 Volume/Folio Lr3100/842 Lot 11856 O'Connell Wy High Wycombe Pinetree Reserve	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	28, SWAN RD, HIGH WYCOMBE	Lot 28 On Plan 4666 Volume/Folio 1536/595 Lot 28 Swan Rd High Wycombe Rangeview Park Crown Reserve 36297 - Lot 9464 Swan Rd High Wycombe - Rangeview Park	3/02/2012	20/07/2015
GWL 000158077 (005)	893275	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	10430, AKEBIA WY, FORRESTFIELD	Crown Reserve 34610 - Lot 10430 Akebia Wy Forrestfield - Akebia Way Reserve	3/02/2012	20/07/2015
GWL 000158261 (002)	100500	Perth	Perth South Confined	Perth - Leederville.	Shire of Mundaring	85, STANHOPE GDNS, MIDVALE	Lot 85 On Plan 15125 Volume/Folio 1702/343 Lot 85 Stanhope Gdns Midvale	3/02/2012	20/07/2015
GWL 000158261 (002)	100500	Perth	Perth South Confined	Perth - Leederville.	Shire of Mundaring	49, MUROS PL, MIDVALE	Lot 49 On Plan 1833 - Volume/Folio 1818/414 - Lot 49 Muros Pl Midvale	8/12/2010	31/07/2012
GWL 000159033 (003)	45300	Perth	Perth South Confined	Perth - Leederville.	Midland Redevelopment Authority		Lot 9014 On Plan 46737 - Volume/Folio 2739/400 - Lot 9014 Midland	8/12/2010	31/07/2012
GWL 000159397 (002)	12408	Perth	Shire of Kalamunda	Perth - Superficial Swan	Mitchell, Maxwell John	22, BRUCE RD, MAIDA VALE	Lot 22 On Diagram 27388 Volume/Folio 1267/97 Lot 22 Bruce Rd Maida Vale	12/04/2011	31/12/2014
GWL 000159502 (003)	49900	Perth	Shire of Kalamunda	Perth - Superficial Swan	Hillview Lifestyle Village Pty Ltd		Lot 5 On Diagram 34828 - Volume/Folio 2183/882 - Lot 5 Kalamunda Road High Wycombe	1/11/2007	1/11/2017
GWL 000161194 (001)	1000	Perth	Perth South Confined	Perth - Leederville.	Guildford Grammar School Inc	24, TERRACE RD, GUILDFORD	Lot 24 On Plan 2315 - Volume/Folio 1071/570 - Lot 24 Terrace Rd Guildford	16/03/2010	16/03/2020
								3/07/2006	13/12/2014
GWL 000161669 (003)	35250	Perth	Shire of Swan South	Perth - Superficial Swan	Domain Project Development PTY LTD; Guilford Grammer School Foundation Inc.	PDE, SOUTH GUILDFORD	Lot 9003 On Plan 56679 Volume/Folio 2683/592 Lot 9003 South Guildford	20/05/2010	12/02/2019

GWL 000162380 (003)	2325	Perth	Shire of Mundaring	Perth - Superficial Swan	Shire of Mundaring	ENA VALLEY RD, HELENA VALLEY	Lot 207 On Plan 4633 - Volume/Folio 1626/767 - Lot 207 Helena Valley Rd Helena Valley	10/03/2010	22/12/2018
GWL 000163872 (002)	2021	Perth	Shire of Kalamunda	Perth - Superficial Swan	Riley, Craig; Riley, Helen	LTANA RD, MAIDA VALE	Lot 111 On Diagram 71481 - Volume/Folio 1757/989 - Lot 111 Sultana Rd Maida Vale	12/10/2009	12/10/2019
GWL 000164988 (003)	8700	Perth	Shire of Swan South	Perth - Superficial Swan	Rando, Stephen		Lot 816 On Plan 53664 - Volume/Folio 2648/953 - Lot 816 Hazelmere Lot 816 On Plan 53664 - Volume/Folio 2648/953 - Lot 816 Hazelmere - Lot 816 Stirling Crescent, Hazelmere	26/11/2009	26/11/2019
GWL 000167016 (001)	7250	Perth	Shire of Kalamunda	Perth - Superficial Swan	Peters, Jennifer Ann	92, MILNER RD, HIGH WYCOMBE	Lot 92 On Plan 13420 - Volume/Folio 1591/969 - Lot 92 Milner Rd High Wycombe	17/10/2008	17/10/2018
GWL 000167041 (001)	3750	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	28, NOTTINGHAM GRN, HIGH WYCOMBE	Lot 28 On Plan 49522 - Volume/Folio Lr3139/210 - Lot 28 Nottingham Grn High Wycombe	17/10/2008	17/10/2018
GWL 000167147 (001)	11250	Perth	Perth South Confined	Perth - Leederville.	Shire of Mundaring	241, HELENA VALLEY RD, HELENA VALLEY	Lot 241 On Plan 4633 - Volume/Folio 1620/630 - Lot 241 Helena Valley Rd Helena Valley	8/12/2011	2/11/2018
GWL 000167785 (001)	3000	Perth	Shire of Kalamunda	Perth - Superficial Swan	Anetic, Rutka	220, NARDINE CL, FORRESTFIELD	Lot 220 On Plan 31169 - Volume/Folio 2526/471 - Lot 220 Nardine Cl Forrestfield	30/10/2008	30/10/2018
GWL 000167798 (001)	3740	Perth	Shire of Kalamunda	Perth - Superficial Swan	Miles, Peter Leslie	82, BRAE RD, HIGH WYCOMBE	Lot 82 on Diagram 60280; Certificate of Title Volume 1591 Folio 293 - Lot 82 Brae Road High Wycombe	16/04/2009	16/04/2019
GWL 000167942 (002)	1200	Perth	Shire of Kalamunda	Perth - Superficial Swan	Littlefield Development Pty Ltd	4, LITTLEFIELD RD, HIGH WYCOMBE	Lot 4 on Diagram 2034; Certificate of Title Volume 1308 Folio 680 - Lot 4 Littlefield Road High Wycombe	21/04/2010	19/02/2019
GWL 000168139 (002)	280775	Perth	Perth South Confined	Perth - Leederville.	City of Swan	98, HARPER ST, WOODBRIDGE	Lot 98 On Plan 26404 - Volume/Folio 2215/629 - Lot 98 Harper St Woodbridge - Ray Marshall Park Lot 183 On Plan 3307 - Volume/Folio 1142/532 - Lot 183 Crosbie Rd Woodbridge - Ray Marshall Park	30/06/2011	30/06/2016
GWL 000168139 (002)	280775	Perth	Perth South Confined	Perth - Leederville.	City of Swan	144, HELENA ST, GUILDFORD	Portion of Guildford Town Lot 144 and being the whole of the land comprised in Certificate of Title Volume 1228 Folio 232 - Lot 144 Helena Street Guildford	30/06/2011	30/06/2016
GWL 000168139 (002)	280775	Perth	Perth South Confined	Perth - Leederville.	City of Swan	9803, MORRISON RD, SWAN VIEW	Crown Reserve 35340 - Lot 9803 Morrison Rd Swan View - Swanview Oval	30/06/2011	30/06/2016
GWL 000168139 (002)	280775	Perth	Perth South Confined	Perth - Leederville.	City of Swan	52, MORRISON RD, MIDLAND	Lot 52 On Plan 3298 - Volume/Folio 2156/710 - Lot 52 Morrison Rd Midland - Midland Oval	30/06/2011	30/06/2016
GWL 000168139 (002)	280775	Perth	Perth South Confined	Perth - Leederville.	City of Swan	10174, GRAY DR, MIDVALE	Crown Reserve 37172 - Lot 10174 Gray Dr Midvale - Ron Jose Oval	30/06/2011	30/06/2016
GWL 000168139 (002)	280775	Perth	Perth South Confined	Perth - Leederville.	City of Swan	13421, EDDIE BARRON DR, MIDDLE SWAN	Lot 13421 On Plan 220279 - Volume/Folio Lr3111/605 - Lot 13421 Eddie Barron Dr Middle Swan - Velodrome	30/06/2011	30/06/2016
GWL 000168473 (001)	900	Perth	Shire of Kalamunda	Perth - Superficial Swan	O'Reilly, Peter Hamilton	32, HAWTIN RD, MAIDA VALE	Lot 32 On Diagram 52799 - Volume/Folio 1509/74 - Lot 32 Hawtin Rd Maida Vale	28/07/2009	28/07/2019
GWL 000168841 (002)	15875	Perth	Shire of Swan South	Perth - Superficial Swan	Metropolitan Cemeteries Board		Lot 501 On Plan 52787 - Volume/Folio LR3146/639 - Lot 501 South Guildford and Lot 502 On Plan 52787 - Volume/Folio LR3146/640 - Lot 502 South Guildford	21/04/2010	11/11/2017
GWL 000169011 (003)	12750	Perth	Shire of Kalamunda	Perth - Superficial Swan	Sunstyle Holdings Pty Ltd	15401, ELMORE WY, HIGH WYCOMBE	Lot 15401 On Plan 39533 - Volume/Folio Lr3134/618 - Lot 15401 Elmore Wy High Wycombe	10/09/2010	9/09/2012
GWL 000169609 (001)	2850	Perth	Shire of Mundaring	Combined - Fractured Rock West - Fractured Rock	Tiong, Mohamad	19, SAMSON PL, HELENA VALLEY	Lot 19 On Plan 4508 - Volume/Folio 1663/753 - Lot 19 Samson Pl Helena Valley	20/01/2010	19/01/2020
GWL 000170338 (001)	8500	Perth	Shire of Kalamunda	Perth - Superficial Swan	Quaker Oats Australia Pty Ltd	3, DUNDAS RD, FORRESTFIELD	Lot 3 On Diagram 49722 - Volume/Folio 1430/986 - Lot 3 Dundas Rd Forrestfield	3/03/2010	3/03/2020
GWL 000170681 (001)	10000	Perth	Shire of Mundaring	Combined - Fractured Rock West - Fractured Rock	Helena Valley Residential Resort Pty Ltd	237, HELENA VALLEY RD, HELENA VALLEY	Lot 237 On Plan 4633 - Volume/Folio 1627/717 - Lot 237 Helena Valley Rd Helena Valley	20/10/2010	20/10/2020
GWL 000170758 (001)	3375	Perth	Shire of Kalamunda	Perth - Superficial Swan	Mulligan Nominees Pty Ltd	500, ABERNETHY RD, HIGH WYCOMBE	Lot 500 On Plan 57839 - Volume/Folio 2682/194 - Lot 500 Abernethy Rd High Wycombe	10/06/2010	10/06/2020
GWL 000171656 (001)	13500	Perth	Shire of Mundaring	Perth - Superficial Swan	Hemsley, Jeffrey	1, HELENA VALLEY RD, HELENA VALLEY	Lot 1 On Plan 51853 - Volume/Folio 2033/573 - Lot 1 Helena Valley Rd Helena Valley Lot 9000 On Plan 30961 - Volume/Folio 2223/565 - Lot 9000 West Pde South Guildford	28/07/2010	28/07/2015
GWL 000172101 (001)	160500	Perth	Shire of Swan South	Perth - Superficial Swan	Gatti Investments Pty Ltd	9000, WEST PDE, SOUTH GUILDFORD	Lot 57 On Plan 28643 - Volume/Folio 2720/200 - Lot 57 West Pde South Guildford	20/10/2010	20/10/2020
GWL 000172128 (002)	19500	Perth	Shire of Mundaring	Combined - Fractured Rock West - Fractured Rock	Department of Education	6714, INNAMINCKA RD, GREENMOUNT	Lot 6714 On Diagram 23385 - Volume/Folio L3013/567 - Lot 6714 Innamincka Rd Greenmount - Greenmount Primary School	21/02/2012	28/02/2022
GWL 000172312 (001)	13500	Perth	Shire of Kalamunda	Perth - Superficial Swan	Tyler, Donald	534, BERKSHIRE RD, FORRESTFIELD	Lot 534 On Plan 4684 - Volume/Folio 1219/69 - Lot 534 Berkshire Rd Forrestfield	30/11/2010	30/11/2020
GWL 000172123 (001)	96800	Perth	Perth South Confined	Perth - Leederville.	Macmahon Contractors Pty Ltd		Lot 41 On Diagram 14616 - Volume/Folio 1130/551 - Lot 41 Midvale	4/01/2011	7/01/2013
GWL 000172427 (001)	9175	Perth	Shire of Mundaring	Combined - Fractured Rock West - Fractured Rock	ROMAN CATHOLIC ARCHBISHOP OF PERTH	200, INNAMINCKA RD, GREENMOUNT	Lot 200 On Diagram 62972 - Volume/Folio 1859/153 - Lot 200 Innamincka Rd Greenmount - Saint Anthony's School Greenmount	2/12/2010	2/12/2020
GWL 000173475 (001)	15340	Perth	Shire of Mundaring	Perth - Superficial Swan	Whitehouse Nominees Pty Ltd	203, HELENA VALLEY RD, HELENA VALLEY	Lot 203 On Plan 4633 - Volume/Folio 1738/031 - Lot 203 Helena Valley Rd Helena Valley	22/06/2011	22/06/2021
GWL 000174323 (001)	5200	Perth	Shire of Kalamunda	Perth - Superficial Swan	Shire of Kalamunda	527, BERKSHIRE RD, FORRESTFIELD	Lot 527 On Plan 4684 - Volume/Folio 1263/561 - Lot 527 Berkshire Rd Forrestfield	13/01/2012	13/01/2014
GWL 000175090 (001)	750	Perth	Shire of Mundaring	Perth - Superficial Swan	Bullton Group Pty Ltd	206, HELENA VALLEY RD, HELENA VALLEY	Lot 206 On Plan 4633 - Volume/Folio 1747/599 - Lot 206 Helena Valley Rd Helena Valley	23/02/2012	23/07/2012

Appendix C – Site Survey Data

REPORT

Midland Survey Services
3 Victoria Street MIDLAND WA 6056
Tel: (08) 9374 7777 | Fax: (08) 9374 7799
E-Mail: survey@midlandsurveys.com.au

DATE	29th June 2012	FAX No.			
TO	**Environmental Services**	ATTENTION	**Greg Watts**		
FROM	Chew Chee Xun	JOB - DOCUMENT No.	**11460-W1**	REV	**0**
TOTAL PAGES INCLUDING THIS ONE	1		REPLY REQUIRED	No	

HEADING **Lot 20 Adelaide Street, Hazelmere**

CLIENT ORDER No.

1. Co-ordinates are in metres related to MGA on SSM MV75
2. Levels are in metres related to AHD based on SSM MV75 (RL: 23.0803m)
3. Levels are to **top of PVC pipe within outer casing**
4. Surveyor: **Chew Chee Xun**
5. Date of Survey: **29th June 2012**
6. Field Book Number: **1215**

Name	Easting	Northing	Casing RL(m)
MB1	406504.04	6467036.79	27.281
MB2	406693.90	6466947.24	30.607
MB3	406997.15	6466823.35	34.622
MB4	406617.75	6467311.73	27.751
MB5	406731.40	6467262.78	29.034
MB6	406998.45	6467183.20	31.611

Approved ______________________

Training Manager

Appendix F – Soil Amendment Management Plan (MDWES)

Environmental Services

Specialising in:

Acid Sulphate Soils
Contaminated Site Assessment
Air Quality Investigations

Remediation Advice and Design
Groundwater Management
Facility Maintenance

ABN 36 835 856 256

OPERATING STRATEGY

Soil Amendment Management Plan

Lot 20 Adelaide Street
Hazelmere

PREPARED FOR:

Wasterock Pty Ltd

MDW

Environmental Services

DOCUMENT DETAILS

Title:	Soil Amendment Management Plan: Lot 20 Adelaide Street, Hazelmere
Author:	Greg Watts
Job number:	E2012-031
Email:	info@environmentalservices.com.au
Synopsis:	This document and subsequent report has been prepared in accordance with the Department of Environment and Conservation (DEC) Acid Sulfate Soil Management series.

DOCUMENT DISTRIBUTION

Version No	Checked by Date	Issued by Date	Distributed to	Copies
1	M. Waite 11/03/2014	G. Watts 12/03/2014	Wasterock Pty Ltd GRA Strategen VDM	Email Email Email Email
Signed		G. J. Watts		

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Acceptance of this document denotes acceptance of these terms.

TABLE OF CONTENTS

1 INTRODUCTION 2
2 OBJECTIVES 2
3 SITE CHARACTERISTICS 2
3.1 Proposed Development 3
3.2 Local Geology 3
3.3 Acid Sulfate Soils 3
Figure 2 ASS Risk Map 5
4 SITE MANAGEMENT PLAN 6
4.1 ACID SULFATE SOILS 6
4.1.1 Re-use 6
4.1.2 Methodology 6
4.1.3 Validation Sampling 7
4.2 HYDROCARBON IMPACTED SOILS 7
4.2.1 Re-use 7
4.2.2 Methodology 7
4.2.3 Validation Sampling 8
5 ASSESSMENT CRITERIA 9
5.1 Acid Sulfate Soil 9
5.1.1 Stage 1 Validation 9
5.1.2 Stage 2 Validation 9
5.2 Hydrocarbon Impacted Soils 9
6 MONITORING AND RECORDING 9
7 REFERENCES 10

FIGURES

Figure 1 Site Location 4
Figure 2 ASS Risk Map 5

1 INTRODUCTION

This Soil Amendment Management Plan (SAMP) has been prepared to support the application submitted by Wasterock Pty Ltd to become licensed for the acceptance and treatment of Acid Sulfate Soils (ASS) and Hydrocarbon Impacted soils (HI) at Lot 20 Adelaide Street, Hazelmere (herein referred to as 'the Site').

The proposed development involves the remediation of current land use at the Site from a closed landfill facility to 'industrial / commercial' use (lot subdivision). .

The SAMP is intended to address the following final use scenarios:

- The use of neutralised/amendment material in on-site landscaping activities.
- The use of neutralised/amendment material in soil blends; and/or
- The disposal of treated material, with no identified re-use options.

The Site occupies an area of approximately 16.95 Ha. Surface and sub-soil consists of Bassendean sands, with limonite-cemented sand (coffee rock) occurring throughout most of the property near the water table.

2 OBJECTIVES

This SAMP has been prepared in order to minimise impacts to the local environment and to ensure no unacceptable environmental impacts occur as a result of the management of ASS/HI materials. The objectives of the plan are to:

- Ensure that no adverse changes occur to ground or surface water quality outside the Site boundary as a result of the management of ASS/HI materials.
- Ensure that soils and peat are treated and disposed in an environmentally conscious manner.
- Ensure that all ASS/HI material accepted is monitored and documents.
- Ensure that all ASS/HI materials are safely managed, treated and re-used/disposed in accordance with relevant guidelines.
- Ensure that groundwater quality at the site is monitored for any changes that may occur.

3 SITE CHARACTERISTICS

The Site is located at Lot 20 Adelaide Street, Hazelmere within the City of Swan, approximately 14 km east north east of the Perth CBD, 6 km east of the Swan River and 1 km west of the Darling Scarp (Figure 1). The Site was formerly vested with Hazelland Pty Ltd since 2006 under the Land Title City of Swan Location Lot 20 Volume 2054 / Folio 299. The Certificate of Title is attached in Appendix A. The Site is currently vested with Wasterock Pty Ltd.

The Site covers an area of approximately 16.95 Ha, bounded by Adelaide Street to the south, and Roe Highway to the east (Figure 2). Semi-rural properties containing discarded farming, market gardens and horse trotting tracks/stables flank the Site to the north, with a small operational industrial site (ice works) functioning adjacent to the western boundary, adjacent to the proposed abstraction bores.

Current topography varies across the Site from approximately RL 33 mAHD at the top of the inert fill mounds in the north east sector, to approximately RL 27 mAHD at the south, adjacent to Adelaide Street.

3.1 Proposed Development

It has been proposed that the Site is to be transformed and remediated from a closed landfill facility into industrial / commercial lots. This will be achived through a process of strategic excavation down to clay/sandy substrates, processing of exctracted soils and placement within a engineered cell.

3.2 Local Geology

The site is underlain by Bassendean sands, which can generally be characterised by pale grey to white; sub-rounded to rounded quartz sands. A layer of friable, limonite-cemented sand, often referred to as 'coffee rock' commonly occurs throughout most of the area near the water table (Davidson 1995).

The Bassendean Sand unconformably overlies the Cretaceous and Tertiary Strata, interfingers with Guildford clays and conformably overlies the Gnangara Sands (Davidson 1995). The stratigraphic configuration of the Bassendean Sand with the Guildford Clay and Gnangara Sand suggests the formation was deposited under changing conditions, most likely alternating between fluvial, estuarine and shallow-marine environments (Davidson 1995).

3.3 Acid Sulfate Soils

The DEC ASS Risk Map obtained from the WA Atlas (Landgate, 2012) indicates that the majority of the Site is located within a moderate to low risk area of ASS generally occurring below 3 mbgl. (Figure 2).

Figure 1 Site Location

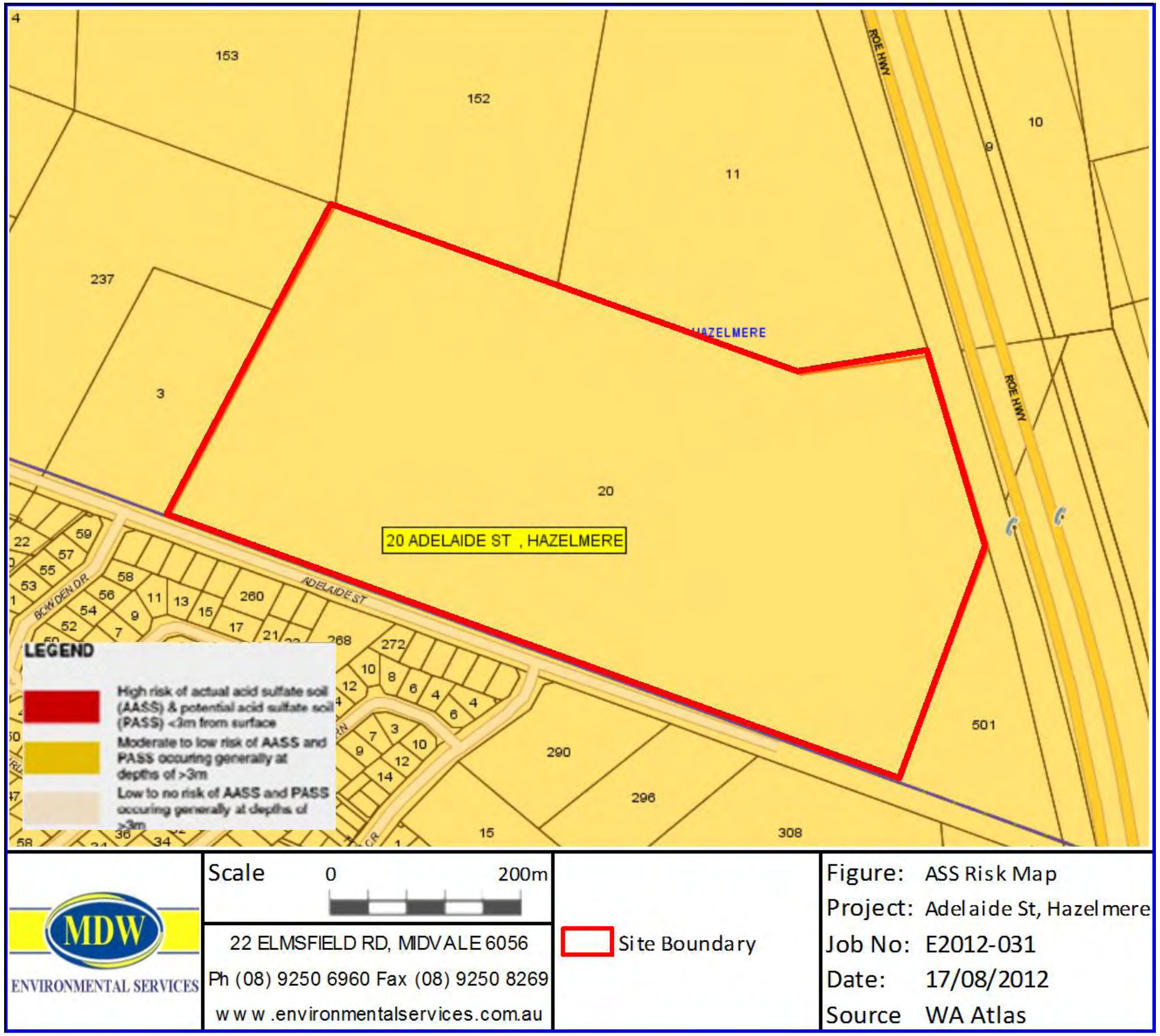

Figure 2 ASS Risk Map

4 SITE MANAGEMENT PLAN

4.1 RECIEVED - ACID SULFATE SOILS

The following pertains to operational considerations for the acceptance, management, re-use and disposal of ASS material.

Samples of untreated material that are identified as PASS or AASS must undertake laboratory analysis to determine the amount of neutralising agent required to neutralise the soil. The analytical methods of choice are the Suspension Peroxide Oxidation Combined Acidity and or Sulfate (SPOCAS) and Chromium Reducible Sulfur (SCR). The number of samples required will be as required according to the *Landfill Waste Classifications and Definitions 1996 (As Amended)*.

4.1.1 Re-use

Peat will be treated and re-used in soil amendment products and will not be disposed of to landfill.

ASS other than peat will be treated and re-used as capping material as part of the remediation of the project. If the soil is not able to be re-used or there is an overabundance of soil in the stockpile, it will be disposed of as landfill, where the organic content is less than 20%. The disposal of ASS soils to a Class 1 landfill facility is only justifiable in the event that:

1. There are no other uses for the material on-site.
2. That the Department of Environment Regulation is informed of the necessity for disposal as landfill and has given the appropriate authorisation.

4.1.2 Methodology

All materials will be tested according to *Landfill Waste Classifications and Waste Definitions 1996 (As Amended)* (DEC 2009). The results will then be validated and checked by MDWES and written approval for acceptance will be submitted to Wasterock Pty Ltd prior to material delivery. MDWES will also advise regarding the treatment, processing and remediation requirements of soils.

The liming rate provided by MDWES will be determined as per the DEC (2011) *Treatment and Management of Soils and Water in Acid Sulfate Soil Landscapes*. Contaminated Sites Branch, Department of Environment and Conservation (now Department of Environment Regulation) and includes a safety factor of 1.5. The treatment procedure will then be provided to the Site Manager; the client advised; and, material delivery will commence.

4.1.2.1 Neutralisation

Every $20m^3$ truck load of ASS material will be tipped onto a limestone treatment pad. Materials are to be treated immediately or as soon as is practicable. The minimum standard shall be, ***"All material is treated on the day of delivery".***

The Site Manager will oversee the application of the appropriate quantity of limestone, which will be spread over the top of each truck load. The material will be blended mechanically with a front end loader bucket and rake. Once homogeneity has been reached, the treated load will be placed on a stockpile designated for that job pending validation testing. The stockpile as a whole will receive further mixing from this handling process and as the material rolls down the stockpile face.

Samples will be taken for validation during delivery and promptly dispatched for analysis. Whilst samples are being validated, the locations will be marked for identification, pending the results. Results will then be tabulated and the material disposed of or re-treated.

4.1.2.2 Treatment Pad

A treatment pad will be used for untreated ASS material to be stockpiled. The material will stay on the treatment pad until analysis confirms that material has been neutralised and meets assessment criteria from Section 5.1. The size and location of the treatment pad will vary according the operational requirements of the Site, however changes must be communicated in writing. Specifications for the treatment pad include:

- The base of the treatment pad will consist of compacted crushed limestone with a minimum thickness of 300mm.
- The pad will be graded with a fall of 1:100 or greater, to facilitate drainage. It will be bunded on all sides with crushed limestone to retain any run-off. The bund will have a minimum height of 300mm, measured from the top of the treatment pad surface. The end of the pad, the highest point, will be protected by a drive-over bund to allow access by trucks. The drive-over bund will be 150mm high, with drainage being directed away from this point by the fall in the pad.

4.1.3 Validation Sampling

Treated materials will be sampled in accordance with the recommendations contained in the Landfill Waste Classifications and Definitions 1996 (As amended). The samples are to be taken in accordance with proper sampling techniques by the Site Manager, to ensure the sample is a good representation of the material treated.

The sample location is to be clearly marked and labelled with the date, job and sample number recorded on the marker. These details and the location should then be recorded in the Site sampling diary.

Samples are to be taken promptly to MDWES for analysis and approximately 25% of the samples will be forwarded to a NATA accredited laboratory for verification analysis under the SPOCAS or CRS method. Analyses results will be produced in a table format by MDWES and compared against the assessment criteria. A written review will then be sent to Wasterock Pty Ltd.

If validation is in compliance with the assessment criteria, the sample markers will be removed and the material will be re-used to its highest and best use. If the samples do not meet assessment criteria, that section will be excavated and re-treated with additional limestone, then re-sampled. The sample validation processes apply.

4.2 RECIEVED - HYDROCARBON IMPACTED SOILS

The following ralates to operational considerations for the acceptance, management, re-use and disposal of Hydrocabon Impacted (HI) soil materials.

Samples of untreated material that are identified must undertake laboratory analysis to determine the amount of bioremediation required to amend the soil. The number of samples required will be as required according to the *Landfill Waste Classifications and Definitions 1996 (As Amended)*.

4.2.1 Re-use

Hydrocabon impacted (HI) soils will be treated and re-used in soil amendment products within the capping layer of the rediated Site. If the soil is not able to be re-used, or there is an overabundance of soil in the stockpile, it will be disposed of as landfill.

4.2.2 Methodology

All materials will be tested according to *Landfill Waste Classifications and Waste Definitions 1996 (As Amended)* (DEC 2009). The results will then be checked by MDWES and written approval for acceptance will be submitted to Wasterock Pty Ltd, prior to material delivery. MDWES will also advise regarding the treatment, processing and remediation requirements of the soils.

4.2.2.1 Bioremediation

Every $20m^3$ truck load of HI material will be tipped onto a limestone treatment pad. Soils will be placed into windrows and will be rotated periodically to assist in the volatilisation of the HI soils.

Samples will be taken for validation once the soils appear to be remediated using hydrocarbon detection/instrumentation. The soils will then be further validated through laboratory analysis. Whilst samples are being validated, the locations will be marked for identification, pending the results. Results will then be tabulated and the material will be suitable for use as capping soils or will re-treated and assessed further.

4.2.2.2 Treatment Pad

A treatment pad wil be used for untreated HI soil material being stockpiled. The material stays on the treatment pad until analyses confirm that material has been volatilised and meets assessment criteria. The size and location of the treatment pad will vary according the operational requirements of the Site, with any changes to be communicated in writing. Specifications for the treatment pad include:

- The base of the treatment pad will consist of a 1.5mm HDPE liner and compacted crushed limestone with a minimum thickness of 300mm.
- The pad will be graded with fall of 1:100 or greater to facilitate drainage and will be bunded on all sides with crushed limestone to retain any run-off. The bund willt have a minimum height of 300mm, measured from the top of the treatment pad surface. The end of the pad, the highest point, will be protected by a drive-over bund to allow access by trucks. The drive-over bund will be 150mm high, with drainage being directed away from this point by the fall in the pad.

4.2.3 Validation Sampling

Treated soil material will be sampled in accordance with the recommendations contained in the *Landfill Waste Classifications and Definitions* 1996 (As amended). The samples will be taken in accordance with proper sampling techniques by the Site Manager, to ensure the sample is a good representation of the material treated.

The sample locations will be clearly marked and labelled with the date, job and sample number recorded on the marker. These details and the location will then be recorded in the Site sampling diary.

Samples will be taken promptly to MDWES for analysis and then forwarded to a NATA accredited laboratory for verification analysis. Analyses will be recorded in a table format by MDWES and compared against the assessment criteria. A written review will then be sent to Wasterock Pty Ltd.

If validation is in compliance with the assessment criteria, the sample markers will be removed and the material will be used/re-used to its highest and best use.

If the samples do not meet assessment criteria, then further volatilisation may be required. To remove the HI within the soils, soils would be placed back into windrows and rotated. This would require further validatory processing and laboratory samples to be taken, to ensure that the soils were suitable for their intended use (capping soils).

5 ASSESSMENT CRITERIA

5.1 Acid Sulfate Soil

5.1.1 Stage 1 Validation

Soil treatment will considered successful if:

- The individual verification samples have field test results of pH_F and pH_{OX} >5.5.
- The laboratory pH >5.5.
- The laboratory net acidity <18 mol H^+/tonne.

Treatment materials will be removed from the pad when a pH of 5.5 or greater has been achieved. The material may be stored anywhere on the site pending Stage 2 testing.

5.1.2 Stage 2 Validation

Treated material that meets the Stage 1 criteria will be further tested in 4 to 8 weeks. These results will be assessed against the assessment criteria of pH_F >6.5 and pH_{OX} >6. If above these Stage 2 levels, the material will be considered "successfully treated" and considered fully neutralised. The soils can then be used for any purpose within the limitations of Section 4.1.

Materials that fail Stage 2 will be subjected to additional testing until the criterion is met. Re-treated material will be re-tested immediately and will not require the 4 to 8 week stabilisation period.

5.2 Hydrocarbon Impacted Soils

Soil treatment is considered successful if:

- The individual verification samples have laboratory test results of TPH below HIL-F.

6 MONITORING AND RECORDING

The existing groundwater monitoring bores at the site will be monitored in accordance with the existing licences. Wasterock Pty Ltd will also record the following information for each disposal operation:

- The total quantity of material accepted.
- The source from which the material originated.
- The end use of the treated material.
- The approximate location of disposal and the dates over which the disposal operation ran.
- Validation results for material amended for re-use on-site.

7 REFERENCES

DEC (2009) *Landfill Waste Classification and Waste Definitions 1996 (As amended December 2009)*. Department of Environment and Conservation.

DEC (2011) *Treatment and Management of Soils and Water in Acid Sulfate Soil Landscapes.* Contaminated Sites Branch, Department of Environment and Conservation

DEP (2002) *Guidelines for Acceptance of Solid Waste to Landfill*, Department of Environmental Protection.

Nearmap (2012) *PhotoMaps by Nearmap* (Online), http://www.nearmap.com

Landgate (2012) WA Atlas (Online), http://www2.landgate.wa.gov.au/bmvf/app/waatlas/

Appendix G – Air Quality Management Plan (MDWES)

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AIR QUALITY MANAGEMENT PLAN

LOT 20 ADELAIDE ST
HAZELMERE

March 2014

PREPARED FOR:

Wasterock Pty Ltd

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DOCUMENT DETAILS

Title:	Air Quality Management Plan (AQMP)
Project Address	Lot 20, Adelaide Street, Hazelmere.
Job number:	E2012-031
Author:	Kevin White
Project Manager:	Greg Watts
Email:	greg@environmentalservices.com.au
Status:	V3
Date:	March 2014
Synopsis:	This Air Quality Management Plan (AQMP) details the management and monitoring requirements for the excavation of contaminated soil during remediation works.

DOCUMENT DISTRIBUTION

Version No	Written by Date	Reviewed by Date	Issued by Date	Distributed to	Copies
v1	Nathan Fuser 30/11/2012	Greg Watts 30/11/2012	Greg Watts 30/11/2012	Wasterock Pty Ltd	Email and Hard Copy
Signed					
v2	Fiona Trevenen 21/11/13	Mathew Bulmer 22/11/13	Greg Watts 22/11/14		
Signed					
V3	Kevin White 21/03/14	Mike Waite 24/03/14	Greg Watts 24/03/14		
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Table of Contents

1 INTRODUCTION 7
1.1 Previous Reports 8
2 SITE BACKGROUND AND CHARACTERISITICS 9
2.1 Proposed Development 9
2.2 Climate 9
2.3 Soil Moisture 10
2.4 Vegetation 10
2.5 Topography 10
2.6 Contaminants of Potential Concern 10
2.7 Potential Receptors 12
3 OBJECTIVES 13
3.1 The objectives of this AQMP are to: 13
3.2 The technical objectives of the plan are to: 13
4 PROPOSED WORKS AND POTENTIAL IMPACTS 14
5 ASSESSMENT OF SITE CHARACTERISTICS 15
5.1 Wind Conditions 15
6 WEATHER MONITORING 17
6.1 Objective 17
6.2 Overview 17
6.3 Rational for Monitoring Positions 17
6.4 Responsibilities 18
6.5 Equipment 18
6.6 Equipment Maintenance 18
6.7 Data Logging and Reporting 19
7 AIR QUALITY MONITORING 20
7.1 Objective 20
7.2 Overview 20
7.3 Rational for Monitoring Positions 20
7.4 Roles and Responsibilities 22
7.5 Qualifications and Experience 24
7.6 Excavation Area (Red Zone) 25
7.7 Stations for Public Exposure Monitoring 25
8 Methodology of Sampling and Analysis 27
8.1 Dust (TSP, PM10 & PM2.5) 27
8.2 Asbestos Fibres 28
8.3 Silica Dust 29
8.4 Metals 29
9 Equipment 30
9.1 QA Lite (TES-7200) 30
9.2 SKC AirChek XR5000 Sampling Pump 30
9.3 SKC PCXR8 Universal Sampling Pump 31
9.4 Equipment Calibration and Maintenance 32
10 Air Quality Assessment Criteria 33
10.1 Sample Recovery 34
10.2 Contingency Measures 34
REFERENCES 36

Table within report

Table A – Historical Weather Information

Table B – Collated Weather Information

Table C – Maintenance Schedule

Table D – Reporting Weather Parameters & Units

Table E – Air Quality Monitoring Program

Table F – Roles & Responsibilities for Air Monitoring Program

Table G – Analytes and the Air Volume Limit

Table H – SKC Aircheck XR500 Sampling Pump Specifications

Table I – SKC PCXR8 Sampling Pump Specifications

Table J – Calibration and Maintenance Requirements

Table K – Assessment Criteria

Appendicies

Appendix A – Monitoring Equipment Technical Data Sheets

1 INTRODUCTION

This Air Quality Management Plan (AQMP) has been prepared by MDWES for Wasterock (client) to manage the release of ‘nuisance’ dust and other potential airborne contaminates during remediation of the client’s site which is llocated in the City of Swan at Lot 20 Adelaide Street, Hazelmere, Perth, herein referred to as ‘the Site’.

Previous environmental Site investigations have confirmed varying concentrations and levels of contaminants will have to be addressed during remediation. Investigations conducted by Parsons Brinckerhoff (2006) identified asbestos, heavy metals, Total Petroleum Hydrocarbons (TPH’s) and Monocyclic Aromatic Hydrocarbons (MAH’s) present within the soil matrix.

Parsons Brinckerhoff also stated that investigations undertaken were not exhaustive and therefore further undetected contaminates could be present. In addition to this, the DER re-classified the Site in November 2010 to ‘*Contaminated – remediation required’.* It is therefore necessary to ensure that appropriate management of the remediation works is undertaken to minimise the risk of potential airborne contaminants and the attributed health effects of both on and off-site occupants.

Based on previous reports and site investigations, one of the most significant health hazards during the remediation works will be the generation of nuisance dust. Which has the potential to release potential contaminants via the excavation of already contaminated soils during the earthworks and groundwork’s phase. This dust has the potential to contain asbestos fibres, silica and heavy metals and must be managed accordingly.

Management guidelines are set out to ensure that the generation of dust is minimised during remediation of the site. These practices will be in conjunction with ALARA (As Low As Reasonably Achievable) for contaminated land sites and BPM (Best Practicable Measures) principles applied to regulatory guidelines (DEC, 2011).

As part of the AQMP, a precautionary approach will be adopted with monitoring to include daily and weekly sampling of potential contaminants, both at the workface and Site boundaries. The objective of the AQMP is to manage any foreseeable risk to human health (site workers & local residents) caused by dust, airborne contaminants and noise being present as a result of remediation works.

1.1 Previous Reports

Information provided in this AQMP is based on outcomes established in reports and investigations that have been completed on the Site from 2005 to present. The following documentation should be read in conjunction with this management plan:

- FOI 1233/05 by Department of Environment & Conservation (DEC) – Freedom of Information – Lot 20, Adelaide Street, Hazelmere (October 2005).
- 2145245A:PR2_16644.RevA by Parsons Brinckerhoff – Site Investigation (SI) – Hazelmere, WA (July 2006).
- V392/2007 grw4469 by Knight Frank – Valuation Report – Lot 20 Adelaide Street, Hazelmere, WA (July 2007).
- 476300-0kjcv070709a by Burgess Rawson – Valuation Report – Lot 20 Adelaide Street, Hazelmere, WA (July 2007).
- 60150301 by AECOM – District Storm water Management Strategy – Hazelmere Enterprise Area (June 2010).
- Drilling Logs by Banister Drilling & Irrigation for 20 Adelaide Street, WA. (May 2012).
- GRA 7729 by Greg Rowe & Assoc. – Community Management Strategy for Remediation of Site: Lot 20 Adelaide Street, Hazelmere. (March 2014).
- E2012-031 (GMI) – MDWES – Groundwater Monitoring Investigation #1 – Adelaide Street Hazelmere (June 2012).
- E2012-031 (GMI) – MDWES – Groundwater Monitoring Investigation #2 – Adelaide Street Hazelmere (October 2012).
- E2012-031 (GMI) – MDWES – Groundwater Monitoring Investigation #3 – Adelaide Street Hazelmere (February 2013).
- E2012-031 (GMI) – MDWES – Groundwater Monitoring Investigation #4 – Adelaide Street Hazelmere (June 2013).
- E2012-031 (GWAB) – MDWES – Groundwater Abstraction for Dust Suppression & Surface Compaction v2 – Adelaide Street Hazelmere (October 2012).
- 6045.k.09_09082_SMP by Waste Rock Pty Ltd – Site Remediation Works Agreement and Site Management Plan – Lot 20 Adelaide Street. (March 2014).
- E2012-031 (ESMP) – MDWES – Environmental Site Management Plan (ESMP) v4 – Adelaide Street Hazelmere, (March 2013).

2 SITE BACKGROUND AND CHARACTERISITICS

The following is a summary of background information relevant to this AQMP. Further detailed information on the Site is outlined in MDWES Environmental Site Management Plan (ESMP) (Mar, 2014) which should be read in conjunction with this updated management plan.

2.1 Proposed Development

Wasterock proposes to remediate the Site using conventional excavation techniques to reduce the current height and fill content of the site and make it suitable for “commercial / industrial” use.

The remedial works of the Site will involve the following stages:

1. Excavation, sorting and processing (crushing and/or screening) of existing material.
2. Acceptance of soil for amendment such as Acid Sulfate Soils (ASS) and Hydrocarbon Impacted Soils (HIS) (Class 1 only) for recycling and reuse. These soils will ultimately be used for the capping layer.
3. Processing (crushing and/or screening) of construction and demolition (C&D) waste for recycling and reuse on Site to engineer a physical warning barrier.
4. Engineered placement, compaction and construction of excavated remediated soil material to form a controlled engineered cell.

Wasterock is proposing to redevelop the area by remediating the Site via excavation and repackaging of materials. The remediation of the site will include the outsourcing and acceptance of external off-site soil material for the capping layer, sourced from local building and development projects within the Perth metropolitan area. An engineered barrier layer will also be placed over the repackaged materials, followed by a validated layer of clean cover.

The use of the Site’s resources to remediate the Site itself will minimise any requirement to transport waste to appropriate waste facilities off-site, or to transport large quantities of sand to site. Although there may be a requirement for off-site disposal for this project, if a resource can be reused and does not have an environmental impact, then Site re-use should be paramount as it is the only cost-effective mechanism for sustainable remediation of the site.

Remediation is estimated to be completed over a 4-5 year period, with Site operations running six days a week (Monday to Saturday). Daily operating hours will be 7:00 – 17:30 (Monday to Friday) and 8:00 – 16:00 (Saturday). The ultimate aim of the project is to rehabilitate the land, such that it can be utilised within the community, through subdivision into light industrial/commercial lots.

2.2 Climate

The potential climate which may be experienced at the Site is considered to be representative of the annual climate in Perth, Western Australia. The Bureau of Meteorology (BOM) describes Perth as being a temperate climate experiencing warm summers and cold winters.

Table A: Historical Weather Information

Month	Temperature °C		Relative Humidity %		Wind Speed km/hr		Rainfall mm
	Min	Max	9am	3pm	9am	3pm	Avg
December-February	28.9	**31.9**	52	**38**	17	**22**	**11.8**
April-May	13.1	25.7	66	46	13	17	52.2
June-August	**8.3**	18.4	**80**	59	**11**	16	**145.4**
September-November	10.6	22.8	56	45	16	**22**	47.8

Data sourced from BOM (2013)

NB:

- Results are averages of Monthly Climate Statistics obtained from Perth Airport Site (1944-2013)
- Red: denotes maximum value
- Blue: denotes minimum value

The average wind direction at Perth Airport varies from east-north-east at 9:00 am to west-south-west at about 3:00 pm (BOM, 2013). Monthly weather data and wind roses from previous years 2011, 2012 and 2013 are presented in the ESMP. Monthly data illustrates the variation in wind conditions seasonal and daily.

Summer wind conditions over the past three years show the morning winds tend to prevail from the East then by mid-afternoon from the south west. Winter conditions tend to prevail from the north to north east and by mid-afternoon from the west.

2.3 Soil Moisture

The Perth metropolitan area remains one of Australia's driest capital cities, particularly through the summer months (December to February). As a consequence, the weather conditions can provide minimal rainfall totals, warmer temperatures, low humidity levels and prevailing wind conditions as outlined in Section 2.2.

Soil moisture content on Site is considered to be low due to the nature of the soil matrix makeup, deep groundwater levels and raised temperature levels. An Increase of evaporation rates could result from increased seasonal sunlight throughout October-May (DEC, 2011). These factors could contribute to reducing soil moisture content for this time of year, further increasing the potential for dust and contaminates to become airborne if not managed correctly.

2.4 Vegetation

Vegetation on Site mainly consists of grasses, weeds, shrubs and several semi-mature trees scattered sporadically throughout the Site. The current root mass reduces the potential for wind-blown dust particles. However, the reduction of the vegetative ground cover as excavation progresses could contribute to increased airborne dust potential. This should be combined with the effects of local weather conditions.

2.5 Topography

Site elevation varies widely across the lot due to historical landfill activities raising the surface discontinuously, reported with the ground level (PB, 2006) to be raised significantly from pre-landfill activity ground levels 27mAHD (PB, 2006). MDWES notes that about two thirds of the Site is a raised plateau averaging 4-6 metres above lot boundary levels. Most of the eastern half of the Site lies between 36-37 mAHD. Variation in elevation is more pronounced across the western half with land gradually falling from 36 to 34 mAHD.

A wedge of land at the base of the plateau runs along the southern boundary (east to west) of varying width has similar levels to that of surrounding landfill levels.

It is likely that current Site topography will have no influence on local weather conditions given Site vegetation, surface roughness and prevailing wind conditions.

2.6 Contaminants of Potential Concern

The Brinckerhoff Site Investigation (2006) detailed the following Contaminants of Potential Concern (CoPC), based on information regarding the materials accepted into the landfill.

- Total Petroleum Hydrocarbons (TPH)
- Monocyclic Aromatic Hydrocarbons (MAH's)
- Asbestos
- Heavy Metals

Based on the CoPC findings above and Site operations during the Sites remediation, air monitoring will be required for the duration of the works. During excavation and engineering of the landfill, dust and particulate matter has the potential to be liberated if not managed properly. Therefore, the following CoPCs may become present in the air:

- Asbestos fibres
- Metals
- TSP
- Nuisance Dusts (PM10 & PM2.5)
- Silica Dust

2.7 Potential Receptors

Human receptors are considered to be most at risk from nuisance dust, due to the potential release of airborne contaminates during remediation activities at the site. This poses a potential health risk for persons both on-site and off-site as they could potentially be exposed to asbestos fibres and airborne contaminants liberated during excavation, sorting and remediation of the Site.

Off-site impacts identified within the risk assessment (MDWES ESMP) suggest residents living on Adelaide Street adjacent to the southern side of the Site may be at risk and exposured to airborne contaminants during remediation activities. Exposure is likely to be via suspension of fibre and particulate matter (<100 μm: typically referred to as TSP) on prevailing winds and deposition and within the nearby residential areas. Transport of large particles off-site via creep and saltation is unlikely to present risk to human and ecological receptors, given the geomorphic characteristics of the largely sandy matrix of the Site.

No environmental or ecological receptors have been identified as being potentially at risk from Site remedial works from airborne deposition. This is based on reported data and based on historic wind rose data that the Bush Forever Site #122, adjacent to south eastern corner of the Site is unlikely to receive any significant deposition from the remediation activities. This is evident from winter or summer wind roses (seasonal extremes) when deposition is most likely to occur.

No surface water bodies have been located on the Site.

A number of surface water bodies and waterways can be found from 1 to 3 kilometres (km) from the Site including Kadina Brook ~1.5 km to the north-east and Helena River ~2.7 km to the north, given the prevailing wind patterns and distance from the Site receptors. It is highly unlikely Site excavations will impact on surface water bodies identified in the area.

3 OBJECTIVES

The main objective of this AQMP is to detail measures which will be implemented by Wasterock to protect both workers operating at the Site and residents in the neighbouring households from potential airborne contaminants.

The AQMP aims to implement air quality monitoring procedures during excavation and soil disturbance activities being undertaken at the Site. Day-to-day activities will have the potential to release ‘nuisance’ dusts (PM10 & PM2.5), asbestos fibres, silica and heavy metals. Monitoring is required to identify any potential exposure to Site personnel/ local residents. The AQMP allows for dust management to be assessed continuously this will allow for measures to be amended, or “work to stop” notices, prior to any long-term health effects for Site workers and local residents.

3.1 The objectives of this AQMP are to:

- Protect life and well being of human and other forms of life, from possible exposure to ACM and other airborne contaminants.
- Comply with relevant statutory environmental requirements – DEC (2011), NOHSC / Safe Work Australia (1995), WA EP Act (1986).
- Provide strategies and contingencies aimed at reducing environmental exposure during earthworks and soil removal activities to possible poor air quality.

3.2 The technical objectives of the plan are to:

- Implement an air quality monitoring program that provides representative data capture for potential airborne contaminants being generated onsite and potentially impacting neighbouring residents.
- Employ safe practices to minimise generation of dust and in doing so, maintain safe air quality for persons/personnel situated both on-site and off-site.
- Discuss all aspects of the Site remediation and any operations which may potentially cause contaminants to be present in air.
- State the location of all Air Monitoring Stations (AMS) and the data records required to be obtained for each.
- Stipulate Regulatory Context (regulators / guidelines / criteria) for airborne concentrations of potential contaminants found onsite.
- Incorporate contingency plans in the event that if any issue arises it is identified during the monitoring program. These include ambient air concentrations detected which approaches or exceeds relevant target action levels / stop work levels.
- Detail measures that will minimise any risk to human health, should asbestos fibres or other contaminants be detected on-site.

4 PROPOSED WORKS AND POTENTIAL IMPACTS

The proposed works for the project are estimated to be completed over a 4-5 year period. Air monitoring is to be carried out for the duration of the project. The proposed works could potentially generate nuisance dust during remediation of the Site, include:

- Soil excavation and dewatering.
- Mobile Crushing.
- Truck loading of remedial waste and export of unsuitable waste.
- Vehicle movement to and from the Site.
- Stockpiling of potentially contaminated soil.
- Replacement of inert landfill.
- Placement of engineered clean fill (imported) and a final capping layer once completed.

CoPC's outlined in Section 2.6, in particular ACM, has the potential to be generated as a consequence of the above activities. The severity may be exacerbated, due to the possible uplift of particulates which have the capacity to be inhaled. However, the majority of particulates are expected to be in the >10 µm or larger TSP range, that are either:

- Not inhalable.
- Won't become airborne.
- Don't often constitute ACM fibres.

ACM fibres, metals and silica were identified as potential contaminants and are anticipated to be present in the soils being excavated. These contaminants have the potential to trigger long-term health effects (especially for workers operating within the Site boundaries). In particular, if inhaled, asbestos fibres are a known cause of asbestosis, mesothelioma, and cancer of the lungs, oesophagus, stomach, colon and rectum cancer (IARC, 2012).

The ESMP details that if controls measures such as dust suppression and PPE are put in place the potential for impact would significantly be reduced.

5 ASSESSMENT OF SITE CHARACTERISTICS

Site characteristics are assessed to ensure that any likely causes of CoPC's from the Site during earthworks are accounted for. The ESMP details mechanisms put in place to keep concentrations to a minimum such as PPE and dust suppression. Concentrations will comply with the relevant standards for management (WA EP Act, 1986) and relevant guidelines concerning contaminant concentrations in air, adopted by the WA DEC (2011) and WA DoH (NOHSC/Safe Work Australia, 1995). This measure will reduce the risk to human health for both onsite and offsite receptors from potential airborne concentrations of contaminants.

In accordance with the DEC (2011) guidelines concerning the management of ambient air quality for land development sites in WA, all surrounding land use(s) detail the following characteristic: average weather conditions, geography, surface and substrate geology have been considered within the MDWES ESMP and AQMP. Wind and drying soil conditions are identified as the major factors most likely to contribute in the generation of airborne CoPc's.

The most sensitive human receptors are located off-site, with the closest residents on Adelaide St located on the southern side of the Site boundary. The most sensitive human receptors located on-site personnel who attend the Site to complete works. Other human receptors include the MDWES Environmental Scientists conducting the air quality monitoring program. Other persons who may be receptors are visitors attend site during the project.

5.1 Wind Conditions

Monthly weather data obtained from the Bureau of Meteorology (BOM) during 2011, 2012 and 2013 illustrate the seasonal and daily changes over the Perth region. For the purposes of this AQMP weather data was sourced from the Perth Airport weather station, located approximately 12km from Site.

Daily wind roses demonstrate the direction of approaching winds which determine the direction and dispersion of potential dust and asbestos fibres. Data shows that wind direction changes from morning to afternoon. Due to this, static onsite monitoring will be completed twice daily. Monitors will be positioned downwind of the prevailing winds in the morning then repositioned in the afternoon to allow for the change in wind direction. MDWES will review the wind direction forecast each morning and afternoon before the stations are positioned. The ESMP details the wind roses and examples of sampling locations based on wind direction.

A weather station will be located onsite to provide real-time local wind direction. This will allow MDWES to determine the risk of exposure (if any) to the potential receptors. Monitoring details are outlined in Section 6.

Table B: Collated Weather Information

Season	Month	Year	General Wind Direction		Wind Speed		Temperature				Rainfall
			9am	*3pm*	*9am*	*3pm*	*Min*	*Max*	*Mean 9am*	*Mean 3pm*	
Summer	January	2011	E	SW	23.3	18.6	19.0	33.7	25.8	31.8	43.2
		2012	E	SW	28.0	22.2	19.7	33.4	23.2	28.1	27.4
		2013	E	SW	21.1	18.6	18.5	32.3	25.9	30.0	8.2
	February	2011	E	SW	29.6	25.7	20.8	34.9	23.7	31.9	0.4
		2012	E	SW	28.0	25.4	18.3	31.3	23.6	28.6	19.0
		2013	E	SW	21.1	16.7	18.6	34.6	25.9	31.0	1.0
Autumn	March	2011	E	S/SW	26.1	24.1	18.5	32.8	25.3	30.8	0
		2012	E	S/SW	20.9	24.0	15.6	31.6	26.1	32.7	0
		2013	E	S/SW	21.4	15.9	15.2	28.4	23.6	29.1	60.2
	April	2011	E/NE	S/SW	22.5	21.9	14.2	27.9	23.8	30.0	26.2
		2012	N/NE	S/SW	25.1	22.0	14.0	26.4	20.0	24.3	53.2
		2013	E/NE	S/SW	17.7	19.9	16.1	28.7	24.0	30.7	7.8
	May	2011	E	E	14.8	19.1	11.0	23.6	17.7	24.7	58.6
		2012	NE	NE/S	22.0	15.6	10.2	23.0	18.7	21.8	39.8
		2013	E	W	16.9	18.0	10.6	21.7	17.8	23.2	112.2
Winter	June	2011	N/NE	N/W	19.5	15.3	10.0	19.7	13.8	18.2	143.2
		2012	N/NE	NE	19.0	20.9	10.1	19.3	15.9	19.3	134.4
		2013	N/NE	NE	17.5	11.9	7.8	19.9	13.1	18.9	23.0
	July	2011	NE	E	19.9	7.5	8.6	18.4	9.7	15.6	164.6
		2012	NE	NE/N	15.1	11.9	5.6	19.2	12.6	20.7	30.6
		2013	N	N/W	15.4	10.6	6.6	18.7	10.3	18.0	119.2
	August	2011	N/NE	W/SW	20.4	15.3	8.8	20.2	13.1	17.4	127.8
		2012	N/NE	W	21.4	11.9	8.2	20.0	13.3	17.8	117.8
		2013	N/NE	W/SW	23.6	10.6	9.9	20.3	14.9	20.9	160.6
Spring	September	2011	N/NE	SW	22.5	10.5	8.9	20.5	13.9	18.3	102.4
		2012	NE	W	25.4	13.0	8.8	21.4	13.3	17.8	103.8
	October	2011	NE/E	W/SW	18.6	11.6	12.2	24.4	18.2	22.1	63.4
		2012	N/E	W/SW	19.3	21.9	11.7	24.9	19.0	22.7	13.8
	November	2011	E	W	22.2	23.3	14.1	26.1	22.4	22.7	38.6
		2012	E/SW	SW	27.2	23.1	12.7	26.1	18.1	19.6	84.8
	December	2011	E	SW	27.4	27.5	17.5	30.6	24.9	30.4	67.4
		2012	E	SW	21.1	20.4	16.8	31.4	22.0	26.6	24.8

6 WEATHER MONITORING

6.1 Objective

The objective of the onsite weather station is to obtain localised weather data and validate the locations of the air quality monitors. Data obtained from the weather station will aid in establishing and verify the positions of the air monitoring sites as well as allowing MDWES to determine the risk of exposure (if any) to the potential receptors.

Weather data will be logged for the duration of works. Data obtained will include: temperature, wind speed, wind direction, relative humidity, barometric pressure and rainfall.

6.2 Overview

Daily on-site weather conditions are considered to be a major factor in determining the potential risk of exposure to the potential receptors. Wind direction and speed is anticipated to be the most significant weather influence at the Site and surrounds, as it will:

- Influence the generation of dust particles.
- Influence the direction, dispersion and distance that deposition may extend to, including beyond the Site boundaries.

Other parameters such as temperature, humidity and rainfall may influence the moisture content of the soil. Warm temperatures, low humidity and limited rainfall (experienced during October – May months) has the potential to decrease the moisture content in the soil and therefore increase the likelihood of dust formation.

6.3 Rational for Weather Monitoring Position

The weather station will be positioned with consideration to *AS3580.14-2011: Methods for sampling and analysis of ambient air – Meteorological monitoring for ambient air quality monitoring applications* (Australian Standards, 2011) and Compact Weather Station - Operating Manual. The following points will be noted when installing the weather station on-site;

General:

- Stable Subsurface.
- Free access to equipment for maintenance works.
- Reliable power supply.
- Good network coverage (transmitting over a mobile network).

Wind Measurement Sensors:

- Installation at top of the mast.
- Installation height at least 2m above the ground.
- Free field around sensor.

The installation of the weather station will be undertaken by a competent person, as per the instrument's operation manual.

6.4 Responsibilities

Responsibility for determining the daily static sampling locations within the excavation zone rests with the AQMP Manager (role further clarified in Section 7.4). In order to undertake this task, wind direction at the Site will be forecast based on historic wind data, forecast meteorological data from the Commonwealth Bureau of Meteorology (BoM) website www.bom.gov.au and local observation data from the on-site weather station.

Based on the Site forecast and scheduled remediation works, the location of morning and afternoon sampling locations will be determined. Forecasts will also be used to assist in determining dust suppression measures for the Site.

The AQMP Manager will be responsible for the calibration and maintenance of the weather station and for the documentation of daily weather observations such as rainfall totals, temperature, wind speed and direction. Some of this data may be analytical or remotely sensed (yet to be determined).

6.5 Weather Equipment

The weather station that will be used on site by MDWES is a *WS501-UMB Compact Weather Station.* The weather station monitors the following parameters:

- **Wind Direction and Speed:** using 4 ultrasound sensors which take cyclical measurements in all directions, Wind speed and direction is calculated from the measured run-time sound differential.
- **Air Temperature and Humidity:** a NTC-resistor measures temperature and a capacity humidity sensor to measure humidity. To minimize the sensors being influenced by external factors such as solar radiation. Sensors are housed in a ventilated housing with radiation protection.
- **Air Pressure:** is measured with a built in sensor (MEMS). The relative air pressure referenced to sea level is calculated using a barometric formula with the aid of local altitude, which is user-configurable on the equipment.
- **Compass:** integrated digital compass used to check North-South adjustment of the sensor housing for wind direction measurement.
- **Precipitation:** additional bucket balance.

6.6 Equipment Maintenance

Maintenance and calibration of the weather station has been devised with considerations to *AS3580.14-2011: Methods for sampling and analysis of ambient air – Meteorological monitoring for ambient air quality monitoring applications* (Australian Standards, 2013) and Compact Weather Station - Operating Manual. Regular checks and calibration will ensure equipment is in good condition and that data being obtained is reliable. Table C outlines the proposed maintenance schedule.

Table C: Maintenance Schedule

Maintenance	Wind Speed and Direction	Temperature	Relative Humidity	Precipitation
External Calibration				
Onsite Operational Precision Check				
Onsite Visual Inspection				

Key:

	< 2 Years		6 Monthly
	Annual		3 Monthly

6.7 Data Logging and Reporting

Weather data will be reported and logged in accordance to *AS3580.14-2011: Meteorological Monitoring for Ambient Air Quality Monitoring Applications.* The report will include:

- Reference the standard (AS3580.14-2011).
- Reporting organisation.
- A recorded value for each parameter:
  - The type of instrument used to obtain the recorded value, including starting thresholds for wind direction and wind speed sensors.
  - The calibrated measurement range in the corresponding reporting units.
  - The measurement height above ground level (in meters).
- Date, time and period of sampling.
- Sampling location, including:
  - Coordinate reference.
  - Height above ground level (mAHD).
  - Classification of area with a description of the sampling location.
- Any non-conformance with the standard.
- Uncertainty associated with the measurement along with the confidence interval and coverage factor.
- Any other relevant data, for example;
  - Mean values (e.g. hourly, daily, monthly or annual).
  - Minimum/Maximum values (e.g. hourly, daily, monthly or annual).
  - Time/day, month or year certain values exceeded.

Table D: Reporting Weather Parameters & Units

Parameter	Units
Wind Speed	Meters/second (m/s)
Wind Direction	Degrees from true North (°)
Ambient Temperature	Degrees Celsius (°C)
Relative Humidity	Percent (%)
Barometric Pressure	Hectopascals (hPa)
Precipitation	Millimeters (mm)

7 AIR QUALITY MONITORING

7.1 Objective

Air quality monitoring will provide information to facilitate management of excavation works in order to minimise potential exposure of poor air quality to on and off-site persons/personnel. However, the main purpose of the monitoring will be to verify that personnel are not being exposed to elevated concentrations of contaminates as a result of excavations works.

The air quality monitoring program proposes the intended to ensure that excavations in possibly contaminated soils do not result in harmful contaminants exceeding the NIOSH/Safe Work Australia (1995) level, also endorsed by the WA DEC.

7.2 Overview

Dust (as nuisance dust (PM10, PM2.5, metals and silica) and asbestos fibres. These potential contaminants may be present in air if contaminated soils are exposed to drier moisture levels and strong prevailing winds. To validate exposure levels monitoring will be undertaken in two capacities on Site:

a. Boundary Monitoring – is established to assess exposure levels and to mitigate any posed risk from asbestos fibres or dust deposition off-site.

b. On-site Monitoring - to ensure personnel (on-site) are not being exposed to potential elevated concentrations of dusts and asbestos fibres.

7.3 Rational for Monitoring Positions

The location of the Air Quality Monitoring Stations has been determined to provide full coverage of Site airborne emissions (Table E) also see MDWES ESMP report. A Tapered Element Oscillating Microbalance (TEOM) located near the south western corner of the Site will provide real-time high quality gravimetric data on fugitive Site emissions. At the same location, a real-time nephelometer will allow for the determination of a calibration factor by comparison of gravimetric and nephelometric data.

Boundary monitoring will be implemented at an additional four locations to provide characterisation of fugitive dust emissions via the real-time nephelometer.

Static sampling will be utilised at three judgemental locations, based on wind direction forecasts, and will characterise potential fibre concentration downwind of the excavation work face.

Airborne fibre sampling will be used within the crib room to validate the ‘clean’ status of the area.

Further monitoring of the personnel in-vehicle will be conducted through fibre monitoring which will profile fibre exposure of workers within the vehicle.

Monitoring on the southern boundary will be used to assess fugitive concentrations of CoPC adjacent to nearby off-site human receptors: primarily residents fronting Adelaide Street.

The weather station will be located in the north western quadrant of the Site, away from structures likely to impact on the direction of surface winds.

Reference is made to Figure 11 located within the MDWES ESMP report. The figure depicts the location of the monitoring stations discussed above and shown on Table E below.

Table E: Air Quality Monitoring Program

Location	ID	Analyte				Rationale
		Dust	Asbestos	Silica	Metals	
Boundary Monitoring Stations						
Primary – South West Corner	AMS1					These positions will be on the southern boundary fence to assess any off site migration of particulate matter and/or asbestos fibres that may potentially impact the residents on Adelaide St.
Southern Boundary	AMS2					
Southern Boundary	AMS3					
North East Corner	AMS4					These positions located on the boundary fence to assess any off site migration of particulate matter and asbestos fibres.
Northern Boundary	AMS5					
North West Corner	AMS6					
On-site Monitoring Stations						
Static Station Excavation - Justified*	AMS7					Downwind close to the excavations to assess any windblown matter/site workers potential exposure.
Static Station Excavation – Justified*	AMS8					
Static Station Excavation – Justified*	AMS9					
Crib Room	AMS10					Potential Risks if the hygiene process has not been adhered to.
Personal Monitor 1 (PM1)	AMS11					Exposure to site worker from landfill material.
Personal Monitor 2 (PM2)	AMS12					
Personal Monitor 3 (PM3) - Vehicles#	AMS13					
Personal Monitor 4 (PM4) - Vehicles#	AMS14					
Weather Monitoring Station – Green Zone	WMS1	Meteorological conditions				Provide on-site weather data to verify monitoring locations.

NB:

- *Sample locations will be positioned and evaluated, dependent on predicted daily (am and pm) wind directions obtained from BOM website each morning.

7.4 Roles and Responsibilities

The management of the AQMP will be undertaken by an Environmental Scientist employed by MDWES. Responsibility for daily delivery of the AQMP (execution of the air quality management plan) will rest with the AQMP Manager. To ensure a high level of performance, transparency and continuity, responsibility for the programme will be assigned to one person for the duration of the project (subject to operational constraints). The role of the AQMP Manager will be to:

- Ensure field equipment and instruments are operating correctly and are calibrated as per manufacturer and operational requirements.
- Review daily wind and weather forecast as described in Section 6.4 to determine static sampling locations within the excavation zone for that day.
- Ensure field technicians are sufficiently experienced to undertake appointed field tasks and are adequately supported in their role.
- Ensure sample and data collection tasks conform to any relevant guidance documents or standards and are performed as per documented MDWES operating procedures.
- Ensure quality control and assurance measures are appropriately managed and met.
- Analyse field and laboratory data on an on-going basis to determine daily fugitive emissions from the Site and provide predictive trend analysis.
- Liaise with Operations Site Manager to ensure they are fully apprised of fugitive emission concentrations and potential impacts on receptors.
- Liaise with major stakeholders to ensure transparency of the AQMP is maintained.
- Manage all mandatory reporting requirements relating to Works Approval and Licensing Conditions are met.

Tasks

A diverse range of task(s) needs to be undertaken on a daily basis to ensure the objectives of the AQMP are met. The AQMP Manager will undertake and appoint tasks as required. Table F summarises tasks, roles and responsibilities. However:

- Meteorological data will be reviewed daily from the on-site weather station and compared with the air quality results to determine the potential deposition of dust and silica. Data will validate the static monitoring locations for that day and assist in Site dust suppression activities.
- Real-time data will be collected on weather conditions at the Site.
- Real-time data on dust emissions from five boundary locations will provide information on background and fugitive dust concentration at the Site and this will allow for source appointment analysis.
- Numerous air quality samples will be collected from across the Site to measure concentration of a range of CoPC. Sample collection will be initiated at the start of work each day, with sampling completed as specified in Section 7.3: Table E.
- Site documentation will include: air sample log, laboratory documentation, Chains of Custody (COCs), records of daily climatic observations including rainfall totals, temperature, wind speed and direction, equipment checks and calibrations.

Table F: Roles & Responsibly for Air Monitoring Program

Parameter Measured	Sampling Site / Locations	Task	Timing *	Completed by Whom	Analysis
Dust PM10 PM2.5	AMS1,3,4,5,6	Review Data	Daily	AQMP Manager or Environmental Scientist	Review real-time data.
	AMS1,3,4,5,6	Sample collection	Daily for one month	AQMP Manager or Environmental Scientist	NATA accredited analysis of sample within 5 working days.
	AMS3,4,5,6	Sample collection	Once per month (over 3 days)	AQMP Manager or Environmental Scientist	NATA accredited analysis of sample within 5 working days.
Dust TSP, PM10	AMS1	Sample collection	Two, once per week	AQMP Manager or Environmental Scientist	NATA accredited analysis of sample within 2 working days.
	NA	Determine calibration factor for TES 7200's	To suite above sampling	AQMP Manager	Comparison of concurrent nephelometeric and gravimetric data to produce Site specific calibration factor for nephelometers.
Silica Dust	AMS1	Sample collection	Daily	AQMP Manager or Environmental Scientist	NATA accredited analysis within 1 working days
Metals	AMS1	Sample collection	Two, once per Week	AQMP Manager or Environmental Scientist	NATA accredited analysis within 5 working days
Asbestos	AMS1-3	Sample collection	Daily	AQMP Manager or Environmental Scientist	NATA accredited analysis of sample within 24 hours.
	AMS7-9	Sample collection	Twice Daily am: 07:00-12:30 pm:12:30-17:30	AQMP Manager or Environmental Scientist	NATA accredited analysis of sample within 24 hours.
	AMS 10	Sample collection	Daily Mon - Sat	AQMP Manager or Environmental Scientist	NATA accredited analysis of sample within 24 hours.
	AMS 11-12	Sample collection	Twice weekly for one month then schedule reviewed subject to historical results	AQMP Manager or Environmental Scientist	NATA accredited analysis of sample within 24 hours.
	AMS 13-14	Sample collection	Daily for 2 weeks then monthly for 6 months. Schedule to be reassessed after subject to historical results	AQMP Manager or Environmental Scientist	NATA accredited analysis of sample within 24 hours.
Weather	NA	Review BoM and Site data	Daily (am)	AQMP Manager	Forecast likely conditions for sample locations.
	WMS-1	Collect data	Daily	AQMP Manager or Environmental Scientist	Review data, check robustness, check for gaps.

CoPC	MDWES office or Site office	Collate data	Daily	Environmental Scientist	Check QA/QC of data, check robustness, data gaps, and check against assessment criteria.
Reporting	MDWES office or Site office	Report	Weekly Report for the previous week's results	AQMP Manager	Ensure compliance with Works Approval and Licensing Conditions.
Manage Air Quality Issues	MDWES office or Site office	Variable	As required	AQMP Manager	NA

NB * Unless otherwise stated, sample collection is from start to end of daily works, Monday to Saturday, for full duration of earthworks.

7.5 Qualifications and Experience

The management of the AQMP will be undertaken by a suitably qualified and experienced Environmental Scientist employed by MDWES. Responsibility for daily delivery of the air quality monitoring programme (execution of the air quality management plan) will rest with the AQMP Manager. Both the AQMP Manager and the Environmental Scientist will meet the following criteria:

- Tertiary qualifications in the field of Environmental Science or equivalent.
- Sound knowledge of Australian standards and guidelines relating to ambient air monitoring.
- History of ambient air monitoring (minimum of three years) demonstrating theoretical and practical knowledge of sampling methodology and reporting.
- Understanding of QA/QC requirements of sampling programs.
- Ability to manage small teams and ensure procedures and standards are met by all relevant project staff.
- Can analyse data and identify trends and non-conformances.

Occasionally, Field Technicians may work under the supervision of an Environmental Scientist to undertake routine daily on-site tasks. If so, they will meet the following criteria:

- Minimum of Diploma of Environmental Monitoring and Technology, qualifications in the field of Environmental Science or equivalent is desirable.
- Ambient air quality monitoring and field experience.
- Technical understanding how to use various types of monitoring equipment.
- Data interpretation and reporting experience.

Calibration of TEOM and primary flow rate calibration devices will be undertaken by appropriately qualified technicians.

7.6 Excavation Area (Red Zone) – Control Measures PPE

As per a hierarchy of control, Site equipment (vehicles) within the red zone will be fitted with High Efficiency Particle Arrestment (HEPA) filters to eliminate an occupant's potential exposure to fibres. Two samples will be collected from mobile cabins as per Table F to quantify fibre concentration.

Other control measures will be utilised, within operational constraints, to minimise Site workers exposure to dust and fibre. Site workers on foot within the red zone will wear respiratory protection as per AS/NZS 1705: 2009, disposable coveralls (appropriate for working with asbestos fibre), safety glasses, hats and dedicated steel capped boots. Personal monitoring of all Site workers will be undertaken as per Table F to quantity potential exposure to fibres.

As per Table E and F, three asbestos monitors will be set up daily around the excavation area. Sample locations within the excavation zone will be predicated by forecast weather conditions to allow optimum position to as much dust and fibre laden air to the monitoring station; i.e. located directly downwind of the excavation works. At noon filter cassettes will be changed and the location of the samplers revised to accommodate afternoon prevailing wind patterns.

7.7 Stations for Public Exposure Monitoring

Boundary monitoring stations, as detailed in Section 7.3, will be located outside of the excavation area with six (6) Air Quality Monitoring Stations positioned around the Site boundary. These monitoring stations will assess daily ambient air quality concentrations with three monitoring stations on the northern boundary line and three along the southern boundary line. The station on the south western corner (AMS1) will be the primary monitoring station and consists of a TEOM, nephelometer, and three sampling pumps for 'fibre', 'TSP, metals' and 'silica'. Stations AMS3 to AMS6 house nephelometers. Station AMS2 houses one sample pump. The objective of the boundary monitoring station placement is to characterise the airborne concentration of identified CoPCs and ponteiual migration off Site. The data will be used to validate that the occupants of Adelaide Street are not being exposed to elevated concentrations of airborne contaminants.

Air monitoring stations will be located in accordance with the guidelines outlined in AS 3580.1.1:2007:

- Avoid sites with restricted air flow such as near buildings and trees. The minimum clear sky angle for the sampling inlet should be 120 degrees.
- Avoid sites that may cause physical and chemical interference (motor vehicle emissions).
- Avoid sites that may adsorb and desorbs contaminants such as trees. Stations should be located at least 20 m from trees and leafy vegetation.
- Locate the monitoring inlet near human breathing zones, 1 to 2 meters above ground level.

8 Methodology of Sampling and Analysis

8.1 Dust (TSP, PM10 & PM2.5)

Dust is made up of a wide range of particles varying in size, shape and density. These characteristics determine the transport fate of the particles. Typically, particles smaller than 100 μm in diameter are called Total Suspended Particulates (TSP). In the context of earthworks, TSP are generally considered from a nuisance perspective as only particles smaller than 10 μm aerodynamic equivalent diameter (AED) are likely to have adverse health impacts. Consequently, PM10 is usually used to measure environmental concentrations of dust. A smaller subset of PM10 is PM2.5 which is typically used to measure occupational concentrations of dust.

Dust concentrations at the Site will be measured using two methods: gravimetric and nephelometry. Both will give real-time PM10 and PM2.5 dust concentrations across the Site and on boundaries.

A number of gravimetric standards have been developed to measure the mass concentration of dust in ambient air. However, the only instrument routinely used to measure temporal changes in particle mass concentration is a Tapered Element Oscillating Multi-balance (TEOM). AS/NZS 3580.9.8:2008 *Determination of suspended particulate matter – PM10 continuous direct mass method using a tapered element oscillating micro-balance analyse* provides guidance on the use of such instruments. As there have been reported differences in concentrations of PM between TEOM and other reference methods for PM10 measurement, the TEOM used on Site will be Thermo Fisher 1405-DF Dichotomous Ambient Particulate Monitor with FDMS, which can continuously measure PM10 and PM2.5.

Ambient air particle mass can also be measured gravimetrically via time weighted methods such as AS3640:1989 - *Workplace Atmospheres - Method for Sampling and Gravimetric Determination of Inspirable Dust* for PM10 and AS2985:1987 - *Workplace Atmospheres - Method for Sampling and Gravimetric Determination of Respirable Dust* for PM2.5. These methods rely upon deposition of particles onto filters over a known period of time.

Dust concentration can also be determined via non-gravimetric methods such as nephelometry which measures the amount of deflected light passing through the dust stream and correlates this to mass based on a calibration aerosol. The advantage of nephelometry is ease of use and cost effectiveness. However, the disadvantage is that while it is widely recognised as a good tool for measuring real-time changes in mass concentration, it is dependent upon good characterisation of the aerosol being measured. Failure to calibrate nephelometers against an appropriate aerosol can lead to understating mass concentration. Inappropriate characterisation of calibration aerosol can be overcome by concurrently collecting a filter based gravimetric sample while monitoring with the nephelometer and then comparing the time weighted results to derive a calibration factor which can be used to scale the nephelometer data either on-board or during data analysis.

Five nephelometers: TES 7200 (QA-Lite) will be used on Site; the instrument has a heated inlet to prevent artefacts from moisture vapour over reporting mass and can collect concurrent filter samples for gravimetric analysis.

Monitoring station AMS1 consists of one TEOM and one QA-Lite. Comparison of both gravimetric samples will ensure gravimetric values for the TEOM and filter method are similar. Comparison of the gravimetric values to the non-gravimetric data will allow development of an accurate calibration factor which can be input into the QA-Lite at AMS1 and other boundary monitoring stations. The monitoring schedule allows for one full month of daily calibration factor development at AMS1. Thereafter, a weekly calibration factor will be derived for the duration of earthworks. Additional daily reviews of real-time TEOM and QA-Lite data from AMS1 will be undertaken to examine any potential variations between the two methods.

The same comparison process will be repeated as per Table F at the remaining four boundary monitoring stations that are fitted with QA-Lites. Such a program of calibration factor derivation will allow for a high level of robustness and confidence in real-time PM10 and PM2.5 data across the entire Site and on Site boundaries.

PM10 and PM2.5 real-time gravimetric, time-weighted gravimetric and nephelometer data will be compared to NEPM ambient air standards.

One of the sampling pumps located at AMS1 will be utilised to collect two TSP samples. After determining sample mass, the samples will be analysed for metal content. Typically there is a fair degree of correlation between ambient TSP and PM10. Consequently, PM10 will also be used to provide additional insights into TSP concentration along the entire Site boundary. There are no air quality guidelines for TSP in ambient air. NHMRC recommended in 1996 a guideline of 90 mg/m^3 as an annual average. However, this has not been adopted on a national or state basis. The World Health Organisation guideline for 24-hour average is 120 mg/m^3. Despite the lack of formal Australian guidelines the concentrations provide useful action trigger points.

A duplicate and replicate PM10 sample will be collected weekly at ASM1 via the use of two additional sample pumps, coupled to PM10 filter cassettes. However, it should be noted that given the active nature of the sample collection process i.e. via pumping at similar rates, total mass between ‘duplicate’ samples may differ; although mass per unit volume of air should be similar.

8.2 Asbestos Fibres

Asbestos fibre concentrations will be measured in accordance with the National Occupational Health and Safety Commission’s Membrane Filter Method (NOHSC: 3003, 2005) the method for estimating airborne asbestos fibres. Asbestos sample locations and frequency are outlined in Section 7.4.

Static monitors will be set up at the four AMS’s (4) boundary, three (3) excavation face static monitors and a crib room monitor (1). GPS locations of the sampling location will be taken when a monitor is relocated. Personal Monitors (including vehicle monitors) will be worn by the workers on-site. Filters will be worn within the workers ‘breathing zone’. They will be attached via a piece of flexible tubing to a personal sampling pump on the workers’ waist.

A known volume of air is passed through each filter using a SKC PCXR8 sampling pump. Rates for sampling will be adjusted in accordance with the duration of daily earthworks, to ensure that a minimum of 500 L or maximum of 1000 L is obtained per sample pump and are representative of site conditions.

Analysis of fibres will be carried out daily by a NATA Accredited laboratory, in accordance with (NOHSC: 3003, 2005). The filter will be treated to become transparent and then observed using a phase contrast microscopic and calibrated eyepiece. Fibres are sized and counted as per defined geometric criteria. Results will be expressed as fibres/mL, calculated from the number of fibres observed on the known filter area and the volume of air sampled.

As analysis does not identify the type of fibres present on the filter, fibre counts will be interpreted as representing asbestos fibre counts. If the initial fibre count exceeds the assessment criteria outlined in Section 10, the filter will be immediately sent to a NATA Accredited laboratory for electron microscope analysis to identify and speciate the fibres present on the filter.

One blank will be analysed per fifty samples for QC purposes.

8.3 Silica Dust

Silica is viewed as a low risk CoCP, given that the crusher (which operates for only a few hours per day), is likely to be the main source of silica dust and dust suppression is not likely to prevent any significant emission of this contaminant into the Site airshed.

Silica dust concentrations will be measured in accordance with *NIOSH Method 7500 – Silica, Crystalline, by XRD (filter re-deposition) (*NIOSH, 2004). It is noted that the above method is a para-occupational method. However, given the perceived low risk to off-site receptors and the relative high cost associated with a dichotomous sampler using an x-ray fluorescence spectrometer, the method is considered appropriate for determining silica concentration at the Site boundary.

One silica dust static monitor will situated at the AMS1 monitoring station. Sampling will be completed daily, Monday to Saturday, for the duration of remediation. Sampling time will be representative of the site workers daily shift (7:00-17:30). A known volume of air will pass through an aluminium cyclone (size-selective sampler) to separate the respirable fraction, prior to being drawn through a poly-vinyl chloride filter which will be connected to a SKC PCXR8 sampling pump. The flow will be set to run at the require rate of 2.5 L/min, for the duration of the daily works. Sample run time will be approximately 12 hours. However, pump run will be approximately 6 hours and will be achieved via use of the pump's programmable functions. On completion of the gravimetric analysis, filters will be sent to a NATA accredited laboratory for x-ray powder diffraction analysis (XRD) to determine the crystalline silica concentration. Analysis will be conducted in accordance with *NIOSH Method 7500 – Silica, Crystalline, by XRD (filter re-deposition) (*NIOSH, 2004). Results will be expressed in mg/m^3. Results will be compared to the relevant assessment criteria as outlined in Section 10.

8.4 Metals

Metal concentrations will be measured in accordance with *NIOSH Method 7300 – Elements by ICP*. The metals of interest are based on the CoPCs identified as part of the initial assessment. The metals being assessed for this project comprise Arsenic (As), Barium (Ba), Cadmium (Cd), Chromium (Cr), Copper (Cu), Manganese (Mn), Nickel (Ni), Lead (Pb), Mercury (Hg) and Zinc (Zn).

It is noted that as with Silica, the stated method is para-occupational. Nevertheless given the expected low airborne concentration (based on sampling experience), the method is considered appropriate for determining metalloid concentrations at the Site boundary.

Two (TSP) samples will be collected at AMS1; one on Tuesdays and one on Wednesdays. After gravimetric analysis has been undertaken, the filters will be analysed for As, Ba, Cd, Cr, Cu, Mn, Ni, Pb and Zn (Tuesday's sample) and Hg (Wednesday's sample). Sampling times will be representative of the site workers daily shift. Sampling will be completed weekly (Wednesdays) for the duration of remediation. Samples will be collected by pumping a known volume of air through a 37 mm sample cassette coupled to a SKC PCXR8 sampling pump. Flow will be set to run at the require rate of 2.0 L/min, for the duration of the daily works. Sample run times will be approximately 12 hours. However, pump run times will be approximately 6 hours and will be achieved via use of the pumps programmable functions. Given that sample collection is via TSP sampling, there will be no constraints on maximum sample volume for various metalloids.

9 Equipment

The following section provides a description and specifications of the equipment to be used as part of the air quality program.

9.1 QA Lite (TES-7200)

A QA Lite (TES-7200) will be set up to monitor dust concentrations at all the dust AMS's. The QA Lite utilises nephelometry to measure dust levels and can simultaneously measure up to six particle size fractions including TSP. A PM10 inlet head fitted to each instrument will limit monitoring to PM10 and finer fractions. Instruments can be fitted with either a solar panel or connected to mains power to record data. The instrument can also collect filter samples for gravimetric analysis by passing the sampled air stream through the filter holder. Table G summaries the instrument specifications.

Table G: QA Light Specifications

Measuring Principle	Nephelometry with laser
Measurement Range	0 – 150 mg/m^3
Minimum Detection Limit	0.01 mg/m^3
Particle Size Range	0.2 – 18.0 micron diameter
Standard Inlets	TSP (Optical measure) PM10, PM2.5 and PM1.0
Logging Averages	Adjustable data logger 1 sec to 1 week averaging periods
Flow Rate	5LPM, Volumetric or Standardised
Operating Temperature	-5°C – 50°C

9.2 SKC AirChek XR5000 Sampling Pump

The SKC AirChek XR5000 sample pump is able to maintain a set flow rate from 5-5000ml/min. The pump uses a patented isothermal flow sensor to measure flow directly and acts as a secondary standard. A built in sensor compensates for changes in temperature that occur after calibration. For the purposes of this project, the air sampling pump will be used with the Asbestos Cassette Filters.

The XR5000 is a compact and light sampling device and therefore will be used in monitoring the personnel working onsite. Table H summarises the instrument specifications.

Table H: SKC Aircheck XR500 Sampling Pump Specifications

Flow Range	1000-5000 ml/min (5-500 ml/min require optional low flow adapter kit)
Flow Control	Holds constant flow to ±5% of the set point
Typical Run Time	20hrs (2L/min), 11hrs (5L/min)
Run Time, Run Delay and Continuous Run	1-9999 minutes (6.8 days). If run time exceeds 6.8 days, timer display rolls over.
Charging Time	Approximately 8hrs
Operating Humidity	0-95%
Operating Temperature	0 to 45 °C

9.3 SKC PCXR8 Universal Sampling Pump

PCXR8 is a constant flow air sampling pump it has an operating range of 1000 to 5000 ml/min. It is a battery-operated air sampling pump. For the purposes of this project, the air sampling pump will be used with the following collecting devices:

- Aluminium Cyclone
- Asbestos Cassette Filters
- IOM Sampler Heads

SKC PCXR8 pumps will be used for the static monitoring locations. The pump is fully programmable with delay start, set sample and run times. Table I summaries the instrument specifications.

Table I: SKC PCXR8 Sampling Pump Specifications

Flow Range	1000-5000 ml/min (adjustable to low flow 5-500ml/min if required)
Flow Control	Holds constant flow to ±5% of the set point
Run Time	NiMH Battery 12hrs minimum at 4000ml/min and 20 inches water back pressure
Resolution	±1 µg/m^3 (instantaneous)
Flow Indicator	Built in rotameter with 250ml division; scaled marked 1,2,3,4,5 L/min
Charging Time	6-8.5 hrs with Powerflex charger
Intrinsic Safety	Yes
Operating Humidity	0-95% non-condensing
Operating Temperature	0 to 45 °C

9.4 Equipment Calibration and Maintenance

Maintenance and calibration of the equipment mentioned above has been devised with considerations too relevant Australian Standard and Operation Manual. Regular checks and calibration will ensure equipment is in good condition and reliable data is being obtained. Table J outlines the proposed maintenance schedule.

Table J: Calibration and Maintenance Requirements

Maintenance	QA Lite (TES-7200)	SKC XR5000	PCXR8
Particle Mass Check			
Particle Mass Calibration			
Volumetric Flow Rate Check			
Volumetric Flow Rate Calibration			
Pressure Transducer Check & Calibration			
Temperature Sensor Check & Calibration			
Zero Check			
Leak Check			
Vacuum Pump Check			
Clean PM10 Air Inlet			
Clean Air Inlet System			
Clean Measurement Chamber			
External Calibration			

Key

	Annual Quarterly
	Quarterly
	3 Monthly
	Daily
	Pre and Post Sample

10 Air Quality Assessment Criteria

For the purposes of the AQMP, assessment criteria will be based on Safe Work Australia *Workplace Exposure Standards for Atmospheric Contaminants in the Workplace* and the National Environmental Protection (Ambient Air Quality) Measure (NEPM). The occupational exposure standard for asbestos fibres, silica and metalloid as dust within the machinery cabin and for personnel working within the excavation area (wearing PPE), are based on the NOHSC/Safe Work Australia Standards (1995). Contaminant concentrations are based on an 8 hour Time Weighted Average (TWA). Workers that are operating vehicles or mobile plant will be protected with HEPA filtering within the air conditioning systems. Workers operating on foot will be equipped with recommended PPE at all times, whilst within the boundaries of the Site where shallow soils are being disturbed. Table K details the trigger proposed action if concentrations exceed CoPC trigger actions, dependent upon the nature of the CoCP.

Table K: Assessment Criteria

Contaminant	Unit	Safe Work Australia *(TWA)*	NEPM *(24 hours)*	WHO *(24 hours)*	Action
Dust					
TSP	µg/m^3			120	Increase dust suppression
PM 10	µg/m^3		50*		Increase dust suppression, review wind speeds associated with exceedance and consider setting maximum wind speed threshold for reduced sorting throughput.
PM 2.5	µg/m^3		25*		Increase dust suppression, reduce sorting and crushing throughput until concentration is below 20 µg/m^3
Asbestos					
Asbestos Fibre (Mixed Fibres)	fibre/mL	0.1#			Stop sorting, investigate site conditions that were likely to have contributed to the exceedance and take appropriate action; Includes report to major stakeholders. Concurrently undertake SEM scanning of sample to determine asbestos fibre content. If asbestos fibre count exceeds trigger value undertake steps to reduce fugitive emissions.
Silica					
Crystalline Silica	mg/m^3	0.1			Investigate dust suppression at crusher and increase dust suppression control measures as required.
Metals					
Arsenic	mg/m^3	0.05			Investigate potential sources of analyte and take appropriate action
Barium	mg/m^3	0.5			As per above
Cadmium	mg/m^3	0.01			As per above
Chromium	mg/m^3	0.5 #			As per above
Copper	mg/m^3	1			As per above
Manganese	mg/m^3	1			As per above
Nickel	mg/m^3	1			As per above
Lead	mg/m^3	0.15	0.0005		As per above
Zinc	mg/m^3	10			As per above
Mercury	mg/m^3	0.025			As per above

NB:

- * No current Safe Work Australia Standards for Dust as PM10 and PM2.5, therefore assessment criteria will be based on the daily Ambient Air NEPM Guidelines. Note 2.5 guideline is an advisory standard.
- # In the event concentrations exceed the assessment criteria further analysis will be conducted to speciated contaminates.
- In the event contaminates exceed in excess of the assessment criteria works may have be stopped and reassessment of work practices will be required.

10.1 Sample Recovery

All gravimetric, fibre, silica and metalloid samples will be recovered as per Table F, Section 7.4 and sent to a NATA accredited laboratory.

Dust monitoring data will be reviewed daily and results logged to ensure action trigger values are not exceeded, as per Table K, Section 10. Results from all monitoring locations will be maintained on a daily logging record for reference and proof of air quality standards compliance, at the request of regulators and relevant stakeholders.

10.2 Contingency Measures

Table K details the immediate action if assessment criteria are exceeded.

Exceedance of action trigger values will generally be related to insufficient dust suppression of access tracks, the excavation zone, remediated land that has insufficient ground cover, the crusher, or a combination of these elements. Dust issues will be exacerbated by strong winds. It is likely that the Site will need to develop a procedure that slows or ceases earthworks and / or increases dust suppression activities as wind speed across the Site increase. The adoption of wind speeds as a control measure is likely to develop, as working characteristics of the Site unfold over time. In the above context, development and improvement of dust suppression methodologies is likely to be triggered by exceedances of CoPC trigger values.

Asbestos Fibre

Given the 24 hour lag time in sample turnaround, returning a single exceedance should not trigger a shutdown of Site However, sorting should cease until Site conditions leading to the exceedance have been examined and appropriate steps taken to prevent future exceedance. It is expected that such an investigation could be complete with one hour. Concurrently, the offending sample would be further analysed by SEM to quantify the type of asbestos fibre. If asbestos fibre concentration exceeds half the trigger value, then sorting rates may need to be reduced for several days or until personnel are confident asbestos fibre concentrations have been reduced.

If SEM results indicate asbestos fibre concentration has exceeded the action criteria, relevant stakeholders will be advised.

TSP

TSP is considered a nuisance. At concentrations below 120 mg/m^3, it is unlikely any complaints of nuisance dust could be attributed to the Site. However, as concentration increases, so too does the risk of complaint. If concentrations exceed 120 mg/m^3 for more than two consecutive weeks, then measures will need to be undertaken to reduce windborne soil leaving the Site. such measure could include increased ground cover via mulch or vegetative cover. Unsealed roads tend to emit significant amounts of TSP if insufficiently watered. As such, watering rates may need to be increased also.

PM10

The NEPM states that the future goal of PM10 is not to exceed the NEPM criteria more than 5 times per year. If daily average PM10 concentration at any boundary as a result of remediation works exceed the criteria more than once per week, then a review of dust suppression within the Site will be undertaken, including examining the frequency of road wetting, and appropriate action undertaken.

PM2.5

If average daily concentrations exceed the NEPM advisory standard two or more days in a row, then additional dust suppression will be undertaken.

Silica

If average daily concentrations exceed the criteria two or more days in a row, then additional dust suppression will be undertaken at the crusher. If this fails to ameliorate concentrations, then additional dust suppression will need to be undertaken within the excavation zone.

Metals

Exceedance of criteria should trigger efforts to locate the point source of metal laden dust and rectify.

Complaints

Any complaint will be followed up with a review of the Site earthworks schedule and air monitoring regime. A change in the management plan and/or the monitoring scope may require an amendment, to improve human safety off-site.

If corrective actions are taken, these may comprise of the following:

- Any identification of potential off-site ACM, TSP or Silica deposition is to be confirmed by analytical analysis.
- Ensure that vehicles / mobile plant are operating in wetted down areas, particularly if shallow soils are being disturbed through excavation.
- Increase the water application rate for disturbed areas, particularly if potential ACM, TSP, Silica has been located. Or exceedances have been identified.
- Potentially reduce the level of earthmoving activity if evaporation rates are drying the soil out quicker than the watering can be applied.
- A potential requirement to apply additional / more suitable physical dust suppressants to inactive work areas if local winds are high.
- Cease all work, if extreme weather conditions are determined to be the prime reason for ACM, TSP or Silica concentrations exceeding the trigger values, particularly if levels have been exceeded on a previous day in similar weather conditions.

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Appendix A – Technical Data Sheets for Proposed Site Sampling Equipment

Product Specifications

U.S. EPA Automated Equivalent PM_{10} Method: EQPM-1102-150

CARB California Approved Sampler (CAS) for PM_{10} and $PM_{2.5}$

True "Continuous Real-Time" Measurement

FH 62 C14 Series

Continuous Ambient Particulate Monitor

Key Features:

New technology that provides continuous "real-time" measurement by a C14 monitor

Radon gas activity measurement eliminates interference of natural airborne radioactivity

Control and data exchange over two serial interfaces possible

Storage of half-hour average concentrations over a whole year

User selectable reporting of mass concentration based on standard or actual flow rate

Processor controlled calibration of all sensors

Insensitive to vibration and diurnal temperatures

Refined Sensitivity

The FH 62 C14 Continuous Ambient Particulate Monitor measures the mass concentration of suspended particulate matter (e.g., TSP, PM_{10}, $PM_{2.5}$, PM_C and PM_1) by use of beta attenuation. In addition, the ambient radioactive influence of natural Radon (Rn-222) gas is measured as a refinement step toward better sensitivity at lower ambient particulate concentrations.

Accurate Results

The FH 62 C14 particulate sample collection area is located between both the C14 source and the proportional detector. While ambient particulate matter is being deposited onto a filter tape sample spot, the dynamic filter loading is measured continuously by the attenuation of the C14 source beta rays. As a result, a continuous "real-time" measurement of airborne particulate is provided. It is not necessary to move the filter spot from the sample position to the detector position for zero and mass determination.

FH 62 C14 Series Specifications

Measuring Principle	Continuous & simultaneous particulate collection coupled with beta ray attenuation
Source	Carbonium-14 (C14), <3.7 MBq (<100µCi)
Ranges	0 to 5,000 µg/m^3 or 0 to 10,000 µg/m^3
Minimum Detection Limit	<1 µg/m^3 (24-hour average); <4 µg/m^3 (1-hour average)
Precision of Two Monitors	± 2 µg/m^3 (24-hour)
Resolution	± 1 µg/m^3 (instantaneous)
Correlation Coefficient	R > 0.98
Measurement Cycle	Single filter spot in position for 24 hours (default); user selectable 30-minutes to 24-hours
Data Averages	Each full 1/2, 1, 3 and 24 hour values automatically stored
Air Flow Rate	1 m^3/h (16.67 lpm) measured across an internal subsonic orifice; user selectable from 0 to 20 lpm
Output	4-20mA or 0-10V output of concentration (µg/m^3)
Operating Temperature	-22 to 140°F (-30 to 60°C)
Power Supply	Instrument: 100-240V, 50/60Hz, 330W max., 15W without pump or heater Pump: 100-110/100-120V, 50/60Hz or 220/240V, 50/60Hz, 100W
Dimensions	Instrument: 19" (W) x 12.25" (H) x 13" (D) / 483mm (W) x 311mm (H) x 330mm (D) Pump: 8.25" (W) x 8.75" (H) x 4.25" (D) / 210mm (W) x 222mm (H) x 108mm (D)
Weight	Instrument: 50 lbs (22.5 kg) Pump: 13.5 lbs (6.1 kg)

Available Options

Adjustable Tube Heaters

Analog I/O Expansion Board

Filter Tape Printer

Foil Separation

RS485 Interface

TSP or PM$_{10}$ Inlets

Mass & Flow Rate Calibration Kits

WINS Impactor, Sharp-Cut Cyclone & Very Sharp-Cut Cyclone for PM$_{2.5}$

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Your only choice for accurate, reliable, user friendly Gravimetric Air Sampling

The QA Flow 7000 **High Volume Air Sampler** utilises a **precise and versatile**, venturi sampling system featuring **electronic flow control**, and meets the most recent international methods for atmospheric particulate matter measurement.

Available configurations include: Total Suspended Particulates (TSP), PM10 and PM2.5.

Each instrument includes a speed controlled brushless blower for accurate, quiet operation and 2 filter holders for easy exchange in the field.

An integrated real time clock, wide graphic display and dedicated keypad allows for user friendly sample programming including TES's EPA mode. No reprogramming or manual start/stops required. The user can select from automatic 3 and 6 day runs or create their own program selectable from 1 min to 168 hours.

The microprocessor controlled system allows for measurement of ambient and orifice flow temperatures, ambient and venturi pressures and allows true mass or volumetric flow standardized to a user selectable reference temperature.

Measured parameters are logged every five seconds and recorded as five minute averages for the 24 hour run period. Run time, averages flow and standard deviation are just some of the obtainable results from the QA Flow 7000 allowing the user to validate the sample run. Data is accessible on the display and can be downloaded to a PC via RS232 or Modem (optional).

An RS485 input allows for logging of external sensors such as **Wind Speed and Wind Direction**.

The QA Flow 7000 offers the following features:

- TSP, PM10 or PM2.5 Configurations
- Easy Programming - EPA mode (automatic 3 or 6 day runs) or user selectable programs
- Quality Assurance System - Flow rate, total volume, temperature and pressure are logged and data is available for download to your PC
- Brushless Blower - Provides accurate flow and quiet operation
- Remote Control via Modem (optional)
- Inputs for logging additional parameters such as wind speed and wind direction
- Meets International and Australian Standards

Add on Wind Speed and Wind Direction or a Complete Met Station – Logged locally by the QA Flow 7000

Thomson Environmental Systems
air quality & process control

Outstanding Quality, Unprecedented Customer Support

QA FLOW 7000

Specifications

Inputs:	RS485 available for logging of external parameters such as Wind Speed and Wind Direction. Analogue, Counter Channels or RS485.
Outputs:	RS232, Analogue, Operational alarm if modem fitted.
Electronic sampling flow rate controlled at standard or actual condition	
Wide retrofitted light graphic display, dedicated keypad, real time clock and date.	
Construction material:	Anodized aluminium shelter (other materials available if required)
Brushless blower:	Speed controlled to limit noise and provide extremely accurate flow control
Flow Range:	1000-1400 L/min Standardised and Volumetric flow available
Power Requirements:	220-240 Vac, 50Hz (110 Vac 50/60 Hz Optional), 10 amp (Standard) or 15amp
Allowable environmental temperature operating range:	-5°C—50°C
Weight:	42 kgs. Plus Inlet head.
Dimension:	62cm x 43cm x 110cm (WxDxH) for TSP unit.
Detachable base. Inlet head easily attached on site.	
Supplied with dual filter cassettes to allow rotating of cartridge with filter changes in lab	
Warranty:	12 Month

Optional Accessories

Part Number	Description
QA 7000 CAL	Calibration Kit including orifice plate, slack tube manometer and carry case (Temperature sensors available if required)
QA 7000 CAL DIG	Calibration Kit including orifice plate, Digital manometer and carry case (Temperature sensors available if required)
QA 7000 COMM	Remote control via GSM Modem
QA 7000 DAMP	Muffler for further noise reduction
QA 7000 FIL – X (X=Filter Type)	Filter Paper 8" x 10" Quartz, Glass Fibre or Cellulose available.
Calibration Contracts (Conducted by qualified technicians)	
QA MET WS 200	Sonic Wind Speed + Wind Direction Sensor (other parameters available on request)

Ordering Options:

Inlet Head:	TSP PM10 PM2.5
Power Requirements:	240V 110V

Also Supplied by Thomson Environmental Systems:

- Ambient Gas & Particulate Monitors
- Meteorological Equipment
- Indoor Air Quality Monitoring Equipment
- Laboratory Equipment
- Reach-In and Walk-In Equipment Shelters
- CEMS and Process systems for monitoring Gases, Opacity/Particulates and Flow/Velocity
- System Design, Installation & Commissioning
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Digital Calibration Kit pictured above

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The **QA Lite** utlilises nephelometry to measure, in real time, the level of particulate activity in the air.

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Each QA Model offers an intuitive menu structure, graphical display and digital input/output. Measurements can be averaged to one minute or longer. Data can be viewed and instruments programmed locally using the instrument display screen or laptop connected via serial port.

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Quality Data is assured with an integrated inlet heater to eliminate moisture and fog interference. **Paired Filters** eliminate the need for pre-weighing, this allows for minimal filter handling and the filters offer sample speciation analysis. The Optical unit is calibrated on Arizona road dust and interchangeable **Calibrated Optical Modules** are available for easy field calibration of your instrument as required.

Weather Sensors can be connected to the QA Lite and logged internally – eliminating the need for additional costly data loggers. The Lufft range of meteorological sensors has all your meteorological requirements covered. Providing equipment suited specifically for your application, the Lufft sensors incorporate as many or as few parameters as you need.

The QA Lite offers the following features:

- TSP, PM10 or PM2.5 configurations
- Portable, Quick Response Installation
- Integrated paired filters – minimises filter handling and allows for sample post analysis
- Heated inlet – Eliminates moisture and fog interference
- Calibrated Optical Module
- Remote Control via Modem (Optional)
- Inputs for logging additional parameters such as wind speed and wind direction, temperature, pressure, relative humidity, solar radiation and precipitation
- Solar Powered Option

Add on Wind Speed and Wind Direction or a Complete Met Station – Logged locally by the QA Lite

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QA LITE

Specifications

Feature	Description
Display	Graphical 128 x 64 bits. Display shows 1 sec to 1 min average as selected.
Keypad	12 button function with keys
Alarms/Digital Output	GSM, 3 relays (NC/COM/NO) Siren, text to mobile phone, visual beacon and email
Security	Password Protection
Logger Averaging	Adjustable data logger 1 sec to 1 week averaging periods.
Other Logging Inputs	Two 0 to 5 volt analogue inputs or 4-20mA)
Meteorological Inputs	Wind speed and direction, rainfall, temperature and humidity and BP. Solar Rad
Digital Input	3 Optically isolated inputs; Voltage free
Analogue Input	2 Channels: Voltage/Current
Analogue Output	0-5V or 4-20mA
Data Storage	Internal with separate battery backup 128KB
Filter Holder	Integrated filter holder: 37mm Millipore filter cartridge (paired)
Serial Connectivity	2 x RS232, RS485/RS422, CAN BUS
Barometer	Ambient static pressure
Temperature Probes	2 Internal and 2 External Channels: RTD (PT100)
Operating Temperature	-5*C to + 50*C
Standard Inlets	TSP (Optical measure) PM10, PM2.5 and PM1.0
Heated Inlet	Heating controlled to RH levels
Flow Rate	5LPM, Volumetric or Standardised
Measurement Range	0 to 150 milligrams per cubic metre
Detection Limit	0.01 micrograms per cubic metre
Indicator Range	0 to 60mg/m3 without particle sizing
Particle Size Range	0.2 to 18.0 micron diameter
Power Options	Solar, Mains, Battery
Detector Method	Nephelometry with laser
Sampling Current Drain	Included heated inlet and backlight – 1.0 amp @ 12VDC
External Power Pack	80 to 260v AC input, weatherproof
RS232 I/O	9600 baud via modem link to 115200 direct
Enclosure Mount	35mm Diameter post
Case Protection	To IP66 (excluding inlet and exhaust)
Dimensions (mm)	W x 300, D x 200 , H x 350, Heater = 500L x 60 diameter
Weight	<6kg for enclosure and 0.5kg for heater

Optional Accessories

Part Number	Description
QA TRIPOD	Tripod to suite QA Lite or QA Flow 5
QA Lite SOLAR	Solar Panel Kit to suit QA Lite
QA Lite CAL	Calibrated Optical Module for easy field exchange
QA Lite COMM	Remote control via GSM or Next G Modem
QA Lite ALM	Relay board for connecting Visual or Audiable Alarms
QA Lite FIL-X	Pack of 50 37mm Filters. X= Teflon or Quartz
QA MET WS 200	Sonic Wind Speed & Wind Direction Sensor (other parameters available on request)
QA Lite LTF	Long term filter option – for longer unattended operation

Ordering Options:

Inlet Head:	TSP PM10 PM2.5
Power Requirements:	240V 110V Solar Powered Battery Operated

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WS600-UMB - TEMPERATURE, RELATIVE HUMIDITY, PRECIPITATION, AIR PRESSURE, WIND

From the WS product family of professional intelligent measurement transducers with digital interface for environmental applications.

Integrated design with ventilated radiation protection for measuring:

- **Air temperature**
- **Relative humidity**
- **Precipitation intensity**
- **Precipitation type**
- **Precipitation quantity**
- **Air pressure**
- **Wind direction**
- **Wind speed**

Relative humidity is measured by means of a capacitive sensor element; a precision NTC measuring element is used to measure air temperature.

Precipitation is measured by way of a 24 GHz Doppler radar, which measures the drop speed of an individual drop of rain/snow.

Precipitation quantity and intensity are calculated from the correlation between drop size and speed.

The difference in drop speed determines the type of precipitation (rain/snow).

Maintenance-free measurement offers a major advantage over the common tipping spoon and tipping bucket processes.

Ultrasonic sensor technology is used to take wind measurements (WS600 only).

Measurement data are available for further processing in the form of a standard protocol (Lufft-UMB protocol).

All in One
aspirated temperature/
humidity measurement
maintenance-free operation
open communication protocol

Technical Data	Order No.
WS600-UMB Compact weather station	**8370.U01** EU, USA, Canada / **8370.U02** UK
Dimensions	Ø ca. 150mm, Height ca. 345mm, Weightt approx. 1,5kg
Temperature	
Principle	NTC
Measuring range	-30…70°C
Accuracy	±0,2°C (-20°C...+50°C), otherwise ± 0,5°C
Relative humidity	
Principle	capacitive
Measuring range	0…100 % RH
Accuracy	±2% RH
Precipitation intensity	
Resolution	0,01mm
Measuring range drop size	0,3…5mm
Reproducibility	typ. >90%
Precipitation type	Rain/snow
Air Pressure	
Principle	MEMS capacitive
Measuring range	300…1200 hPa
Accuracy	±1,5hPa
Wind direction	
Principle	Ultrasonic
Measuring range	0…359,9°
Accuracy	± 3°
Wind speed	
Principle	Ultrasonic
Measuring range	0…60m/s
Accuracy	± 0,3m/s or ±3% (0...35m/s)
Heating	30VA at 24VDC
General information	
Interface	RS485, 2-wire, half-duplex
Operating power consumption	24VDC +/- 10% <4VA (without heating)
Operating humidity range	0…100%
Operating temperature range	-30…70°C
Accessories	**Order No.**
Surge protection	**8379.USP**
Power supply 24V/4A	**8366.USV1**
UMB interface converter ISOCON	**8160.UISO**

WS500-UMB - TEMPERATURE, RELATIVE HUMIDITY, AIR PRESSURE, WIND

From the WS product family of professional intelligent measurement transducers with digital interface for environmental applications.

Integrated design with ventilated radiation protection for measuring:

- **Air temperature**
- **Relative humidity**
- **Air pressure**
- **Wind direction**
- **Wind speed**

Relative humidity is measured by means of a capacitive sensor element; a precision NTC measuring element is used to measure air temperature.

Maintenance-free measurement offers a major advantage over the common tipping spoon and tipping bucket processes.

Measurement data are available for further processing in the form of a standard protocol (Lufft-UMB protocol).

Technical Data	Order No.
WS500-UMB Compact weather station	**8373.U01**
Dimensions	Ø ca. 150mm, Height ca. 290mm, Weight approx. 1,3kg
Temperature	
Principle	NTC
Measuring range	-30…70°C
Accuracy	±0,2°C (-20°C...+50°C), otherwise ± 0,5°C
Relative humidity	
Principle	capacitive
Measuring range	0…100 % RH
Accuracy	±2% RH
Air Pressure	
Principle	MEMS capacitive
Measuring range	300…1200 hPa
Accuracy	±1,5hPa
Wind direction	
Principle	Ultrasonic
Measuring range	0…359,9°
Accuracy	± 3°
Wind speed	
Principle	Ultrasonic
Measuring range	0…60m/s
Accuracy	± 0,3m/s or ±3% (0...35m/s)
Heating	10VA at 24VDC
General information	
Interface	RS485, 2-wire, half-duplex
Operating power consumption	24VDC +/- 10% <4VA (without heating)
Operating humidity range	0…100%
Operating temperature range	-30…70°C

Accessories	Order No.
Surge protection	**8379.USP**
Power supply 24V/4A	**8366.USV1**
UMB interface converter ISOCON	**8160.UISO**

Ultrasonic wind sensor
maintenance-free operation
open communication protocol

WS400-UMB - TEMPERATURE, RELATIVE HUMIDITY, PRECIPITATION, AIR PRESSURE

From the WS product family of professional intelligent measurement transducers with digital interface for environmental applications.

Integrated design with ventilated radiation protection for measuring:

- **Air temperature**
- **Relative humidity**
- **Precipitation intensity**
- **Precipitation type**
- **Precipitation quantity**
- **Air pressure**

Relative humidity is measured by means of a capacitive sensor element; a precision NTC measuring element is used to measure air temperature.

Precipitation is measured by way of a 24 GHz Doppler radar, which measures the drop speed of an individual drop of rain/snow.

Precipitation quantity and intensity are calculated from the correlation between drop size and speed.

The difference in drop speed determines the type of precipitation (rain/snow).

Maintenance-free measurement offers a major advantage over the common tipping spoon and tipping bucket processes.

Measurement data are available for further processing in the form of a standard protocol (Lufft-UMB protocol).

Radar-based precipitation detection
Aspirated temperature/humidity measurement
Open communication protocol

Technical Data	Order No.
WS400-UMB Compact weather station	**8369.U01** EU, USA, Canada
WS400-UMB Compact weather station	**8369.U02** UK
Dimensions	Ø ca. 150mm, Height ca. 280mm, Weight approx. 1,4kg
Temperature	
Principle	NTC
Measuring range	-30…70°C
Accuracy	±0,2°C (-20°C...+50°C), otherwise ± 0,5°C
Relative humidity	
Principle	capacitive
Measuring range	0…100 % RH
Accuracy	±2% RH
Precipitation intensity	
Resolution	0,01mm
Measuring range drop size	0,3…5mm
Reproducibility	typ. >90%
Precipitation type	Rain/snow
Air Pressure	
Principle	MEMS capacitive
Measuring range	300…1200 hPa
Accuracy	±1,5hPa
General information	
Interface	RS485, 2-wire, half-duplex
Operating power consumption	24VDC +/- 10% <4VA (without heating)
Operating humidity range	0…100%
Operating temperature range	-30…70°C
Heating	20VA at 24VDC
Accessories	**Order No.**
Surge protection	**8379.USP**
Power supply 24V/4A	**8366.USV1**
UMB interface converter ISOCON	**8160.UISO**

WS300-UMB - TEMPERATURE, RELATIVE HUMIDITY, AIR PRESSURE

From the WS product family of professional intelligent measurement transducers with digital interface for environmental applications.

Integrated design with ventilated radiation protection for measuring:

- **Air temperature**
- **Relative humidity**
- **Air pressure**

Relative humidity is measured by means of a capacitive sensor element; a precision NTC measuring element is used to measure air temperature.

Measurement data are available for further processing in the form of a standard protocol (Lufft-UMB protocol).

Technical Data	Order No.
WS300-UMB Compact weather station	**8372.U01**
Dimensions	Ø ca. 150mm, Height ca. 225mm, Weight approx. 1,2kg
Temperature	
Principle	NTC
Measuring range	-30…70°C
Accuracy	±0,2°C (-20°C...+50°C), otherwise ± 0,5°C
Relative humidity	
Principle	capacitive
Measuring range	0…100 % RH
Accuracy	±2% RH
Air Pressure	
Principle	MEMS capacitive
Measuring range	300…1200 hPa
Accuracy	±1,5hPa
General information	
Interface	RS485, 2-wire, half-duplex
Operating power consumption	24VDC +/- 10% <4VA
Operating humidity range	0…100%
Operating temperature range	-30…70°C
Accessories	**Order No.**
Surge protection	**8379.USP**
Power supply 24V/4A	**8366.USV1**
UMB interface converter ISOCON	**8160.UISO**

Radar-based precipitation detection
Aspirated temperature/humidity measurement
Open communication protocol

WS200-UMB - WIND

From the WS product family of professional intelligent measurement transducers with digital interface for environmental applications.

Integrated design with ventilated radiation protection for measuring:

- Wind direction
- Wind speed

Ultrasonic sensor technology is used to take wind measurements.

Measurement data are available for further processing in the form of a standard protocol (Lufft-UMB protocol).

Ultrasonic wind measurement
open communication protocol

Technical Data	Order No.
WS200-UMB Compact weather station	**8371.U01**
Dimensions	Ø ca. 150mm, Height ca. 200mm, Weight approx. 1kg
Wind direction	
Principle	Ultrasonic
Measuring range	0…359,9°
Accuracy	± 3°
Wind speed	
Principle	Ultrasonic
Measuring range	0…60m/s
Accuracy	± 0,3m/s or ±3% (0...35m/s)
Heating	10VA at 24VDC
General information	
Interface	RS485, 2-wire, half-duplex
Operating power consumption	24VDC +/- 10% <4VA (without heating)
Operating humidity range	0…100%
Operating temperature range	-30…70°C
Accessories	**Order No.**
Surge protection	**8379.USP**
Power supply 24V/4A	**8366.USV1**
UMB interface converter ISOCON	**8160.UISO**

R2S-UMB - PRECIPITATION SENSOR (PRESENT WEATHER DETECTOR)

The drop speed is captured with a 24-GHz-Doppler radar.

The precipitation quantity and intensity is calculated from the correlation between drop size and speed.

The type of precipitation (rain, snow, sleet, freezing rain, hail) is detected from the difference in drop speed.

The measurement data are available for further processing in the form of a standard protocol (Lufft UMB protocol).

Technical Data	Order No.
R2S-UMB Precipitation sensor	**8367.U01** EU, USA, Canada
with UMB, pulse and frequency interface	**8367.U02** UK
Measuring range drop size	0.3...5.0mm
Measuring range hail	5.1...ca. 30mm
Resolution liquid precipitation	0.01...0.1...1.0mm/m²
Type of precipitation	Rain, snow, sleet, freezing rain, hail
Reproducibility	Typical >90%
Interface	RS485 half-duplex, UMB protocol
Power consumption	24VDC (22...28VDC)
Power supply	ca. 30VA (24V)
Operating temperature range	-30...70°C
Operating humidity range	0...100%
Connecting cable	Included in delivery
Accessories	**Order No.**
UMB interface converter ISOCON	**8160.UISO**
Power supply 24V/4A	**8366.USV1**
Protection shield for R2S	**8367.SCHIRM**
Surge protection	**8379.USP**

Maintenance-free
Fast response time
Present Weather detector
Resolution 0.01 mm

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ANNUAL GROUNDWATER SUMMARY REPORT

Lot 20 Adelaide Street Hazelmere

PREPARED FOR:

Wasterock Pty Ltd

Mobile Dewatering Environmental Services Pty Ltd as trustee for
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Environmental Services

DOCUMENT DETAILS

Title:	Annual Groundwater Summary Report
Project Address	Lot 20 Adelaide Street, Hazelmere
Client	Wasterock Pty Ltd
Job Number	E2012-031
Author:	Dale Andrews
Project Manager	Greg Watts
Email:	greg@environmentalservices.com.au
Status:	Final
Synopsis:	This document and investigation has been prepared in accordance with the Contaminated Sites Act, Western Australia (2006) and Department of Environment and Conservation (DEC) Contaminated Sites Management Series guidelines. The Scope of Works lists the extent of the investigation undertaken.

DOCUMENT DISTRIBUTION

Version No	Written by Date	Reviewed by Date	Issued by Date	Distributed to	Copies
Final v1	Dale Andrews 9/08/13	Mathew Bulmer 03/09/13	Greg Watts 18/10/13	Hazelland Pty Ltd	Email
Signed	D.R. Andrews.		G. J. Watts		

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Table of Contents

EXECUTIVE SUMMARY 4
1 INTRODUCTION 5
2 SCOPE OF WORK 5
2.1 Objectives 6
3 SITE IDENTIFICATION 7
4 BACKGROUND INFORMATION 9
4.1 Site History 9
4.2 Land Owner 9
4.3 Land Use 9
4.4 Site Boundary 9
4.5 Groundwater Use 9
4.6 Previous Studies 9
4.7 Contaminated Sites Database 9
5 POTENTIAL CONTAMINANTS OF CONCERN (PCOC) 11
5.1 Preferential Contaminant Pathways 11
6 SAMPLING ANALYSIS PLAN AND METHODOLOGY 12
7 QUALITY ASSURANCE / QUALITY CONTROL 13
7.1 Quality Assurance 13
7.2 Groundwater Sampling Procedure 13
7.2.1 Decontamination of Sampling Equipment 13
7.3 Laboratory 14
7.4 Quality Control 14
7.5 Waste Disposal 15
8 ASSESSMENT CRITERIA 16
9 RESULTS 17
9.2 Data Interpretation 19
9.3 Groundwater Levels 19
10 DISCUSSION & RECOMMENDATIONS 23
11 REFERENCES 24

List of Tables in Report

Table A: Site Summary Form....7
Table B: Site UTM coordinates....7
Table C: Groundwater Investigation Summary....12
Table D: Summary of TPH against LOR....17
Table E: Summary of Total and Dissolved Metals Concentrations....18
Table F: Groundwater Levels....20

List of Figures in Report

Figure 1 Site Location Map....8
Figure 2 Monitoring Well Locations....10
Figure 3 Annual Groundwater Fluctuations Across the Site....21
Figure 4 Groundwater Contours (GME #4 Data)....22

List of Attachments

Tables
Table 1 – Groundwater Analysis Results – WRMW1
Table 2 – Groundwater Analysis Results – WRMW2
Table 3 – Groundwater Analysis Results – WRMW3
Table 4 – Groundwater Analysis Results – WRMW4
Table 5 – Groundwater Analysis Results – WRMW5

Appendices
Appendix A – Certificate of Title
Appendix B – Groundwater Monitoring Event #1-4 Reports

EXECUTIVE SUMMARY

MDW Environmental Services (MDWES) was commissioned by Wasterock Pty Ltd to undertake groundwater investigations on the Hazelland site at Lot 20 Adelaide Street, Hazelmere (the Site). Groundwater monitoring events (GMEs) were completed on a quarterly basis to collect sufficient data to enable the interpretation of the annual fluctuations and trend of the groundwater beneath the Site.

A total of four (4) quarterly GMEs were completed during the months of May, August, January and June to capture seasonal variations in depth to water as well as chemical and physical properties of the groundwater. This Annual Groundwater Summary Report draws on the sampling and laboratory analysis completed during the GMEs and further information should be found within the following documents:

- *E2013-031 by MDWES – Groundwater Investigation Report – Hazelland Landfill Site, Lot 20 Adelaide Street, Hazelmere. (May 2012).*
- *E2013-031 Addendum 1 by MDWES – Groundwater Monitoring Event #2 – Hazelland Landfill Site, Lot 20 Adelaide Street, Hazelmere. (September 2012).*
- *E2013-031 Addendum 2 by MDWES – Groundwater Monitoring Event #3 – Hazelland Landfill Site, Lot 20 Adelaide Street, Hazelmere. (February 2013).*
- *E2013-031 Addendum 3 by MDWES – Groundwater Monitoring Event #4 – Hazelland Landfill Site, Lot 20 Adelaide Street, Hazelmere. (May 2013).*

Field results indicate that the groundwater flows in a north-north easterly direction and is intercepted between 18.6 RL mAHD (Relative Level metres Australian Height Datum) and 23.8 RL mAHD. Average groundwater flux across the Site during the 2012 -2013 test period was 0.8m.

Laboratory results indicate that total petroleum hydrocarbons (TPH) has impacted upon the groundwater below the Site. However, concentrations remain below assessment criteria and therefore not a concern at present. Current data does not accurately show the location and extent of the TPH impact.

Results indicate a seasonal fluctuation of nutrient concentrations which increase with the wet months and decrease during the dry months.

All other analytes do not exhibit tends or signs of seasonal fluctuation identifiable within the available data.

1 INTRODUCTION

This report has been prepared to summarise the annual trends and fluctuations of the groundwater at the Hazelland Landfill in Hazelmere, herein referred to as the Site. MDW Environmental Services (MDWES) were commissioned by Wasterock Pty Ltd to complete quarterly groundwater investigations and compile an Annual Groundwater Summary Report.

This report encompasses sampling and results from groundwater monitoring events (GME) completed during 2012 and 2013. This report should be read in conjunction with the following reports. For further information on the sampling events please refer to the following reports (Appendix B):

- *E2013-031 by MDWES – Groundwater Investigation Report – Hazelland Landfill Site, Lot 20 Adelaide Street, Hazelmere. (May 2012).*
- *E2013-031 Addendum 1 by MDWES – Groundwater Monitoring Event #2 – Hazelland Landfill Site, Lot 20 Adelaide Street, Hazelmere. (September 2012).*
- *E2013-031 Addendum 2 by MDWES – Groundwater Monitoring Event #3 – Hazelland Landfill Site, Lot 20 Adelaide Street, Hazelmere. (February 2013).*
- *E2013-031 Addendum 3 by MDWES – Groundwater Monitoring Event #4 – Hazelland Landfill Site, Lot 20 Adelaide Street, Hazelmere. (May 2013).*

2 SCOPE OF WORK

The Scope of Work for this project is as follows:

- Complete quarterly GME over a twelve (12) month period.
- Collect and analyse representative samples from six groundwater monitoring wells for each GME. Samples will be analysed by a NATA accredited laboratory for:
  - Total Petroleum Hydrocarbon / Total Recoverable Hydrocarbon (TPH/TRH);
  - Monocyclic Aromatic Hydrocarbons (MAH);
  - Polynuclear Aromatic Hydrocarbons (PAH;
  - Benzene, Toluene, Ethyl Benzene and Xylene (BTEX);
  - Phenolic Compunds;
  - Dissolved and Total Metalloids (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn); and
  - Organochlorine and Organophosphorous Pesticides (OC/OP).
- Using the data sets from each quarterly GME compare and identify seasonal and annual trends and fluctuations of the groundwater.
- Compile a detailed scientific report.

2.1 Objectives

The technical objectives of the investigation are to:

- Identify the annual directional flow of the groundwater below the site;
- Identify and determine the extent of the risk that any identified contamination may pose to human health and the environment;
- Identify seasonal fluctuations in groundwater depth and quality below the site;
- Establish groundwater data from the Site prior to the proposed remediation works;
- Determine the suitability of water abstraction from the superficial aquifer for the purposes of dust suppression and compaction.

3 SITE IDENTIFICATION

Information regarding the Site identification is presented in Table A below.

Table A: Site Summary Form

Site Location:	Lot 20 Adelaide Street, Hazelmere
Current Site Use:	Industrial
Total Site Area:	2054 m^2
Folio:	299
Certificates of Title:	20/D76128 (Appendix A)
Local Council:	City of Swan

The Site is bound by the coordinates as shown in Table B.

Table B: Site UTM coordinates

BOUNDARY CORNERS	MGA94 Zone 50	
	Easting (E)	Northing (N)
North west corner	406595	6467321
North east corner	407034	6467190
North east corner (mid)	406939	6467172
South east corner	407015	6466812
South west corner	406476	6467046
Eastern Corner	407078	6467020

Figure 1 Site Location Map

4 BACKGROUND INFORMATION

The Site (Figure 1) is located within the City of Swan, approximately 14 km east north east of Perth CBD. Situated between Talbot Road and Adelaide Street access is gained from the south of the Site off Adelaide Street. Historically the Site was occupied and used as a licenced inert waste landfill in which potentially contaminating wastes were dumped. Following investigation by Parsons Brinckerhoff (2006) the Site was classified “Contaminated – Remediation Required” by the Department of Environment and Conservation (DEC). The Parsons Brinckerhoff report contains substantial amounts of background information regarding this property and the Groundwater Investigation Report should be read in conjunction with this previously completed soil investigation.

4.1 Site History

A detailed historical investigation was not completed as part of this GME.

4.2 Land Owner

The Site is currently vested with Hazelland Pty Ltd and has been so since 2006, under the Land Title City of Swan, Location: Lot 20, Volume: 2054, Folio: 299. A copy of the Certificate of Title is attached in Appendix A.

4.3 Land Use

The Site has been used for collection and storage of inert demolition waste as landfill with some potentially contaminating waste.

4.4 Site Boundary

The Site is surrounded by private land to the north and south with industrial proprieties to the west and Roe Highway runs along the eastern boundary.

4.5 Groundwater Use

The site does not currently make use of groundwater.

4.6 Previous Studies

Soil investigations were completed on Site during 1992 (Dames and Moore) and 2006 (Parsons Brinckerhoff).

4.7 Contaminated Sites Database

The site is currently classified as “*Contaminated – Remediation Required*” as per DEC Contaminated Sites Database.

Figure 2 Monitoring Well Locations

5 POTENTIAL CONTAMINANTS OF CONCERN (PCOC)

The land is proposed for development into industrial lots. The following list of Potential Contaminants of Concern (PCOC) is based on the proposed use, historical and current Site activities, regional soil and related issues, proximity to classified contaminated sites and off-site sources of impacts:

- Dissolved and Total Metalloids: Arsenic (As), barium (Ba), beryllium (Be), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), manganese (Mn), molybdenum (Mo), nickel (Ni), silver (Ag), selenium (Se), vanadium (V), zinc (Zn), and mercury (Hg);
- Benzene, Toluene, Ethyl Benzene, Xylene (BTEX);
- Polynuclear Aromatic Hydrocarbons (PAH);
- Monocyclic Aromatic Hydrocarbons (MAH);
- Phenolic compounds;
- Total Petroleum Hydrocarbons / Total Recoverable Hydrocarbons (TPH/TRH);
- Organochlorine and Organophosphorous Pesticides (OC/OP).

5.1 Preferential Contaminant Pathways

Many of the PCOC identified have the potential to impact soil and groundwater at the Site and surrounding areas. Listed above are the contaminants most likely to be found within the fill and most likely to present a risk to human health and the environment. The PCOC have been identified due to the wide range of inert demolition waste likely to have been deposited at the Site. The preferential contaminant pathways can be summarised as soil, air and groundwater; notwithstanding that the Scope of Works for this investigation only includes assessment of groundwater.

6 SAMPLING ANALYSIS PLAN AND METHODOLOGY

The Monitoring Well (MW) locations (on Site) are shown in Figure 2. The groundwater sampling conducted at the Site is summarised in Table C below.

The sampling and analysis of quarterly GME's was completed to determine whether imported fill on the site had adversely affected the groundwater and establish background groundwater quality. This report utilise the GME data to identify trends and fluctuations over the previous 12 months to create an insight into annual groundwater quality of the Site.

Table C: Groundwater Investigation Summary

Activity	Details
Date of Field Activity	18/5/2012, 30/8/2012, 15/1/2013 and 3/6/2013.
Investigation	A total of six groundwater wells located onsite and sampled during each groundwater sampling event.
Sampling Method	Monitoring wells were sampled via use of a 12V GeoTech Low Flow Bladder pump coupled to YSI Quattro low flow sampler
Samples	One sample is collected from each monitoring well during each GME and a total of six samples collected for each event.
Calibration	YSI Quattro low flow calibrated
Decontamination Procedure	Gloves were disposed of after each sample taken.
Analysis	• Dissolved and Total Metals • Nutrients • Groundwater Parameters • OC/OP • Phenolic Compunds • PAH • TRH/TPH • BTEX
Laboratory	Samples were sent to the primary laboratory, ALS Environmental. Secondary samples were sent to ARL, both NATA Accredited.
Sample Preservation	Samples were placed in laboratory supplied bottles. Samples were stored on ice (<4°C) in an esky while on site and in transit to the laboratory.

7 QUALITY ASSURANCE / QUALITY CONTROL

The following Quality Assurance / Quality Control (QA/QC) program was implemented throughout the investigations to ensure the accuracy and precision of the data obtained. QC measures the effectiveness of the procedures of the QA program.

7.1 Quality Assurance

All procedures including staff selection, sampling methodologies, equipment, analysis methods and data transfer were based on:

- Australian Standards AS-4482.1-2005 and AS-4482.2-1999: Guides to the Sampling and Investigation of Potentially Contaminated Soil.
- Australian/New Zealand Standard AS/NZS 5667.1:1998 Water Quality-Sampling.

Particularly, the following actions applied:

- Samples were collected by a trained, experienced field technician,
- Samples were collected by the same personnel, ensuring that techniques used were consistent across the sampling program.

7.2 Groundwater Sampling Procedure

All groundwater samples were subject to the following procedures:

- Dedicated tubing was used for each well and the pump and low flow cell were decontaminated between wells;
- Samples were collected into laboratory supplied sample bottles. Preservatives (if required) were provided by the laboratory in the appropriate sample bottle;
- Samples were filled to the top to ensure no headspace remained;
- All samples were marked in the field using permanent marker with a label showing sample location, date and job number;
- Samples were immediately placed on ice within an esky for transport to the laboratory.

For further details and laboratory certificates of analysis including sample receipt notification, chain of custody and laboratory quality control see the associated GME report.

7.2.1 Decontamination of Sampling Equipment

All sampling equipment was decontaminated prior to use and between each sample location. Decontamination was completed using the following procedure:

- Equipment washed in water;
- Equipment thoroughly scrubbed in water with Decon90;
- Equipment rinsed in tap water;
- Equipment rinsed in de-ionised water.

7.3 Laboratory

Two NATA certificated laboratories were selected to analyse the samples. ALS Laboratory Group was selected as the primary laboratory. ARL WA was the secondary laboratory used for the analysis to replicate samples and for inter-laboratory quality control (QC).

The laboratory conducts internal quality control analysis as part of their QA/QC Procedures. Following discussions with the laboratory and a review of their laboratory certificates of analysis, the following laboratory QC protocols occur:

- At least 10% of samples are split into internal laboratory duplicate samples. These samples are homogenised prior to splitting into sub samples;
- At least 5% of samples are run with Matrix Spikes of known additions;
- Laboratory Control Samples (LCS) are run at the required rate (minimum 1 LCS per batch of samples). The LCS results are reported in the laboratory certificates named 'Interpretive Quality Control Report' and the 'Quality Control Report'.

For further details and laboratory certificates of analysis including sample receipt notification, chain of custody and laboratory quality control see the associated GME report.

7.4 Quality Control

To ensure the quality of the sampling method and laboratory analysis Quality Control (QC) samples were collected for each GME consisting of one (1) Rinsate Blank, one (1) Field Blank, one (1) set of duplicate and triplicate samples of a groundwater sample.

The reproducibility of the sampling and analytical methodology is measured as precision. Laboratory and field precision is measured using the Relative Percent Difference (RPD) between the sample and its duplicates. For further details and internal and external QC information refer to the associated GME report.

For those RPD values which exceed a generally acceptable 30% - 50% (Australian Standard AS 4482.1), data precision is considered poor, however, consideration needs to be given to sample homogeneity and the concentrations detected. Therefore, the acceptable ranges adopted for the RPDs are based on the laboratories RPD acceptance criteria and are dependent on the magnitude of results in comparison to the limits of reporting (LOR) as follows:

Result < 10 times LOR = No limit

Result 10 – 20 times LOR = 0% - 50%

Result > 20 times LOR = 0% - 20%

Where values are reported below the laboratory LOR, RPDs are not calculated.

For further information and groundwater QC results review the report associated with each GME.

7.5 Waste Disposal

Sampling was completed in consultation with MDWES Standard Operating Procedure and all waste was disposed of appropriately as to not impose a risk or cause contamination.

8 ASSESSMENT CRITERIA

To assess the groundwater quality at the Site, water quality results were compared against the criteria outlined within the DEC's *Contaminated Site Management Series - Assessment Levels for Soil, Sediment and Water* (DEC, 2010). Laboratory results were compared against the following criteria:

- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* prepared by the Australian and New Zealand Environment and Conservation Council (ANZECC 2000) as reproduced in the DEC's *Contaminated Site Management Series - Assessment Levels for Soil, Sediment and Water* (DEC 2010):
  - Freshwater Ecosystems
  - Marine Ecosystems
  - Short-term Irrigation Water
  - Long-term Irrigation Water
- Department of Health *Contaminated Sites Reporting Guideline for Chemicals in Groundwater*, (DoH 2006):
  - Domestic Non-Potable groundwater use
- National Health and Medical Research Council and Agriculture and Resource Management Council of Australia and New Zealand *Australian Drinking Water Guidelines* (NHMRC & ARMCANZ 2004):
  - Drinking Water Health Value
  - Drinking Water Aesthetic Value

It should be noted that the purpose of this report is to summarise the groundwater on an annual basis rather that note individual exceedances of assessment criteria. Laboratory analyses of groundwater samples undertaken onsite are presented in Table 1 through to Table 5.

9 RESULTS

Full laboratory results for the GME's conducted by MDWES during 2012/2013 are presented in the attachment Tables. GME Reports #1-4 are included in Appendix B.

The following notes are the summaries of laboratory results for the annual testing and the comparison to assessment criteria.

9.1.1 Total Petroleum Hydrocarbons (TPH)

Each of the TPH fractions analysed were generally below the laboratory LOR. The following TPH fractions, indicated in Table D below, were above the LOR. However, none of the TPH analysed identified concentrations above the assessment criteria adopted during the year.

Table D: Summary of TPH against LOR

Analytes	LOR	Location and concentration of analytes above the LOR concentration
C_{15} – C_{28}	100	**WRMW1** (200µg/L)**,** **WRMW3** (110µg/L), **WRMW6** (260µg/L, 380µg/L, 380µg/L)
C_{29} – C_{36}	50	**WRMW3** (270µg/L, 100µg/L) , **WRMW6** (60µg/L, 60µg/L)
C_{10} – C_{36} (sum)	50	**WRMW1** (200µg/L)**,** **WRMW3** (270µg/L, 210µg/L), **WRMW6** (320µg/L, 380µg/L, 440µg/L)

9.1.2 Monocyclic Aromatic Hydrocarbons (MAH)

Each of the speciated MAH analysed were below the LOR for each location throughout the year.

9.1.3 Polycyclic Aromatic Hydrocarbons (PAH)

Each of the speciated PAH analysed were below the LOR for each location throughout the year.

9.1.4 Phenolic Compounds

Each of the speciated phenolic compounds analysed were below the LOR for each location throughout the year.

9.1.5 Benzene, Toluene, Ethyl Benzene, Xylene (BTEX)

Each of the speciated BTEX analytes analysed were below the LOR within those samples analysed for each location throughout the year.

9.1.6 Organochlorine Pesticides (OC)

Each of the speciated OC analysed were below the LOR for each location throughout the year.

9.1.7 Organophosphorus Pesticides (OP)

Each of the speciated OP analysed were below the LOR for each location throughout the year.

9.1.8 Major Anions and Cations

There were no elevated concentrations of the major anions and cations above the assessment criteria adopted throughout the year.

9.1.9 Metals

Many total and dissolved metals concentrations exceed the LOR, Table E details summaries and notes of analytes which exceed assessment criteria or considered elevated.

Table E: Summary of Total and Dissolved Metals Exceedances.

Location	Dissolved Metals	Total Metals
WRMW1	Aluminium, Zinc and Iron.	Aluminium, Copper, Lead, Nickel, Zinc and Iron.
WRMW2	Aluminium, Nickel, Zinc and Iron.	Aluminium, Copper, Lead, Zinc and Iron.
WRMW3	Aluminium, Zinc and Iron.	Aluminium, Copper, Lead, Managanese, Nickel, Zinc, Iron and Mercury.
WRMW4	Aluminium, Nickel, Zinc and Iron.	Aluminium, Copper, Lead, Nickel, Zinc and Iron.
WRMW5	Aluminium, Zinc and Iron,	Aluminium, Copper, Lead, Zinc and Iron.
WRMW6	Aluminium, Nickel, Zinc and Iron.	Aluminium, Copper, Lead, Nickel, Zinc and Iron.

9.1.10 Nutrients

Total Nitrogen and Total Phosphorus exceed Fresh Waters assessment criteria at all locations throughout the year.

9.2 Data Interpretation

Laboratory analyses of samples completed during the GME's are tabulated to identify changes in groundwater quality (attached Table 1 to Table 5). The following points are summarisations and identification of trends of the annual data.

- Laboratory results of MW1 samples indicate an increase in pH, Total Aluminium, Total Lead, Total Zinc, Total Lead, TRH ($<C_{16}$ – C_{34} Fraction), and TPH (C_{15} – C_{28} Fraction). MW1 Decreased in levels observed for Dissolved Aluminium, Total Zinc, and Total Nitrogen. All other analytes remained relatively similar throughout monitoring events.
- MW2 laboratory results indicate that pH, Suspended Solids (SS), Turbidity, Dissolved and Total Iron and Total Aluminium have increased between monitoring events. Dissolved Aluminium, Dissolved Zinc, Dissolved Nickel, Total Copper and Total Nitrogen have decreased, whilst all other analytes have remained similar.
- Results for MW3 show that Dissolved Aluminium, Dissolved Manganese, Dissolved Iron, Total Nitrogen and Total Phosphorus have decreased. Turbidity, SS, Acidity, Dissolved Zinc, Total Aluminium, Total Copper, Total Lead, Total Manganese, Total Nickel, Total Zinc, Total Iron, TPH (C_{15} – C_{28} Fraction and C_{29} – C_{36} Fraction), and TRH ($>C_{16}$ – C_{34} Fraction) have increased. All other analytes remained similar throughout all monitoring events.
- Laboratory results of MW4 indicate a decrease in SS, Turbidity, Chloride, Dissolved Aluminium, Dissolved Nickel, Dissolved Zinc, Total Aluminium, Total Copper, Total Lead, Total Nickel, Total Zinc, Total Iron, Total Nitrogen and Total Phosphorus. An increase was only evident in TDS. All other analytes remained relatively similar over the monitoring events.
- Comparisons of MW5 results indicate a decrease in TDS, Dissolved Aluminium, Dissolved Zinc, Total Aluminium, Total Copper, Total Lead, Total Zinc and Total Iron, whilst increases were evident in pH, Acidity and Total Nitrogen. All other analytes remained relatively similar throughout previous monitoring events.
- MW6 was not sampled during GME #4 due to the monitoring well being dry.

9.3 Groundwater Levels

The depth to groundwater was measured during the GME's and tabulated with historical data (Table F). Commencement of monthly depth to groundwater measurements also occurred (March and ongoing) with groundwater depths presented in Table G.

An interface meter was used to verify the presence / absence of free phase hydrocarbon products over the groundwater with no free phase products detected. Groundwater is intercepted between 18.6 RL mAHD (Relative Level metres Australian Height Datum) and 23.8 RL mAHD. Average seasonal variation experienced within the well indicate groundwater changed 0.8m over the 2012-2013 test period.

Figure 3 illustrates annual fluctuations in groundwater depth beneath the site.

Plotting the water table values enable determination of groundwater direction. Figure 4 identifies a groundwater flux towards in north-north west direction.

Table F: Groundwater Levels

SAMPLE LOCATION		MW1				MW2				MW3				MW4				MW5				MW6			
		Standpipe (m):	0.45	Ground (RL mAHD):	26.84	Standpipe (m):	0.62	Ground (RL mAHD):	29.99	Standpipe (m):	0.51	Ground (RL mAHD):	34.11	Standpipe (m):	0.63	Ground (RL mAHD):	27.13	Standpipe (m):	0.56	Ground (RL mAHD):	28.47	Standpipe (m):	0.64	Ground (RL mAHD):	30.97
Date	Day	Water Level (mm TOC)	Water Level Change (mm)	Water Level (mbgl)	Water Level (RL mAHD)	Water Level (mm TOC)	Water Level Change (mm)	Water Level (mbgl)	Water Level (RL mAHD)	Water Level (mm TOC)	Water Level Change (mm)	Water Level (mbgl)	Water Level (RL mAHD)	Water Level (mm TOC)	Water Level Change (mm)	Water Level (mbgl)	Water Level (RL mAHD)	Water Level (mm TOC)	Water Level Change (mm)	Water Level (mbgl)	Water Level (RL mAHD)	Water Level (mm TOC)	Water Level Change (mm)	Water Level (mbgl)	Water Level (RL mAHD)
18/5/12	Fri	-3700	-3700	-3.26	23.58	-7666	-7666	-7.05	22.94	-11846	-11846	-11.34	22.78	-8509	-8509	-8.06	19.06	-8836	-8836	-8.22	20.25	-8759	-8759	-8.25	22.72
30/8/12	Thu	-3455	245	-3.01	23.83	-7260	406	-6.65	23.35	-11725	121	-11.22	22.90	-7790	719	-7.35	19.78	-8280	556	-7.67	20.81	-9215	-456	-8.71	22.27
15/1/13	Tue	-3646	-191	-3.20	23.64	-7682	-422	-7.07	22.93	-11858	-133	-11.35	22.76	-8289	-499	-7.84	19.28	-8641	-361	-8.03	20.45	-9312	-97	-8.80	22.17
21/3/13	Thu	-3870	-224	-3.43	23.41	-7530	152	-6.92	23.08	-12110	-252	-11.60	22.51	-8830	-541	-8.39	18.74	-9130	-489	-8.52	19.96	-9710	-398	-9.20	21.77
23/4/13	Tue	-4000	-130	-3.56	23.28	-7600	-70	-6.99	23.01					-8960	-130	-8.52	18.61	-9310	-180	-8.70	19.78	-9865	-155	-9.36	21.62
3/6/13	Mon	-3987	13	-3.54	23.29	-7924	-324	-7.31	22.68	-12197	-87	-11.69	22.43	-8872	88	-8.43	18.70	-9322	-12	-8.71	19.77	-9917	-52	-9.41	21.56
18/6/13	Tue	-4045	-58	-3.60	23.24	-7570	354	-6.96	23.04	-12230	-33	-11.72	22.39	-8865	7	-8.42	18.71	-9310	12	-8.70	19.78	-9917	0	-9.41	21.56

NOTES: 1. MW3 inaccessible 23/4/13

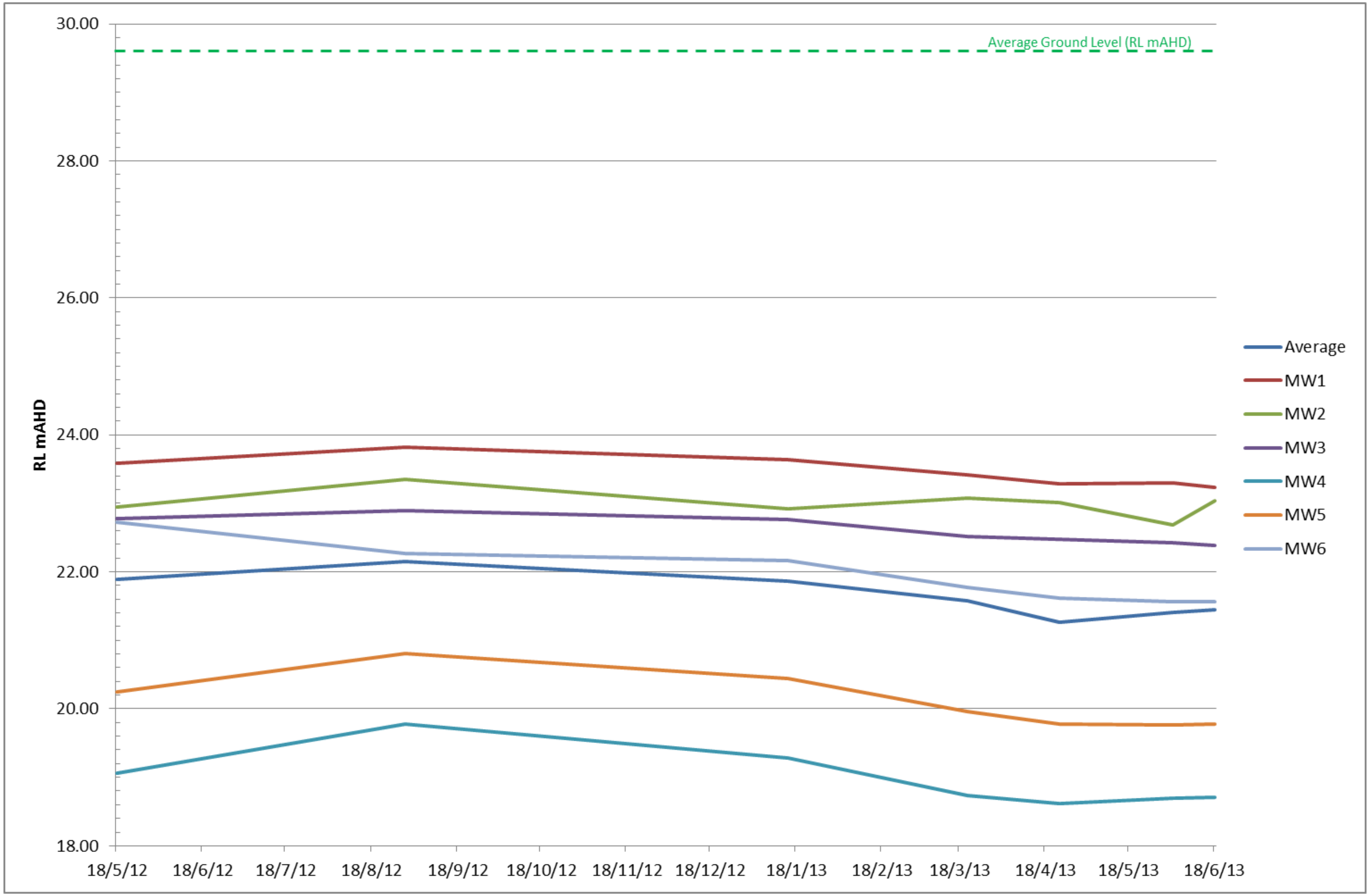

Figure 3 Annual Groundwater Fluctuations Across the Site

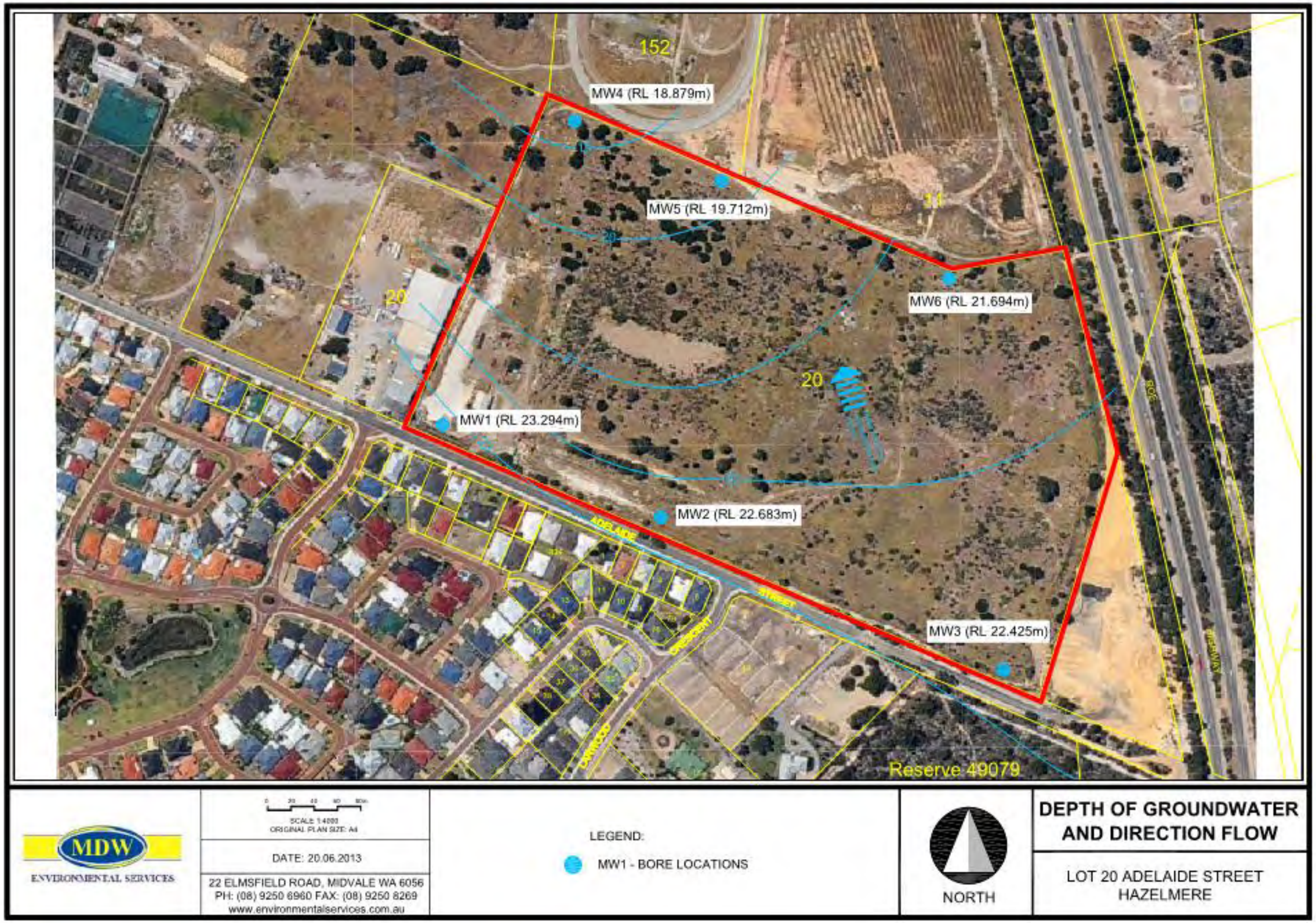

Figure 4 Groundwater Contours (GME #4 Data)

10 DISCUSSION & RECOMMENDATIONS

Standing water level measurements recorded by MDWES during the GME sampling indicate that groundwater is encountered between RL 18.6 mAHD and 23.8 mAHD beneath the Site. Groundwater levels are highest during August and lowest during April and flows in a general north-north west direction with an average seasonal fluctuation of 0.85m.

Laboratory results indicate that the groundwater beneath the site is fresh and mildly acidic to brackish with pH seasonal fluctuations appearing minimal with pH ranging from 5.15 to 7.83 across the site. This is an acceptable range of pH for groundwater within this locality.

Laboratory results do not show any real trends or identify seasonal fluctuations in metals results. Metalloid results could be considered higher than expected for background waters within this locality, however, elevated levels of suspended solids within majority of the samples could have contributed to artificially increasing the results.

Elevated nutrient levels are experienced across the site with concentrations peaking around August. This can be attributed to the higher groundwater table following the wet season. Although concentrations are elevated above ANZECC criteria, surface waters are not located in the immediate vicinity of the site and downstream receptors are likely to be more significantly impacted upon by land uses to the north of the site including rendering facilities.

Laboratory results show that TPH has impacted upon WRMW1, WRMW3 and WRMW6 throughout the year. Referring to the historical data, it is apparent that TPH has an intermittent presence in the groundwater at WRMW3. As the well is not in any landfill, it is likely that seasonal infiltration of rainfall from surface landfill material is the influential factor. TPH is considered a contaminant of high concern however concentrations remain below all assessment criteria.

With the exception of TPH concentrations, groundwater quality below the site appears relatively stable in all locations. At present sufficient data is not available to indicate the location and extent of TPH below the site. However, as concentrations remain below assessment criteria this is not of concern.

MDWES recommends that groundwater monitoring be scaled back to bi-annually sampling and annual reporting to track TPH concentrations until the commencement of remedial works.

11 REFERENCES

ANZECC (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.* Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ).

DEC (2010) *Assessment Levels for Soil, Sediment and Water*, Contaminated Sites Management Series, Contaminated Sites Branch

DEP (2004) Potentially Contaminating Activities, Industries and Land Uses, Contaminated Sites Management Series

DoH (2006) *Contaminated Sites Reporting Guideline for Chemicals in Groundwater*

DEP (2001) *Reporting on Site Assessments*, Contaminated Sites Management Series.

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Groundwater Investigation Report

Lot 20 Adelaide Street
Hazelmere

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Table of Contents

1 INTRODUCTION 4
2 SCOPE OF WORK 4
2.1 Objectives 4
3 SITE IDENTIFICATION 4
4 BACKGROUND INFORMATION 7
4.1 Site History 7
4.2 Land Owner 7
4.3 Land Use 7
4.4 Site Boundary 7
4.5 Groundwater Use 7
4.6 Previous Studies 7
4.7 Contaminated Sites Database 7
5 POTENTIAL CONTAMINANTS OF CONCERN (PCOC) 9
5.1 Preferential Contaminant Pathways 9
6 SAMPLING ANALYSIS PLAN AND METHODOLOGY 10
6.1 Groundwater Sampling 10
7 QUALITY ASSURANCE / QUALITY CONTROL 10
7.1 Quality Assurance 10
7.1.1 Groundwater Sampling Procedure 11
7.1.2 Decontamination of Sampling Equipment 11
7.2 Laboratory 12
7.3 Quality Control 12
7.4 Waste Disposal 12
8 RESULTS 17
8.1 Groundwater Levels 21
9 DISCUSSION 23
10 REFERENCES 24
11 APPENDICES 25

List of Figures

Figure 1 Site location plan 6
Figure 2 Detailed Site view and Monitoring Well Locations. 8
Figure 3 Groundwater Contours 22

List of Tables

Table 1 Groundwater Quality Control Results. 13
Table 2 Laboratory Analysis of Field Blank and Rinsate Samples....15
Table 3 Groundwater Laboratory Analysis Results....19
Table 4 Groundwater Measurements 21

1 INTRODUCTION

This report has been prepared to detail the sampling methodology and results from the groundwater investigation completed at the Hazelland Landfill in Hazelmere, herein referred to as the Site. MDW Environmental Services (MDWES) were commissioned by Wasterock Pty Ltd to complete a groundwater investigation and compile a Groundwater Investigation Report in support of Section 3.7 of the *Site Remediation Works Agreement and Site Management Plan.*

2 SCOPE OF WORK

The Scope of Work for this project is as follows:

- Install six (6) groundwater monitoring wells;
- Collect and analyse representative samples from the monitoring wells. Samples will be analysed by a NATA certified laboratory for:
    - Total Petroleum Hydrocarbon (TPH);
    - Benzene, Toluene, Ethyl Benzene and Xylene (BTEX);
    - Phenols;
    - Metalloids (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn); and,
    - Organochlorine and Organophosphorous Pesticides,
- Data interpretation and reporting.

2.1 Objectives

The technical objectives of the investigation are to:

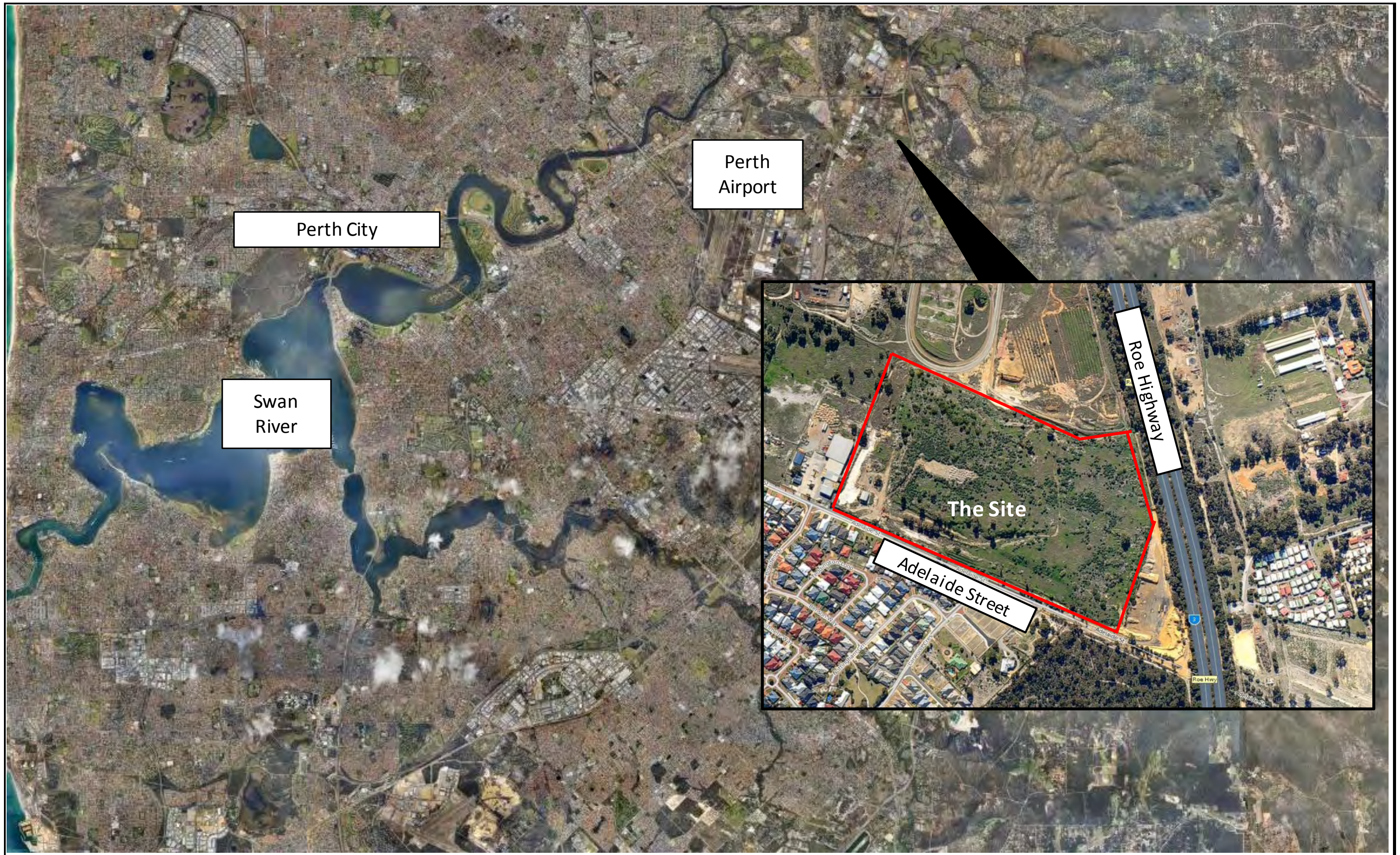
- Identify the directional flow of the groundwater below the site; and,
- To identify and determine the extent of the risk that any identified contamination may pose to human health and the environment;
- Establish baseline groundwater data from the Site prior to the proposed remediation works;
- To determine the suitability of water abstraction from the superficial aquifer for the purposes of dust suppression and compaction.

3 SITE IDENTIFICATION

Address:	Lot 20 Adelaide Street, Hazelmere.
Land description:	Industrial
Lots	20
Volume:	2054
Folio:	299
Certificates of Title:	20/D76128 (Appendix A)
Local government authority:	City of Swan
Locality view:	Figure 1

UTM Co-ordinates: The Site is bounded by the following coordinates.

BOUNDARY CORNERS	MGA94 Zone 50	
	Easting (E)	**Northing (N)**
North west corner	406595	6467321
North east corner	407034	6467190
North east corner (mid)	406939	6467172
South east corner	407015	6466812
South west corner	406476	6467046
Eastern Corner	407078	6467020



ENVIRONMENTAL SERVICES

Scale 0 4km

Unit 1, 22 Elmsfield Road, Midvale 6056
Ph (08) 9250 6960 Fax (08) 9250 8269
www.environmentalservices.com.au

N

Figure:	Site Location
Project:	Hazelland Landfill Site
Job No:	E2012-031
Date:	6/07/2012
Source	Nearmap

Figure 1 Site location Plan

4 BACKGROUND INFORMATION

The site (Figure 1) is located within the City of Swan, approximately 14 km east north east of Perth CBD. Situated between Talbot Road and Adelaide Street access is gained from the south of the Site off Adelaide Street. Historically the Site was occupied and used as a licenced inert waste landfill in which potentially contaminating wastes were dumped. Following investigation by Parsons Brinckerhoff (2006) the site was classified "Contaminated – Remediation Required" by the Department of Environment and Conservation (DEC). The Parsons Brinckerhoff report contains substantial amounts of background information regarding this property and the Groundwater Investigation Report should be read in conjunction with this previously completed soil investigation.

4.1 Site History

A detailed historical investigation was not completed as part of this Groundwater Investigation Report.

4.2 Land Owner

The Site is currently vested with Hazelland Pty Ltd and has been so since 2006 under the Land Title City of Swan Location Lot 20 Volume 2054 Folio 299. A copy of the Certificate of Title is in Appendix A.

4.3 Land Use

The Site has been used for collection and storage of inert demolition waste as landfill with some potentially contaminating waste.

4.4 Site Boundary

The Site is surrounded by private land to the north and south with industrial proprieties to the west and Roe Highway runs along the eastern boundary.

4.5 Groundwater Use

The site does not currently make use of groundwater.

4.6 Previous Studies

Soil investigations were completed on the site during 1992 (Dames and Moore) and 2006 (Parsons Brinckerhoff).

4.7 Contaminated Sites Database

The site is currently classed as "*Contaminated – Remediation Required*" as per DEC Contaminated Sites Database.

MDW ENVIRONMENTAL SERVICES	Scale 0 100m	N	Figure: Detailed Site View
	Unit 1, 22 Elmsfield Road, Midvale 6056		Project: Hazelland Landfill
	Ph (08) 9250 6960 Fax (08) 9250 8269		Job No: E2012-031
	www.environmentalservices.com.au		Date: 18/06/2011
			Source Nearmap

Figure 2 Detailed Site View and Monitoring Well Locations.

5 POTENTIAL CONTAMINANTS OF CONCERN (PCOC)

The land is proposed for development into industrial lots. The following list of PCOC is based on proposed use, historical and current Site activities, regional soil and issues, proximity to Contaminated Sites and off-site sources of impacts:

- Metalloids: Arsenic (As), barium (Ba), beryllium (Be), Cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), manganese (Mn), molybdenum (Mo), nickel (Ni), silver (Ag), selenium (Se), vanadium (V), zinc (Zn), and mercury (Hg);
- Polynuclear Aromatic Hydrocarbons (PAH);
- Monocyclic Aromatic Hydrocarbons (MAH);
- Phenolic compounds;
- Total Petroleum Hydrocarbons (TPH);
- Organochlorine and Organophosphorous Pesticides.

5.1 Preferential Contaminant Pathways

Many of the PCOC identified at the Site have the potential to impact soil and groundwater at the Site and surrounding areas. Listed above are the contaminants most likely to be found within the fill and most likely to present a risk to human health and the environment. The PCOC have been identified due to the wide range of inert demolition waste likely to have been deposited at the Site. The preferential contaminant pathways can be summarized as soil, air and groundwater; notwithstanding that the Scope of Works for this investigation only includes assessment of potential groundwater contamination.

6 SAMPLING ANALYSIS PLAN AND METHODOLOGY

The sampling and analysis of the Groundwater Investigation Report were completed to determine whether imported fill on the site had adversely affected the groundwater. The results within this report will form background groundwater data and be used to highlight any changes in groundwater quality during the proposed site remediation works.

6.1 Groundwater Monitoring Well Installation

Between the 7th and 10th of May 2012, six (6) groundwater monitoring wells were installed around the perimeter of the site (Figure 2) using a trained and competent drilling company. In consultation with the Western Australian Groundwater Atlas estimated depths of the superficial aquifer were determined and drilling and well construction was completed in accordance with this information. Drilling was completed using a mud rotary drill rig to install groundwater wells to depths ranging from 6.0 metres below ground level (mbgl) to 14.5 mbgl with slotted screen installed to a minimum of 1.0 metres above the water table. Post construction the groundwater monitoring wells were left to equilibrate for a minimum stabilization period of seven (7) days as per DEC requirements.

Soil lithology was noted during construction and can be generally described as red clay overlain by layers of coarse then fine sands with brown clay and yellow sands to the surface. Drill Logs and Monitoring Well Construction Logs are included within Appendix B and C respectively.

6.2 Groundwater Sampling

Sampling was completed on the 18th May 2012; the standing water level was recorded using an electronic water level indicator. Sampling was then undertaken using a 12V GeoTech Low Flow Bladder pump, coupled to a YSI Quattro low flow sampler to enable continuous measurement of field parameters. Once stabilisation of the parameters was reached, samples were collected and submitted to a National Association of Testing Authorities (NATA) accredited laboratory for analysis. Field Sheets are attached in Appendix D.

Surveying was completed on the groundwater monitoring wells post installation to establish accurate water levels and enable further characterization of the groundwater below the site. Certificate of Survey is attached in Appendix E.

7 QUALITY ASSURANCE / QUALITY CONTROL

The following Quality Assurance / Quality Control (QA/QC) program was implemented throughout the investigation to ensure the accuracy and precision of the data obtained. QC measures the effectiveness of the procedures of the QA program.

7.1 Quality Assurance

All procedures including staff selection, sampling methodologies, equipment, analysis methods and data transfer were based on:

- *AS/NZS 5667.11:1998: Water Quality, Part 1: Guidance on the design of sampling programs, sampling techniques, and the preservation and handling of samples. (AS/NZS 5667.11:1998),* and
- *AS/NZS 5667.11:1998 Water Quality, Part 11: Guidance on Sampling of Groundwaters (AS/NZS 5667.11:1998)*.

Particularly, the following actions applied:

- Samples were collected by a trained, experienced field technician,
- Samples were collected by the same personnel, ensuring that techniques used were consistent across the sampling program.

Following discussions with the primary laboratory and a review of their laboratory certificates of analysis, the following laboratory QC protocols occurred:

- At least 5% of samples are split into internal laboratory duplicate samples. These samples are homogenised prior to splitting into sub samples;
- At least 5% of samples are run with Matrix Spikes of known additions.
- Laboratory Control Samples (LCS) are run at the required rate; minimum 1 LCS per batch of samples. The LCS results are reported in the laboratory certificates named 'Interpretive Quality Control Report' and the 'Quality Control Report'.

7.1.1 Groundwater Sampling Procedure

All groundwater samples were subject to the following procedures:

- Dedicated tubing was used for each well and the pump and low flow cell were decontaminated between wells;
- Samples were collected within an eight hour period into new, laboratory supplied sample bottles. Preservatives (if required) were provided by the laboratory in the appropriate sample bottle;
- Samples were filled to the top to ensure no headspace remained;
- All samples were marked in the field using permanent marker with a label showing sample location, date and job number;
- Samples were immediately placed on ice within an esky for transport to the laboratory accompanied with standard chain of custody documentation.

7.1.2 Decontamination of Sampling Equipment

All sampling and drilling equipment were decontaminated prior to use and between each sample location. Decontamination was completed using the following procedure:

- Equipment washed in water;
- Equipment thoroughly scrubbed in water with Decon 90;
- Equipment rinsed in tap water;

- Equipment rinsed in de-ionised water.

7.2 Laboratory

Two NATA certificated laboratories were selected to analyse the samples. ALS Laboratory Group was selected as the primary laboratory. ARLWA; the secondary laboratory, was used for the analysis of replicate samples and for inter-laboratory quality control (QC).

7.3 Quality Control

To ensure the quality of the sampling method and laboratory analysis Quality Control (QC) samples were collected consisting of one (1) Rinsate Blank, one (1) Field Blank, one set of (1) duplicate and triplicate samples of groundwater.

- A rinsate sample was collected for each day of field sampling (RINSATE);
- A field blank was collected for each day of field sampling (FIELD);
- WRMW4-001 was used as the DUP and TRIP.

Laboratory certificates of analysis including sample receipt notification, chain of custody, and laboratory quality control are available in Appendix F.

The reproducibility of the sampling and analytical methodology is measured as precision. Laboratory and field precision is measured using the Relative Percent Difference (RPD) between the sample and its duplicates. For those RPD values which exceed a generally acceptable 30% - 50% (Australian Standard AS 4482.1), data precision is considered poor, however, consideration needs to be given to sample homogeneity and the concentrations detected. Therefore, the acceptable ranges adopted for the RPDs are based on the laboratories RPD acceptance criteria and are dependent on the magnitude of results in comparison to the limits of reporting (LOR) as follows:

Result < 10 times LOR = No limit

Result 10 – 20 times LOR = 0% - 50%

Result > 20 times LOR = 0% - 20%

Groundwater QC results (Table 1) indicated exceedance of RPD limits for Total Iron and Total Phosphorus these can be likely attributed to moderate levels of Suspended Solids and Turbidity. ALS Laboratory Group QC documentation indicates the lab’s internal QC were observed.

Laboratory analysis of QA samples indicates exceedances of adopted criteria of Copper within both samples and levels of Zinc within the Rinsate. Detailed results are found in Table 2.

7.4 Waste Disposal

Sampling was completed in consultation with MDWES Standard Operating Procedure and all waste was disposed of appropriately as to not impose a risk or cause contamination.

Table 1 Groundwater Quality Control Results.

Analyte grouping/Analyte	Units	18/05/2012 WRMW4	18/05/2012 DUP	DUP RL (%)	DUP RPD (%)	18/05/2012 TRIP	TRIP RL (%)	TRIP RPD
pH Value	pH Unit	6.04	5.88	20	2.65	6.4	20	5.63
Electrical Conductivity	µS/cm	354	334	20	5.65	400	20	11.50
Total Dissolved Solids	mg/L	226	194	20	14.16	280	20	19.29
Suspended Solids	mg/L	144	34	20	76.39	56	50	61.11
Turbidity	NTU	86.9	20.8	20	76.06	72	20	17.15
Total Alkalinity $CaCO_3$	mg/L	5	4	N/L	20.00	6	N/L	16.67
Acidity as $CaCO_3$	mg/L	8	8	N/L	0.00	<5	N/L	-
Sulfate as SO_4^{2-}	mg/L	17	16	50	5.88	-	-	-
Alkalinity : Sulfate	ratio	0.29	0.25	N/L	15.00	-	-	-
Chloride	mg/L	89	84	20	5.62	100	20	11.00
Sulfate : Chloride	ratio	0.19	0.19	N/L	0.28	-	-	-
Dissolved Metals								
Aluminium	mg/L	0.02	0.05	N/L	60.00	<0.1	N/L	-
Arsenic	mg/L	<0.001	<0.001	N/L	-	<0.001	N/L	-
Cadmium	mg/L	<0.0001	<0.0001	N/L	-	<0.002	N/L	-
Chromium	mg/L	<0.001	<0.001	N/L	-	<0.01	N/L	-
Manganese	mg/L	0.013	0.01	50	23.08	0.01	N/L	23.08
Nickel	mg/L	<0.001	<0.001	N/L	-	<0.01	N/L	-
Selenium	mg/L	<0.01	<0.01	N/L	-	<0.001	N/L	-
Zinc	mg/L	0.01	0.01	N/L	0.00	<0.01	N/L	-
Iron	mg/L	0.11	0.09	N/L	18.18	0.03	N/L	72.73
Ferrous Iron	mg/L	<0.05	0.05	N/L	-	<0.1	N/L	-
Chromium VI	mg/L	<0.010	<0.010	N/L	-	-	-	-
Total Metals								
Aluminium	mg/L	4.3	2.34	20	45.58	0.7	N/L	83.72
Arsenic	mg/L	0.001	<0.001	N/L	-	<0.001	N/L	-
Cadmium	mg/L	<0.0001	<0.0001	N/L	-	<0.002	N/L	-
Chromium	mg/L	0.004	0.002	N/L	50.00	<0.01	N/L	-
Copper	mg/L	0.005	0.003	N/L	40.00	-	-	-
Lead	mg/L	0.011	0.006	50	45.45	-	-	-
Manganese	mg/L	0.016	0.012	50	25.00	0.01	N/L	37.50
Molybdenum	mg/L	<0.001	<0.001	N/L	-	-	-	-
Nickel	mg/L	0.001	<0.001	N/L	-	<0.01	N/L	-
Selenium	mg/L	<0.01	<0.01	N/L	-	<0.001	N/L	-
Silver	mg/L	<0.001	<0.001	N/L	-	-	-	-
Zinc	mg/L	0.017	0.013	N/L	23.53	0.01	N/L	41.18
Iron	mg/L	0.88	0.51	50	42.05	0.26	20	70.45
Mercury	mg/L	<0.0001	<0.0001	N/L	-	-	-	-
Nutrients								
Ammonia as N	mg/L	0.11	0.12	50	8.33	0.4	N/L	72.50
Nitrite as N	mg/L	0.01	0.01	N/L	0.00	<0.01	N/L	-
Nitrate as N	mg/L	3.75	3.79	20	1.06	3.9	20	3.85
Kjeldhal Nitrogen	mg/L	0.5	0.7	N/L	28.57	0.4	N/L	20.00
Total Nitrogen	mg/L	4.3	4.5	20	4.44	4.3	20	0.00
Total Phosphorus	mg/L	0.04	0.04	N/L	0.00	0.49	20	91.84
Reactive Phosphorus	mg/L	<0.01	<0.01	N/L	-	0.05	N/L	-
Sulfide	mg/L	<0.1	<0.1	N/L	-	0.4	N/L	-
COD	mg/L	11	13	N/L	15.38	10	N/L	9.09
BOD	mg/L	4	7	N/L	42.86	<5	N/L	-
Organochlorine Pesticides (OC)								
alpha-BHC	µg/L	<0.5	<0.5	N/L	-	-	-	-
Hexachlorobenzene (HCB)	µg/L	<0.5	<0.5	N/L	-	-	-	-
beta-BHC	µg/L	<0.5	<0.5	N/L	-	-	-	-
gamma-BHC	µg/L	<0.5	<0.5	N/L	-	-	-	-
delta-BHC	µg/L	<0.5	<0.5	N/L	-	-	-	-
Heptachlor	µg/L	<0.5	<0.5	N/L	-	-	-	-
Aldrin	µg/L	<0.5	<0.5	N/L	-	-	-	-
Heptachlor epoxide	µg/L	<0.5	<0.5	N/L	-	-	-	-
trans-Chlordane	µg/L	<0.5	<0.5	N/L	-	-	-	-
alpha-Endosulfan	µg/L	<0.5	<0.5	N/L	-	-	-	-
cis-Chlordane	µg/L	<0.5	<0.5	N/L	-	-	-	-
Dieldrin	µg/L	<0.5	<0.5	N/L	-	-	-	-
4.4`-DDE	µg/L	<0.5	<0.5	N/L	-	-	-	-
Endrin	µg/L	<0.5	<0.5	N/L	-	-	-	-
beta-Endosulfan	µg/L	<0.5	<0.5	N/L	-	-	-	-
4.4`-DDD	µg/L	<0.5	<0.5	N/L	-	-	-	-
Endrin aldehyde	µg/L	<0.5	<0.5	N/L	-	-	-	-
Endosulfan sulfate	µg/L	<0.5	<0.5	N/L	-	-	-	-
4.4`-DDT	µg/L	<2	<2	N/L	-	-	-	-
Endrin ketone	µg/L	<0.5	<0.5	N/L	-	-	-	-
Methoxychlor	µg/L	<2	<2	N/L	-	-	-	-
Organophosphorus Pesticides (OP)								
Dichlorvos	µg/L	<0.5	<0.5	N/L	-	-	-	-
Demeton-S-methyl	µg/L	<0.5	<0.5	N/L	-	-	-	-
Monocrotophos	µg/L	<2	<2	N/L	-	-	-	-
Dimethoate	µg/L	<0.5	<0.5	N/L	-	-	-	-
Diazinon	µg/L	<0.5	<0.5	N/L	-	-	-	-
Chlorpyrifos-methyl	µg/L	<0.5	<0.5	N/L	-	-	-	-
Parathion-methyl	µg/L	<2	<2	N/L	-	-	-	-
Malathion	µg/L	<0.5	<0.5	N/L	-	-	-	-
Fenthion	µg/L	<0.5	<0.5	N/L	-	-	-	-
Chlorpyrifos	µg/L	<0.5	<0.5	N/L	-	-	-	-
Parathion	µg/L	<2	<2	N/L	-	-	-	-
Pirimphos-ethyl	µg/L	<0.5	<0.5	N/L	-	-	-	-
Chlorfenvinphos	µg/L	<0.5	<0.5	N/L	-	-	-	-
Bromophos-ethyl	µg/L	<0.5	<0.5	N/L	-	-	-	-
Fenamiphos	µg/L	<0.5	<0.5	N/L	-	-	-	-
Prothiofos	µg/L	<0.5	<0.5	N/L	-	-	-	-
Ethion	µg/L	<0.5	<0.5	N/L	-	-	-	-
Carbophenothion	µg/L	<0.5	<0.5	N/L	-	-	-	-
Azinphos Methyl	µg/L	<0.5	<0.5	N/L	-	-	-	-
Monocyclic Aromatic Hydrocarbons								
Benzene	µg/L	-	-	-	-	<0.001	N/L	-
Toluene	µg/L	-	-	-	-	<0.001	N/L	-
Ethylbenzene	µg/L	-	-	-	-	<0.001	N/L	-
meta- & para-Xylene	µg/L	-	-	-	-	-	-	-
Styrene	µg/L	<5	<5	N/L	-	-	-	-
ortho-Xylene	µg/L	-	-	-	-	-	-	-
Isopropylbenzene	µg/L	<5	<5	N/L	-	-	-	-
n-Propylbenzene	µg/L	<5	<5	N/L	-	-	-	-
1.3.5-Trimethylbenzene	µg/L	<5	<5	N/L	-	-	-	-
sec-Butylbenzene	µg/L	<5	<5	N/L	-	-	-	-
1.2.4-Trimethylbenzene	µg/L	<5	<5	N/L	-	-	-	-
tert-Butylbenzene	µg/L	<5	<5	N/L	-	-	-	-
p-Isopropyltoluene	µg/L	<5	<5	N/L	-	-	-	-
n-Butylbenzene	µg/L	<5	<5	N/L	-	-	-	-
Oxygenated Compounds								
Vinyl Acetate	µg/L	<50	<50	N/L	-	-	-	-
2-Butanone (MEK)	µg/L	<50	<50	N/L	-	-	-	-
4-Methyl-2-pentanone (MIBK)	µg/L	<50	<50	N/L	-	-	-	-
2-Hexanone (MBK)	µg/L	<50	<50	N/L	-	-	-	-

Sulfonated Compounds								
Carbon disulfide	µg/L	<5	<5	N/L	-	-	-	-
Fumigants								
2.2-Dichloropropane	µg/L	<5	<5	N/L	-	-	-	-
1.2-Dichloropropane	µg/L	<5	<5	N/L	-	-	-	-
cis-1.3-Dichloropropylene	µg/L	<5	<5	N/L	-	-	-	-
trans-1.3-Dichloropropylene	µg/L	<5	<5	N/L	-	-	-	-
1.2-Dibromoethane (EDB)	µg/L	<5	<5	N/L	-	-	-	-
Halogenated Aliphatic Compounds								
Dichlorodifluoromethane	µg/L	<50	<50	N/L	-	-	-	-
Chloromethane	µg/L	<50	<50	N/L	-	-	-	-
Vinyl chloride	µg/L	<50	<50	N/L	-	-	-	-
Bromomethane	µg/L	<50	<50	N/L	-	-	-	-
Chloroethane	µg/L	<50	<50	N/L	-	-	-	-
Trichlorofluoromethane	µg/L	<50	<50	N/L	-	-	-	-
1.1-Dichloroethene	µg/L	<5	<5	N/L	-	-	-	-
Iodomethane	µg/L	<5	<5	N/L	-	-	-	-
trans-1.2-Dichloroethene	µg/L	<5	<5	N/L	-	-	-	-
1.1-Dichloroethane	µg/L	<5	<5	N/L	-	-	-	-
cis-1.2-Dichloroethene	µg/L	<5	<5	N/L	-	-	-	-
1.1.1-Trichloroethane	µg/L	<5	<5	N/L	-	-	-	-
1.1-Dichloropropylene	µg/L	<5	<5	N/L	-	-	-	-
Carbon Tetrachloride	µg/L	<5	<5	N/L	-	-	-	-
1.2-Dichloroethane	µg/L	<5	<5	N/L	-	-	-	-
Trichloroethene	µg/L	<5	<5	N/L	-	-	-	-
Dibromomethane	µg/L	<5	<5	N/L	-	-	-	-
1.1.2-Trichloroethane	µg/L	<5	<5	N/L	-	-	-	-
1.3-Dichloropropane	µg/L	<5	<5	N/L	-	-	-	-
Tetrachloroethene	µg/L	<5	<5	N/L	-	-	-	-
1.1.1.2-Tetrachloroethane	µg/L	<5	<5	N/L	-	-	-	-
trans-1.4-Dichloro-2-butene	µg/L	<5	<5	N/L	-	-	-	-
cis-1.4-Dichloro-2-butene	µg/L	<5	<5	N/L	-	-	-	-
1.1.2.2-Tetrachloroethane	µg/L	<5	<5	N/L	-	-	-	-
1.2.3-Trichloropropane	µg/L	<5	<5	N/L	-	-	-	-
Pentachloroethane	µg/L	<5	<5	N/L	-	-	-	-
1.2-Dibromo-3-chloropropane	µg/L	<5	<5	N/L	-	-	-	-
Hexachlorobutadiene	µg/L	<5	<5	N/L	-	-	-	-
Halogenated Aromatic Compounds								
Chlorobenzene	µg/L	<5	<5	N/L	-	-	-	-
Bromobenzene	µg/L	<5	<5	N/L	-	-	-	-
2-Chlorotoluene	µg/L	<5	<5	N/L	-	-	-	-
4-Chlorotoluene	µg/L	<5	<5	N/L	-	-	-	-
1.3-Dichlorobenzene	µg/L	<5	<5	N/L	-	-	-	-
1.4-Dichlorobenzene	µg/L	<5	<5	N/L	-	-	-	-
1.2-Dichlorobenzene	µg/L	<5	<5	N/L	-	-	-	-
1.2.4-Trichlorobenzene	µg/L	<5	<5	N/L	-	-	-	-
1.2.3-Trichlorobenzene	µg/L	<5	<5	N/L	-	-	-	-
Trihalomethanes								
Chloroform	µg/L	<5	<5	N/L	-	-	-	-
Bromodichloromethane	µg/L	<5	<5	N/L	-	-	-	-
Dibromochloromethane	µg/L	12	11	N/L	*8.33*	-	-	-
Bromoform	µg/L	13	15	N/L	*13.33*	-	-	-
Phenolic Compounds								
Phenol	µg/L	<1.0	<1.0	N/L	-	-	-	-
2-Chlorophenol	µg/L	<1.0	<1.0	N/L	-	-	-	-
2-Methylphenol	µg/L	<1.0	<1.0	N/L	-	-	-	-
3- & 4-Methylphenol	µg/L	<2.0	<2.0	N/L	-	-	-	-
2-Nitrophenol	µg/L	<1.0	<1.0	N/L	-	-	-	-
2.4-Dimethylphenol	µg/L	<1.0	<1.0	N/L	-	-	-	-
2.4-Dichlorophenol	µg/L	<1.0	<1.0	N/L	-	-	-	-
2.6-Dichlorophenol	µg/L	<1.0	<1.0	N/L	-	-	-	-
4-Chloro-3-Methylphenol	µg/L	<1.0	<1.0	N/L	-	-	-	-
2.4.6-Trichlorophenol	µg/L	<1.0	<1.0	N/L	-	-	-	-
2.4.5-Trichlorophenol	µg/L	<1.0	<1.0	N/L	-	-	-	-
Pentachlorophenol	µg/L	<2.0	<2.0	N/L	-	-	-	-
Polynuclear Aromatic Hydrocarbons								
Naphthalene	µg/L	<1.0	<1.0	N/L	-	-	-	-
Acenaphthylene	µg/L	<1.0	<1.0	N/L	-	-	-	-
Acenaphthene	µg/L	<1.0	<1.0	N/L	-	-	-	-
Fluorene	µg/L	<1.0	<1.0	N/L	-	-	-	-
Phenanthrene	µg/L	<1.0	<1.0	N/L	-	-	-	-
Anthracene	µg/L	<1.0	<1.0	N/L	-	-	-	-
Fluoranthene	µg/L	<1.0	<1.0	N/L	-	-	-	-
Pyrene	µg/L	<1.0	<1.0	N/L	-	-	-	-
Benz(a)anthracene	µg/L	<1.0	<1.0	N/L	-	-	-	-
Chrysene	µg/L	<1.0	<1.0	N/L	-	-	-	-
Benzo(b)fluoranthene	µg/L	<1.0	<1.0	N/L	-	-	-	-
Benzo(k)fluoranthene	µg/L	<1.0	<1.0	N/L	-	-	-	-
Benzo(a)pyrene	µg/L	<0.5	<0.5	N/L	-	-	-	-
Indeno(1.2.3.cd)pyrene	µg/L	<1.0	<1.0	N/L	-	-	-	-
Dibenz(a.h)anthracene	µg/L	<1.0	<1.0	N/L	-	-	-	-
Benzo(g.h.i)perylene	µg/L	<1.0	<1.0	N/L	-	-	-	-
Total Petroleum Hydrocarbons								
C6 - C9 Fraction	µg/L	<20	<20	N/L	-	<0.02	N/L	-
C10 - C14 Fraction	µg/L	<50	<50	N/L	-	<0.02	N/L	-
C15 - C28 Fraction	µg/L	<100	<100	N/L	-	<0.04	N/L	-
C29 - C36 Fraction	µg/L	<50	<50	N/L	-	<0.04	N/L	-
C10 - C36 Fraction (sum)	µg/L	<50	<50	N/L	-	<0.04	N/L	-

Table 2 Laboratory Analysis of Field Blank and Rinsate Samples

Analyte grouping/Analyte	Units	ANZECC & ARMCANZ (2000)[1] Fresh Waters[4]	ANZECC & ARMCANZ (2000)[1] Marine Waters[4]	ADWG (2004)[2] Drinking Water Health Value (HV)	ADWG (2004)[2] Drinking Water Aesthetic Value	DOH (2006)[3] Domestic non-potable	ANZECC & ARMCANZ (2000)[1] Short-term Irrigation Water	ANZECC & ARMCANZ (2000)[1] Long-term Irrigation Water[5]	18/05/2012 FIELD	18/05/2012 RINSATE
pH Value	pH Unit	6.5-8.5	8.0-8.4		6.5-8.5			6.0-8.5	5.7	5.7
Electrical Conductivity	µS/cm								1	<1
Total Dissolved Solids	mg/L								<10	<10
Suspended Solids	mg/L								<5	<5
Turbidity	NTU								0.1	<0.1
Total Alkalinity $CaCO_3$	mg/L								<1	<1
Acidity as $CaCO_3$	mg/L								5	<1
Sulfate as SO_4^{2-}	mg/L								<1	<1
Alkalinity : Sulfate	ratio			500	250	5000			<1	<1
Chloride	mg/L								1	<1
Sulfate : Chloride	ratio				250	2500			<1	<1
Total Metals										
Aluminium	mg/L	0.055			0.2	2	20	5	<0.01	<0.01
Arsenic	mg/L	0.013		0.01		0.07	2	0.1	<0.001	<0.001
Cadmium	mg/L	0.0002	0.0007	0.002		0.02	0.05	0.01	<0.0001	<0.0001
Chromium	mg/L						1	0.1	<0.001	<0.001
Copper	mg/L	0.0014	0.0013	2	1	20	5	0.2	0.004	0.004
Lead	mg/L	0.0034	0.0044	0.01		0.1	5	2	<0.001	<0.001
Manganese	mg/L	1.9		0.5	0.1	5	10	0.2	<0.001	<0.001
Molybdenum	mg/L			0.05		0.5	0.05	0.01	<0.001	<0.001
Nickel	mg/L	0.011	0.02	0.02		0.2	2	0.2	<0.001	0.002
Selenium	mg/L	0.005		0.01		0.1	0.05	0.02	<0.01	<0.01
Silver	mg/L	0.00005	0.0014	0.1		1			<0.001	<0.001
Zinc	mg/L	0.008	0.015		3	30	5	2	<0.005	0.045
Iron	mg/L	0.3	1.0 / 0.35		0.33	3	10	0.2	<0.05	<0.05
Mercury	mg/L	0.00006	0.0001	0.001		0.01	0.002	0.002	<0.0001	<0.0001
Nutrients										
Ammonia as N	mg/L	0.9	0.91						0.01	<0.01
Nitrite as N	mg/L			3.0		30			<0.01	<0.01
Nitrate as N	mg/L			50		500			<0.01	<0.01
Kjeldhal Nitrogen	mg/L								<0.1	<0.1
Total Nitrogen	mg/L	1.0 / 2.0[1]							<0.1	<0.1
Total Phosphorus	mg/L	0.1 / 0.2[1]							0.01	<0.01
Reactive Phosphorus	mg/L								<0.01	<0.01
Sulfide	mg/L	0.001							<0.1	<0.1
COD	mg/L								<5	<5
BOD	mg/L								4	3
Organochlorine Pesticides (OC)										
alpha-BHC	µg/L								<0.5	<0.5
Hexachlorobenzene (HCB)	µg/L								<0.5	<0.5
beta-BHC	µg/L								<0.5	<0.5
gamma-BHC	µg/L								<0.5	<0.5
delta-BHC	µg/L								<0.5	<0.5
Heptachlor	µg/L	0.01							<0.5	<0.5
Aldrin	µg/L								<0.5	<0.5
Heptachlor epoxide	µg/L			0.05	0.3	3			<0.5	<0.5
trans-Chlordane	µg/L	0.03[2]		0.01	1	10			<0.5	<0.5
alpha-Endosulfan	µg/L	0.03[3]	0.005[3]	0.05	30	30			<0.5	<0.5
cis-Chlordane	µg/L	0.03[2]		0.01	1	10			<0.5	<0.5
Dieldrin	µg/L								<0.5	<0.5
4.4`-DDE	µg/L								<0.5	<0.5
Endrin	µg/L	0.01	0.004						<0.5	<0.5
beta-Endosulfan	µg/L	0.03[3]	0.005[3]						<0.5	<0.5
4.4`-DDD	µg/L								<0.5	<0.5
Endrin aldehyde	µg/L								<0.5	<0.5
Endosulfan sulfate	µg/L								<0.5	<0.5
4.4`-DDT	µg/L	0.006		0.06	30	0.1			<2	<2
Endrin ketone	µg/L								<0.5	<0.5
Methoxychlor	µg/L								<2	<2
Organophosphorus Pesticides (OP)										
Dichlorvos	µg/L								<0.5	<0.5
Demeton-S-methyl	µg/L								<0.5	<0.5
Monocrotophos	µg/L								<2	<2
Dimethoate	µg/L	0.15			50	50			<0.5	<0.5
Diazinon	µg/L	0.01		1	3	1			<0.5	<0.5
Chlorpyrifos-methyl	µg/L	0.01	0.009		10	100			<0.5	<0.5
Parathion-methyl	µg/L								<2	<2
Malathion	µg/L	0.05							<0.5	<0.5
Fenthion	µg/L								<0.5	<0.5
Chlorpyrifos	µg/L	0.01	0.009						<0.5	<0.5
Parathion	µg/L	0.004			10	10			<2	<2
Pirimphos-ethyl	µg/L								<0.5	<0.5
Chlorfenvinphos	µg/L								<0.5	<0.5
Bromophos-ethyl	µg/L								<0.5	<0.5
Fenamiphos	µg/L								<0.5	<0.5
Prothiofos	µg/L								<0.5	<0.5
Ethion	µg/L								<0.5	<0.5
Carbophenothion	µg/L								<0.5	<0.5
Azinphos Methyl	µg/L	0.02							<0.5	<0.5
Monocyclic Aromatic Hydrocarbons										
Benzene	µg/L	0.95	0.5	0.001		0.01			-	-
Toluene	µg/L			0.80	0.025	0.025			-	-
Ethylbenzene	µg/L			0.30	0.003	0.003			-	-
meta- & para-Xylene	µg/L	200							-	-
Styrene	µg/L			0.03	0.004	0.004			<5	<5
ortho-Xylene	µg/L	350							-	-
Isopropylbenzene	µg/L								<5	<5
n-Propylbenzene	µg/L								<5	<5
1.3.5-Trimethylbenzene	µg/L								<5	<5
sec-Butylbenzene	µg/L								<5	<5
1.2.4-Trimethylbenzene	µg/L								<5	<5
tert-Butylbenzene	µg/L								<5	<5
p-Isopropyltoluene	µg/L								<5	<5
n-Butylbenzene	µg/L								<5	<5
Oxygenated Compounds										
Vinyl Acetate	µg/L								<50	<50
2-Butanone (MEK)	µg/L								<50	<50
4-Methyl-2-pentanone (MIBK)	µg/L								<50	<50
2-Hexanone (MBK)	µg/L								<50	<50

Sulfonated Compounds										
Carbon disulfide	µg/L								<5	<5
Fumigants										
2.2-Dichloropropane	µg/L								<5	<5
1.2-Dichloropropane	µg/L								<5	<5
cis-1.3-Dichloropropylene	µg/L								<5	<5
trans-1.3-Dichloropropylene	µg/L								<5	<5
1.2-Dibromoethane (EDB)	µg/L								<5	<5
Halogenated Aliphatic Compounds										
Dichlorodifluoromethane	µg/L								<50	<50
Chloromethane	µg/L								<50	<50
Vinyl chloride	µg/L			0.0003		0.003			<50	<50
Bromomethane	µg/L								<50	<50
Chloroethane	µg/L								<50	<50
Trichlorofluoromethane	µg/L								<50	<50
1.1-Dichloroethene	µg/L			0.03		0.3			<5	<5
Iodomethane	µg/L								<5	<5
trans-1.2-Dichloroethene	µg/L								<5	<5
1.1-Dichloroethane	µg/L								<5	<5
cis-1.2-Dichloroethene	µg/L								<5	<5
1.1.1-Trichloroethane	µg/L								<5	<5
1.1-Dichloropropylene	µg/L								<5	<5
Carbon Tetrachloride	µg/L								<5	<5
1.2-Dichloroethane	µg/L			0.003		0.03			<5	<5
Trichloroethene	µg/L								<5	<5
Dibromomethane	µg/L								<5	<5
1.1.2-Trichloroethane	µg/L	6500	1900						<5	<5
1.3-Dichloropropane	µg/L								<5	<5
Tetrachloroethene	µg/L			0.05		0.5			<5	<5
1.1.1.2-Tetrachloroethane	µg/L								<5	<5
trans-1.4-Dichloro-2-butene	µg/L								<5	<5
cis-1.4-Dichloro-2-butene	µg/L								<5	<5
1.1.2.2-Tetrachloroethane	µg/L								<5	<5
1.2.3-Trichloropropane	µg/L								<5	<5
Pentachloroethane	µg/L								<5	<5
1.2-Dibromo-3-chloropropane	µg/L								<5	<5
Hexachlorobutadiene	µg/L								<5	<5
Halogenated Aromatic Compounds										
Chlorobenzene	µg/L			0.30	0.01	0.01			<5	<5
Bromobenzene	µg/L								<5	<5
2-Chlorotoluene	µg/L								<5	<5
4-Chlorotoluene	µg/L								<5	<5
1.3-Dichlorobenzene	µg/L	0.26			0.02	0.02			<5	<5
1.4-Dichlorobenzene	µg/L	0.06		0.04	0.003	0.003			<5	<5
1.2-Dichlorobenzene	µg/L	0.16		1.5	0.001	0.001			<5	<5
1.2.4-Trichlorobenzene	µg/L	0.085	80	0.03	0.005	0.005			<5	<5
1.2.3-Trichlorobenzene	µg/L	0.003		0.03	0.005	0.005			<5	<5
Trihalomethanes										
Chloroform	µg/L								<5	<5
Bromodichloromethane	µg/L								<5	<5
Dibromochloromethane	µg/L								<5	<5
Bromoform	µg/L								<5	<5
Phenolic Compounds										
Phenol	µg/L	320	400						<1.0	<1.0
2-Chlorophenol	µg/L	340		300	0.1	3000			<1.0	<1.0
2-Methylphenol	µg/L								<1.0	<1.0
3- & 4-Methylphenol	µg/L								<2.0	<2.0
2-Nitrophenol	µg/L								<1.0	<1.0
2.4-Dimethylphenol	µg/L								<1.0	<1.0
2.4-Dichlorophenol	µg/L	120		200	0.3	2000			<1.0	<1.0
2.6-Dichlorophenol	µg/L								<1.0	<1.0
4-Chloro-3-Methylphenol	µg/L								<1.0	<1.0
2.4.6-Trichlorophenol	µg/L	3		20	2	200			<1.0	<1.0
2.4.5-Trichlorophenol	µg/L								<1.0	<1.0
Pentachlorophenol	µg/L	3.6	11						<2.0	<2.0
Polynuclear Aromatic Hydrocarbons										
Naphthalene	µg/L	16	50						<1.0	<1.0
Acenaphthylene	µg/L								<1.0	<1.0
Acenaphthene	µg/L								<1.0	<1.0
Fluorene	µg/L								<1.0	<1.0
Phenanthrene	µg/L								<1.0	<1.0
Anthracene	µg/L								<1.0	<1.0
Fluoranthene	µg/L								<1.0	<1.0
Pyrene	µg/L								<1.0	<1.0
Benz(a)anthracene	µg/L								<1.0	<1.0
Chrysene	µg/L								<1.0	<1.0
Benzo(b)fluoranthene	µg/L								<1.0	<1.0
Benzo(k)fluoranthene	µg/L								<1.0	<1.0
Benzo(a)pyrene	µg/L			0.01		0.1			<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L								<1.0	<1.0
Dibenz(a.h)anthracene	µg/L								<1.0	<1.0
Benzo(g.h.i)perylene	µg/L								<1.0	<1.0
Total Petroleum Hydrocarbons										
C6 - C9 Fraction	µg/L								<20	<20
C10 - C14 Fraction	µg/L								<50	<50
C15 - C28 Fraction	µg/L								<100	<100
C29 - C36 Fraction	µg/L								<50	<50
C10 - C36 Fraction (sum)	µg/L	600 [4]							<50	<50

8 RESULTS

Field results and laboratory analysis of groundwater samples undertaken onsite are presented in Table 3. To assess the background groundwater quality at the Site, water quality results were compared against the criteria outlined within the DEC's *Contaminated Site Management Series - Assessment Levels for Soil, Sediment and Water* (DEC, 2010). Laboratory results were compared against the following criteria;

- Freshwater Ecosystem Trigger Values, Marine Ecosystem Trigger Values, Short-term Irrigation Water and the Long-term Irrigation Water from the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* prepared by the Australian and New Zealand Environment and Conservation Council (ANZECC, 2000);
- Drinking Water Health Value and Drinking Water Aesthetic Value from the *Australian Drinking Water Guidelines* (NHMRC & ARMCANZ, 2004); and,
- Domestic Non-potable Groundwater Use from the Department of Health's (DoH) Contaminated Sites Reporting Guideline for Chemicals in Groundwater (DoH, 2006).

The following notes are the summaries of laboratory results and the comparison to assessment criteria.

Total Petroleum Hydrocarbons (TPH)
Laboratory results indicate the presence of TPH with in WRMW3 and WRMW6 however are below assessment criteria.

Monocyclic Aromatic Hydrocarbons (MAH)
MAHs were not detected in any of the samples analysed.

Polycyclic Aromatic Hydrocarbons
PAHs were not detected in any of the samples analysed.

Phenols
Laboratory results indicate the presence of 3-&4-Methylphenol within WRMW2 all other samples were below laboratory detection limits.

Metals
The following metals exceedances were detected:

- Aluminium exceeded the following assessment criteria at the associated locations;
  - WRMW3 exceeded all assessment criteria;
  - WRMW1, WRMW2 and WRMW5 exceeded all assessment criteria excluding the Short-term Irrigation levels;
  - WRMW4 exceeded the Domestic Non-potable groundwater use and Drinking Water Aesthetic Values; and
  - WWRMW6 exceeded Drinking Water Aesthetic Values,
- Copper exceeded the Fresh and Marine waters criteria for all locations,

- Lead exceeded Drinking Water Aesthetic Values, Fresh and Marine waters criteria at WRMW3,
- Manganese exceeded Fresh waters and Drinking Water Aesthetic values criteria at WRMW3,
- Zinc exceeded the following assessment criteria at the following location;
  - Fresh and Marine waters criteria was exceeded at WRMW2, WRMW3 and WRMW4,
  - Fresh waters criteria was exceeded at WRMW5 and WRMW6,
- Iron exceeded assessment criteria at the following locations for the associated locations;
  - WRMW3 and WRMW6 exceeded all assessment criteria,
  - Drinking Water Aesthetic Values, Lon-term Irrigation, Fresh and Marine waters criteria was exceeded at WRMW4 and WRMW5,
  - WRMW2 exceeds all assessment criteria with the exception of Short-term Irrigation criteria,
  - WRMW1 exceeds Short-term irrigation criteria,
- Mercury exceeds Fresh waters criteria at WRMW1 and WRMW2

OC Pesticides
OC pesticides were below laboratory assessment criteria for all laboratory samples.

OP Pesticides
OP pesticides were not detected in any of the samples analysed. It is noted that the primary laboratory detection limits were not low enough to detect methyl parathion at DNPGW trigger values.

Major Anions and Cations
No exceedances were identified.

Nutrients
Ammonia (NH_3-N) exceeded Fresh and Marine water criteria for WRMW6.
Total Nitrogen exceeded Fresh water s assessment criteria for WRMW1, WRMW2, WRMW4 and WRMW6.
Total Phosphorus exceeded Fresh waters criteria at WRMW2 and WRMW3.
WRMW1 exceeded Fresh waters criteria for Sulphide.

Table 3 Groundwater Laboratory Analysis Results

Analyte grouping/Analyte	Units	ANZECC & ARMCANZ (2000)[1]		ADWG (2004)[2]		DOH (2006)[3]	ANZECC & ARMCANZ (2000)[1]		18/05/2012	18/05/2012	18/05/2012	18/05/2012	18/05/2012	18/05/2012
		Fresh Waters[4]	Marine Waters[4]	Drinking Water Health Value (HV)	Drinking Water Aesthetic Value (AV)	Domestic non-potable groundwater use	Short-term Irrigation Water	Long-term Irrigation Water[5]	WRMW1	WRMW2	WRMW3	WRMW4	WRMW5	WRMW6
pH Value	pH Unit	6.5-8.5	8.0-8.4		6.5-8.5			6.0-8.5	6.58	6.14	7.41	6.04	5.86	5.83
Electrical Conductivity	µS/cm								635	307	1070	354	449	808
Total Dissolved Solids	mg/L								434	244	704	226	341	492
Suspended Solids	mg/L								582	292	425	144	59	50
Turbidity	NTU								166	236	383	86.9	137	76.6
Total Alkalinity $CaCO_3$	mg/L								43	17	292	5	5	38
Acidity as $CaCO_3$	mg/L								15	26	16	8	13	22
Sulfate as SO_4^{2-}	mg/L			500	250	5000			105	13	40	17	19	173
Chloride	mg/L				250	2500			134	80	216	89	132	124
Total Metals														
Aluminium	mg/L	0.055			0.2	2	20	5	11.1	16.2	34.4	4.3	10	0.74
Arsenic	mg/L	0.013		0.01		0.07	2	0.1	<0.001	<0.001	0.01	0.001	0.001	<0.001
Cadmium	mg/L	0.0002	0.0007	0.002		0.02	0.05	0.01	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001
Chromium	mg/L						1	0.1	0.007	0.016	0.047	0.004	0.005	<0.001
Copper	mg/L	0.0014	0.0013	2	1	20	5	0.2	0.004	0.07	0.032	0.005	0.005	0.002
Lead	mg/L	0.0034	0.0044	0.01		0.1	5	2	0.013	0.017	0.087	0.011	0.015	0.007
Manganese	mg/L	1.9		0.5	0.1	5	10	0.2	0.006	0.026	0.191	0.016	0.01	0.034
Molybdenum	mg/L			0.05		0.5	0.05	0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	mg/L	0.011	0.02	0.02		0.2	2	0.2	0.002	0.005	0.014	0.001	0.003	0.002
Selenium	mg/L	0.005		0.01		0.1	0.05	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Silver	mg/L	0.00005	0.0014	0.1		1			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	mg/L	0.008	0.015		3	30	5	2	0.008	0.08	0.068	0.017	0.011	0.012
Iron	mg/L	0.3	1.0 / 0.35		0.33	3	10	0.2	0.29	4.82	11.9	0.88	0.49	10.4
Mercury	mg/L	0.00006	0.0001	0.001		0.01	0.002	0.002	0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nutrients														
Ammonia as N	mg/L	0.9	0.91						0.06	0.36	0.03	0.11	0.01	1.64
Nitrite as N	mg/L			3.0		30			0.03	0.02	<0.01	0.01	0.04	0.05
Nitrate as N	mg/L			50		500			5.15	0.62	0.17	3.75	0.45	0.17
Kjeldhal Nitrogen	mg/L								0.5	0.5	0.3	0.5	0.1	1.6
Total Nitrogen	mg/L	1.0 / 2.0[1]							5.7	1.1	0.5	4.3	0.6	1.8
Total Phosphorus	mg/L	0.1 / 0.2[1]							0.01	0.15	0.24	0.04	0.02	0.03
Reactive Phosphorus	mg/L								<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Sulfide	mg/L	0.001							0.1	<0.1	<0.1	<0.1	<0.1	<0.1
COD	mg/L								18	16	155	11	9	25
BOD	mg/L								<2	3	69	4	3	26
Organochlorine Pesticides (OC)														
alpha-BHC	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene (HCB)	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
beta-BHC	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
gamma-BHC	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
delta-BHC	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Heptachlor	µg/L	0.01							<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Aldrin	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Heptachlor epoxide	µg/L			0.05	0.3	3			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
trans-Chlordane	µg/L	0.03 [2]		0.01	1	10			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
alpha-Endosulfan	µg/L	0.03 [3]	0.005 [3]	0.05	30	30			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
cis-Chlordane	µg/L	0.03 [2]		0.01	1	10			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dieldrin	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDE	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Endrin	µg/L	0.01	0.004						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
beta-Endosulfan	µg/L	0.03 [3]	0.005 [3]						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDD	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Endrin aldehyde	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Endosulfan sulfate	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDT	µg/L	0.006		0.06	30	0.1			<2	<2	<2	<2	<2	<2
Endrin ketone	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Methoxychlor	µg/L								<2	<2	<2	<2	<2	<2
Aldrin plus dieldrin	µg/L			0.010	0.3	3			<1	<1	<1	<1	<1	<1
Organophosphorus Pesticides (OP)														
Dichlorvos	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Demeton-S-methyl	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Monocrotophos	µg/L								<2	<2	<2	<2	<2	<2
Dimethoate	µg/L	0.15			50	50			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Diazinon	µg/L	0.01		1	3	1			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos-methyl	µg/L	0.01	0.009		10	100			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Parathion-methyl	µg/L								<2	<2	<2	<2	<2	<2
Malathion	µg/L	0.05							<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fenthion	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos	µg/L	0.01	0.009						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Parathion	µg/L	0.004			10	10			<2	<2	<2	<2	<2	<2
Pirimphos-ethyl	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorfenvinphos	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromophos-ethyl	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fenamiphos	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Prothiofos	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethion	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Carbophenothion	µg/L								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Azinphos Methyl	µg/L	0.02							<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Monocyclic Aromatic Hydrocarbons														
Benzene	µg/L	0.95	0.5	0.001		0.01			-	-	-	-	-	-
Toluene	µg/L			0.80	0.025	0.025			-	-	-	-	-	-
Ethylbenzene	µg/L			0.30	0.003	0.003			-	-	-	-	-	-
meta- & para-Xylene	µg/L	200							-	-	-	-	-	-
Styrene	µg/L			0.03	0.004	0.004			<5	<5	<5	<5	<5	<5
ortho-Xylene	µg/L	350							-	-	-	-	-	-
Isopropylbenzene	µg/L								<5	<5	<5	<5	<5	<5
n-Propylbenzene	µg/L								<5	<5	<5	<5	<5	<5
1.3.5-Trimethylbenzene	µg/L								<5	<5	<5	<5	<5	<5
sec-Butylbenzene	µg/L								<5	<5	<5	<5	<5	<5
1.2.4-Trimethylbenzene	µg/L								<5	<5	<5	<5	<5	<5
tert-Butylbenzene	µg/L								<5	<5	<5	<5	<5	<5
p-Isopropyltoluene	µg/L								<5	<5	<5	<5	<5	<5
n-Butylbenzene	µg/L								<5	<5	<5	<5	<5	<5
Oxygenated Compounds														
Vinyl Acetate	µg/L								<50	<50	<50	<50	<50	<50
2-Butanone (MEK)	µg/L								<50	<50	<50	<50	<50	<50
4-Methyl-2-pentanone (MIBK)	µg/L								<50	<50	<50	<50	<50	<50
2-Hexanone (MBK)	µg/L								<50	<50	<50	<50	<50	<50

Sulfonated Compounds														
Carbon disulfide	µg/L								<5	<5	<5	<5	<5	<5
Fumigants														
2.2-Dichloropropane	µg/L								<5	<5	<5	<5	<5	<5
1.2-Dichloropropane	µg/L								<5	<5	<5	<5	<5	<5
cis-1.3-Dichloropropylene	µg/L								<5	<5	<5	<5	<5	<5
trans-1.3-Dichloropropylene	µg/L								<5	<5	<5	<5	<5	<5
1.2-Dibromoethane (EDB)	µg/L								<5	<5	<5	<5	<5	<5
Halogenated Aliphatic Compounds														
Dichlorodifluoromethane	µg/L								<50	<50	<50	<50	<50	<50
Chloromethane	µg/L								<50	<50	<50	<50	<50	<50
Vinyl chloride	µg/L			0.0003		0.003			<50	<50	<50	<50	<50	<50
Bromomethane	µg/L								<50	<50	<50	<50	<50	<50
Chloroethane	µg/L								<50	<50	<50	<50	<50	<50
Trichlorofluoromethane	µg/L								<50	<50	<50	<50	<50	<50
1.1-Dichloroethene	µg/L			0.03		0.3			<5	<5	<5	<5	<5	<5
Iodomethane	µg/L								<5	<5	<5	<5	<5	<5
trans-1.2-Dichloroethene	µg/L								<5	<5	<5	<5	<5	<5
1.1-Dichloroethane	µg/L								<5	<5	<5	<5	<5	<5
cis-1.2-Dichloroethene	µg/L								<5	<5	<5	<5	<5	<5
1.1.1-Trichloroethane	µg/L								<5	<5	<5	<5	<5	<5
1.1-Dichloropropylene	µg/L								<5	<5	<5	<5	<5	<5
Carbon Tetrachloride	µg/L								<5	<5	<5	<5	<5	<5
1.2-Dichloroethane	µg/L			0.003		0.03			<5	<5	<5	<5	<5	<5
Trichloroethene	µg/L								<5	<5	<5	<5	<5	<5
Dibromomethane	µg/L								<5	<5	<5	<5	<5	<5
1.1.2-Trichloroethane	µg/L	6500	1900						<5	<5	<5	<5	<5	<5
1.3-Dichloropropane	µg/L								<5	<5	<5	<5	<5	<5
Tetrachloroethene	µg/L			0.05		0.5			<5	<5	<5	<5	<5	<5
1.1.1.2-Tetrachloroethane	µg/L								<5	<5	<5	<5	<5	<5
trans-1.4-Dichloro-2-butene	µg/L								<5	<5	<5	<5	<5	<5
cis-1.4-Dichloro-2-butene	µg/L								<5	<5	<5	<5	<5	<5
1.1.2.2-Tetrachloroethane	µg/L								<5	<5	<5	<5	<5	<5
1.2.3-Trichloropropane	µg/L								<5	<5	<5	<5	<5	<5
Pentachloroethane	µg/L								<5	<5	<5	<5	<5	<5
1.2-Dibromo-3-chloropropane	µg/L								<5	<5	<5	<5	<5	<5
Hexachlorobutadiene	µg/L								<5	<5	<5	<5	<5	<5
Halogenated Aromatic Compounds														
Chlorobenzene	µg/L			0.30	0.01	0.01			<5	<5	<5	<5	<5	<5
Bromobenzene	µg/L								<5	<5	<5	<5	<5	<5
2-Chlorotoluene	µg/L								<5	<5	<5	<5	<5	<5
4-Chlorotoluene	µg/L								<5	<5	<5	<5	<5	<5
1.3-Dichlorobenzene	µg/L	0.26			0.02	0.02			<5	<5	<5	<5	<5	<5
1.4-Dichlorobenzene	µg/L	0.06		0.04	0.003	0.003			<5	<5	<5	<5	<5	<5
1.2-Dichlorobenzene	µg/L	0.16		1.5	0.001	0.001			<5	<5	<5	<5	<5	<5
1.2.4-Trichlorobenzene	µg/L	0.085	80	0.03	0.005	0.005			<5	<5	<5	<5	<5	<5
1.2.3-Trichlorobenzene	µg/L	0.003		0.03	0.005	0.005			<5	<5	<5	<5	<5	<5
Trihalomethanes														
Chloroform	µg/L								<5	<5	<5	<5	<5	<5
Bromodichloromethane	µg/L								<5	<5	<5	<5	5	<5
Dibromochloromethane	µg/L								<5	<5	<5	**12**	**20**	<5
Bromoform	µg/L								<5	<5	<5	**13**	**22**	<5
Phenolic Compounds														
Phenol	µg/L	320	400						<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chlorophenol	µg/L	340		300	0.1	3000			<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Methylphenol	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
3- & 4-Methylphenol	µg/L								<2.0	**2.6**	<2.0	<2.0	<2.0	<2.0
2-Nitrophenol	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2.4-Dimethylphenol	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2.4-Dichlorophenol	µg/L	120		200	0.3	2000			<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2.6-Dichlorophenol	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
4-Chloro-3-Methylphenol	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2.4.6-Trichlorophenol	µg/L	3		20	2	200			<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2.4.5-Trichlorophenol	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Pentachlorophenol	µg/L	3.6	11						<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Polynuclear Aromatic Hydrocarbons														
Naphthalene	µg/L	16	50						<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthylene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Fluorene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Phenanthrene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Anthracene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Fluoranthene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Pyrene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benz(a)anthracene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chrysene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(b)fluoranthene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(k)fluoranthene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(a)pyrene	µg/L			0.01		0.1			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	µg/L								<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total Petroleum Hydrocarbons														
C6 - C9 Fraction	µg/L								<20	<20	<20	<20	<20	<20
C10 - C14 Fraction	µg/L								<50	<50	<50	<50	<50	<50
C15 - C28 Fraction	µg/L								<100	<100	<100	<100	<100	**260**
C29 - C36 Fraction	µg/L								<50	<50	**270**	<50	<50	**60**
C10 - C36 Fraction (sum)	µg/L	600 [4]							<50	<50	**270**	<50	<50	**320**

8.1 Groundwater Levels

The depth to groundwater was measured on 18th May 2012. An interface meter was used to verify the presence / absence of free phase hydrocarbon products over the groundwater: no free phase products were detected. Groundwater is intercepted between 19 RL mAHD (Relative level metres Australian Height Datum) and 24 RL mAHD detailed groundwater depths are displayed in Table 4.

Plotting the water table values enable determination of groundwater direction. Figure 3 identifies a groundwater flux towards the northwest, with a hydraulic gradient covering the Site of between 0.009 and 0.015.

Table 4 Groundwater Measurements

Groundwater Well ID	Date	Depth to Water mbgl	Top of Casing RL	Groundwater RL
MW1	18/05/2012	3.700	27.281	23.581
MW2	18/05/2012	7.666	30.607	22.941
MW3	18/05/2012	11.846	34.622	22.776
MW4	18/05/2012	8.509	27.751	19.242
MW5	18/05/2012	8.836	29.034	20.198
MW6	18/05/2012	8.759	31.611	22.852

Figure 3 Groundwater Contours

MDW ENVIRONMENTAL SERVICES

0 20 40 60 80m
SCALE 1:4000
ORIGINAL PLAN SIZE: A4

DATE: 16.07.2012

22 ELMSFIELD ROAD, MIDVALE WA 6056
PH: (08) 9250 6960 FAX: (08) 9250 8269
www.environmentalservices.com.au

LEGEND:

MW1 - BORE LOCATIONS

NORTH

DEPTH OF GROUNDWATER AND DIRECTION FLOW

LOT 20 ADELAIDE STREET
HAZELMERE

9 DISCUSSION

Standing water level measurements recorded by MDWES during May 2012 sampling indicate that groundwater is encountered at between 3.7 – 11.8 mbgl (RL 19.2 m – 23.58 m AHD) beneath the Site. Based upon current redevelopment plans, groundwater will not be intercepted during the proposed remediation work.

Field results indicate that the groundwater beneath the site is fresh and mildly acidic with pH ranging from 5.83 to 7.41. This is an acceptable range of pH for groundwater within this locality.

Contamination of the groundwater from material previously deposited on the Site appears to be minimal. With the exception of metalloids, low levels of TPH in WRMW3 and WRMW6, and the presence of 3-&4-Methylphenol within WRMW2 all other PCOC were below laboratory detection limits.

Metalloid results could be considered higher than expected for background waters within this locality, however, moderate levels of suspended solids within all samples could have contributed to artificially increasing the results. It is further suspected that if dissolved metal concentrations were requested, these would be significantly lower than the total metal results and more indicative of the quality of water that would be abstracted for use for dust suppression and compaction

Although nutrient levels were slightly elevated above ANZECC criteria, surface waters are not located in the immediate vicinity of the site and downstream receptors are likely to be more significantly impacted upon by land uses to the north of the site including rendering facilities.

MDWES are of the opinion that the contamination of the groundwater from material previously deposited on the Site is minimal and the site does not appear to be a source site for contamination external to the site boundaries. Groundwater flux appears to be in a northwest direction and if the properties to the north of the site are to be included in the redevelopment proposal for this site, it is recommended that additional groundwater investigations are completed on these properties.

It is also recommended that field monitoring of groundwater wells be completed on a monthly basis and laboratory analysis be completed on a quarterly basis until the remediation commence to gather additional groundwater data prior to the inert wastes being disturbed during remediation earthmoving activities.

10 REFERENCES

ANZECC (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.* Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ).

DEC (2010) *Contaminated Site Management Series - Assessment Levels for Soil, Sediment and Water*. Contaminated Sites Branch, Department of Environment and Conservation.

DEC 2009. Department of Environment and Conservation, Contaminated Sites Management Series - Site classification scheme.

DEC 2006a. Department of Environment and Conservation: Contaminated Sites Management Series – The Use of Risk Assessment in Contaminated Site Assessment Management.

DEC 2006b. Department of Environment and Conservation: Contaminated Sites Management Series – Community Consultation Guideline

DEC 2010. Department of Environment and Conservation: Assessment Levels for Soil, Sediment, and Water, Feb 2010

DEP 2004. Department of Environmental Protection, Contaminated Sites Management Series - Potentially contaminating activities, Industries and land uses
DoH 2006. Department of Health Domestic non-potable groundwater use.

DEP 2001. Department of Environmental Protection, Contaminated Sites Management Series - Reporting of site assessments.

Standards Australia/Standards New Zealand. 1998. AS/NZS 5667.1:1998. Water Quality – Sampling. Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of sample. Standards Australia and Standards New Zealand, Homebush NSW and Wellington NZ.

11 APPENDICES

Appendix A Certificate of Title

REGISTER NUMBER	
20/D76128	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
3	13/6/2008

WESTERN AUSTRALIA

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

VOLUME 2054 FOLIO 299

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

REGISTRAR OF TITLES

LAND DESCRIPTION:

LOT 20 ON DIAGRAM 76128

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

HAZELLAND PTY LTD OF SUITE 5, 17 FOLEY STREET, BALCATTA
(TP K606822) REGISTERED 26 MAY 2008

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

1. *K606823 NOTIFICATION CONTAINS FACTORS AFFECTING THE WITHIN LAND. LODGED 26.5.2008.
2. *L520703 MEMORIAL. CONTAMINATED SITES ACT 2003 (CONTAMINATED SITE - REMEDIATION REQUIRED) REGISTERED 30.12.2010.

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

--END OF CERTIFICATE OF TITLE--

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND:	2054-299 (20/D76128).
PREVIOUS TITLE:	1697-970, 1103-577.
PROPERTY STREET ADDRESS:	LOT 20 ADELAIDE ST, HAZELMERE.
LOCAL GOVERNMENT AREA:	CITY OF SWAN.

LT. 37

ORIGINAL—NOT TO BE REMOVED FROM OFFICE OF TITLES

Application G704

Volume Folio
1103 577
1697 970

WESTERN AUSTRALIA

REGISTER BOOK
VOL. FOL.
CT 2054 299

CERTIFICATE OF TITLE

UNDER THE "TRANSFER OF LAND ACT, 1893" AS AMENDED

I certify that the person described in the First Schedule hereto is the registered proprietor of the undermentioned estate in the undermentioned land subject to the easements and encumbrances shown in the Second Schedule hereto.

Dated 9th October, 1995

G Sach
REGISTRAR OF TITLES

ESTATE AND LAND REFERRED TO

Estate in fee simple in portion of Helena Location 20a and being Lot 20 the subject of Diagram 76128, delineated on the map in the Third Schedule hereto.

FIRST SCHEDULE (continued overleaf)

~~Envirosclean Waste Services Pty Ltd of Post Office Box 347 Victoria Park.~~

SECOND SCHEDULE (continued overleaf)

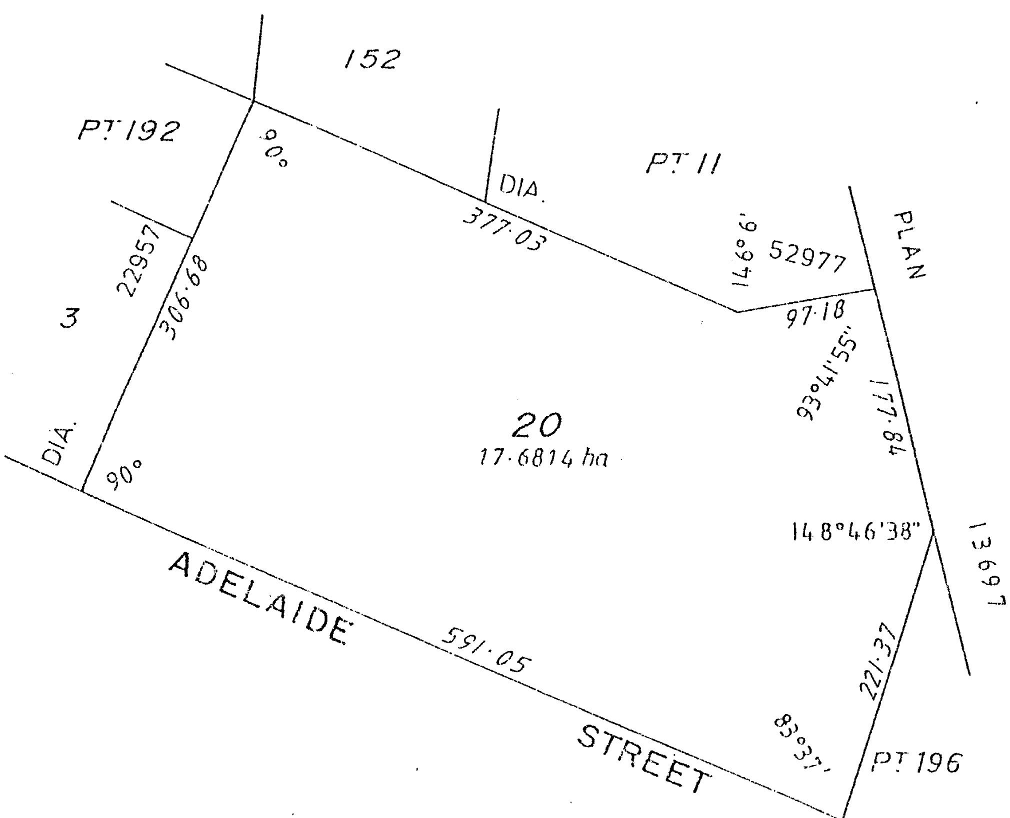
~~1. MORTGAGE E223538 to Commonwealth Bank of Australia. Registered 31.10.89 at 10.02 hrs.~~
Discharged G108671 23.2.96

~~As to portion only:~~
~~2. CAVEAT E674833 Lodged 9.8.91 at 11.27 hrs.~~
Withdrawn G108674 23.2.96

~~As to portion only:~~
~~3. MEMORIAL E730989 of Section 46 Land Tax Assessment Act 1976. Registered 25.10.91 at 9.15 hrs.~~
Withdrawn G108673 23.2.96

~~4. CAVEAT F544516 Lodged 10.5.94 at 12.12 hrs.~~
Withdrawn G108672 23.2.96

THIRD SCHEDULE



SCALE 1:5000

NOTE: ENTRIES MAY BE AFFECTED BY SUBSEQUENT ENDORSEMENTS.

PERSONS ARE CAUTIONED AGAINST ALTERING OR ADDING TO THIS CERTIFICATE OR ANY NOTIFICATION HEREON

 LT. 37

FIRST SCHEDULE (continued) NOTE: ENTRIES MAY BE AFFECTED BY SUBSEQUENT ENDORSEMENTS

REGISTERED PROPRIETOR	INSTRUMENT NATURE	INSTRUMENT NUMBER	REGISTERED	TIME	SEAL	CERT. OFFICER
Westgroup Pty Ltd of 665 Welshpool Road, Wattle Grove.	Transfer	G108675	23.2.96	10.18		

SECOND SCHEDULE (continued) NOTE: ENTRIES MAY BE AFFECTED BY SUBSEQUENT ENDORSEMENTS

INSTRUMENT NATURE	INSTRUMENT NUMBER	PARTICULARS	REGISTERED	TIME	SEAL	CERT. OFFICER	CANCELLATION	NUMBER	REGISTERED OR LODGED	SEAL	CERT. OFFICER
Mortgage	G108676	to Cash Resources Australia Pty Ltd	23.2.96	10.18			Discharged	G708165	9.2.98		
Mortgage	G108677	to Cash Resources Australia Pty Ltd	23.2.96	10.18			Discharged	G708165	9.2.98		
Caveat	G108552	Lodged 23.2.96 at 10.18 hrs.					Withdrawn	G708164	9.2.98		
Mortgage	G708166	to National Australia Bank Ltd.	9.2.98	9.16							
Caveat	G708167	Lodged 9.2.98 at 9.16 hrs.									
Memorial	G806391	Land tax Assessment Act 1976. Lodged 29.5.98 at 15.00 hrs.					Withdrawn	H178898	27.7.99		
Memorial	H663104	Land Tax Assessment Act 1976. Lodged 7.2.01 at 10.35 hrs.									

CERTIFICATE OF TITLE VOL. FOL.

Appendix B Drill Logs

0892564460

BANNISTER DRILLING & IRRIGATION

ABN 59 776 488 257

LITHOLOGY & CONSTRUCTION REPORT

DRILLER: Phillip DRILLER LICENCE NUMBER: 183

JOB LOCATION: Adelaide St Hazelmere

DATE COMMENCED: 7-5-12 DATE COMPLETED: 10-5-12

DRILLING METHOD: Mud AIR DEVELOPMENT: Yes (1hr) GRAVEL PACK: Yes

STRATA DESCRIPTION

FROM | TO |

Bore no 1.

0mts - 2 mts Yellow Sand

2mts - 4 mts Yellow Sand / Brown Clay

4mts - 6 mts Red Clay

Bore no. 2

0mts - 3mts Yellow Sand

3mts - 7mts Red Clay

7mts - 9.5mts Coarse Sand

Bore no. 3

0mts - 2.5 mts Yellow Sand

2.5mts - 7mts Brown Clay

7mts - 11mts Red Clay

11mts - 14.5mts Coarse Sand

18 DORNOCH WAY CANNINGVALE 6155 PH/FAX 92564460 MOB 0410 422 006

0892564460

BANNISTER DRILLING & IRRIGATION

ABN 59 776 488 257

LITHOLOGY & CONSTRUCTION REPORT

DRILLER: Philip DRILLER LICENCE NUMBER: 183

JOB LOCATION: Adelaide St Hazelmere

DATE COMMENCED: 7-5-12 DATE COMPLETED: 10-5-12

DRILLING METHOD: Mud AIR DEVELOPMENT: Yes (1hr) GRAVEL PACK: Yes

STRATA DESCRIPTION

FROM | TO |

Bore no. 4

0mts - 4mts Brown Clay

4mts - 5.5mts fine Sand

5.5mts - 7mts Coarse Sand

7mts - 10mts Red Clay

Bore no 5

0mts - 3mts Brown Clay

3mts - 4mts fine Sand

4mts - 6mts Coarse Sand

6mts - 11mts Red Clay

Bore no. 6

0mts - 2.5mts Brown Clay

2.5mts - 3.5mts fine Sand

3.5mts - 5mts Coarse Sand

5mts - 9mts Red Clay

18 DORNOCH WAY CANNINGVALE 6155 PH/FAX 92564460 MOB 0410 422 006

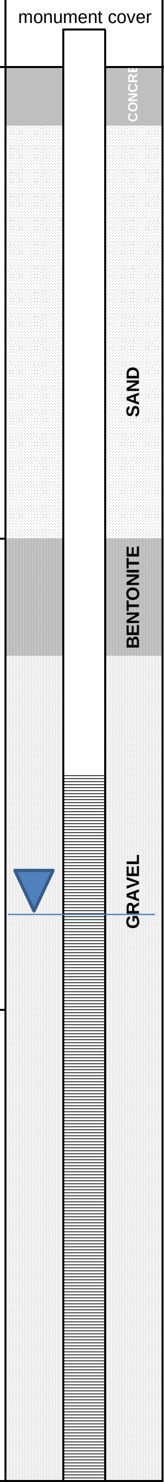
Appendix C Monitoring Well Construction Logs

Bore Completion Details: MW1

Lithology

Depth	Lithology
0 m	
1 m	Yellow Sand
2 m	
3 m	Yellow Sand/ Brown Clay
4 m	
5 m	Red Clay
6 m	End of Hole 6.0 m

Monitoring Bore



General Information

Standpipe - 0.45m

Date: 7/5/12 - 10/5/12

Driller: Bannister Drilling & Irrigation

Location: 20 Adelaide Street, Hazelmere

Depth to Water

Bore Completion Details: MW2

Lithology

0 m

Yellow Sand

2 m

4 m

Red Clay

6 m

8 m

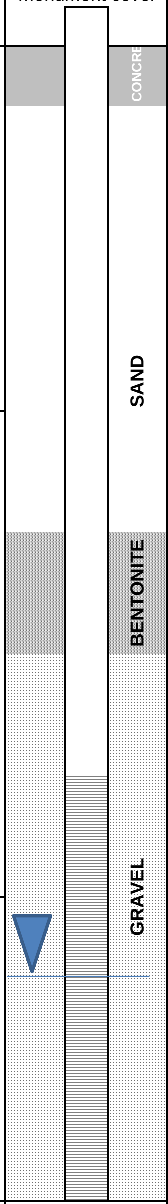
Coarse Sand

End of Hole 9.5 m

10 m

Monitoring Bore

monument cover



General Information

Standpipe - 0.68 m

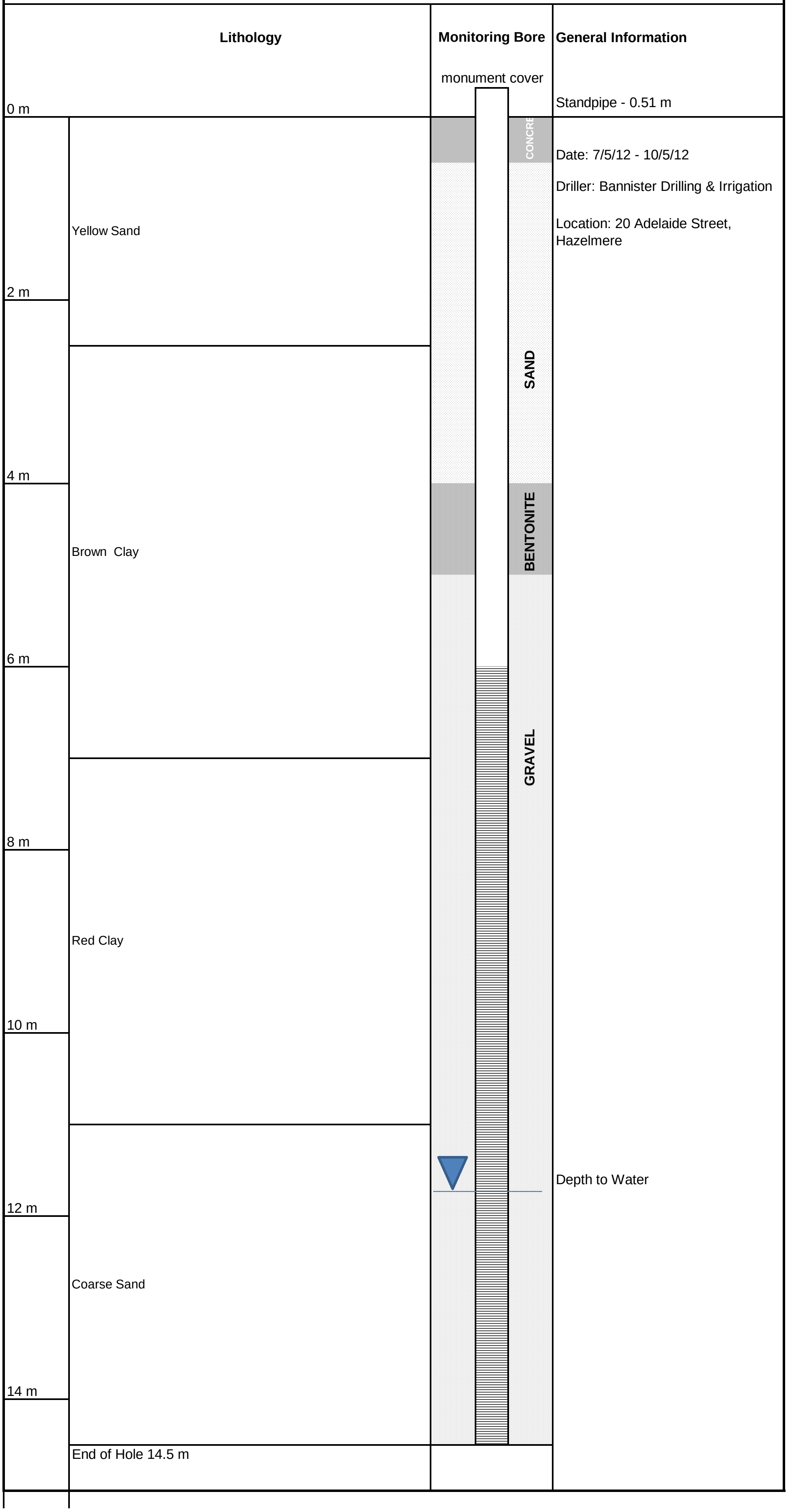
Date: 7/5/12 - 10/5/12

Driller: Bannister Drilling & Irrigation

Location: 20 Adelaide Street, Hazelmere

Depth to Water

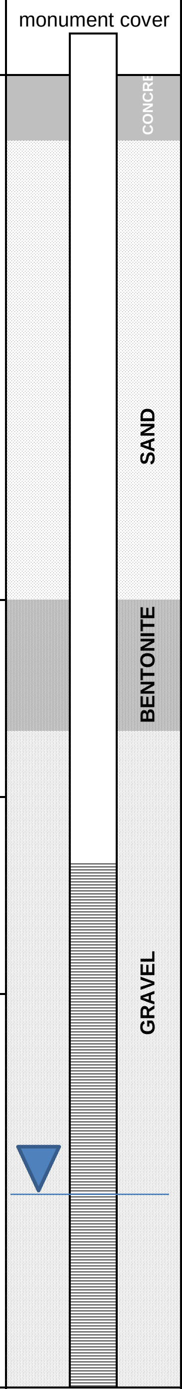
Bore Completion Details: MW3



Bore Completion Details: MW4

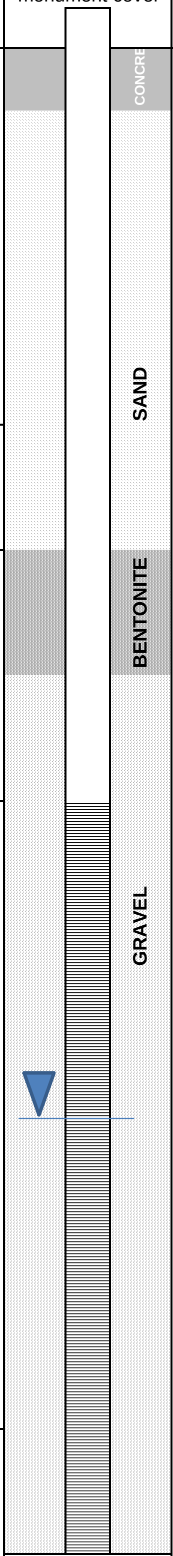
Depth	Lithology	General Information
0 m		Standpipe - 0.64 m
0 m – 4 m	Brown Clay	Date: 7/5/12 - 10/5/12 Driller: Bannister Drilling & Irrigation Location: 20 Adelaide Street, Hazelmere
4 m – 5.5 m	Fine Sand	
5.5 m – 7 m	Coarse Sand	
7 m – 10 m	Red Clay	Depth to Water
10 m	End of Hole 10.0 m	

Monitoring Bore



Bore Completion Details: MW5

Depth	Lithology	Monitoring Bore	General Information
0 m		monument cover	Standpipe -
	Brown Clay		Date: 7/5/12 - 10/5/12 Driller: Bannister Drilling & Irrigation Location: 20 Adelaide Street, Hazelmere
2 m			
	Fine Sand		
4 m			
	Coarse Sand		
6 m			
8 m			
	Red Clay		
10 m			
	End of Hole 11.0 m		
12 m			



Bore Completion Details: MW6

Lithology

0 m

Brown Clay

2 m

Fine Sand

4 m

Coarse Sand

6 m

Red Clay

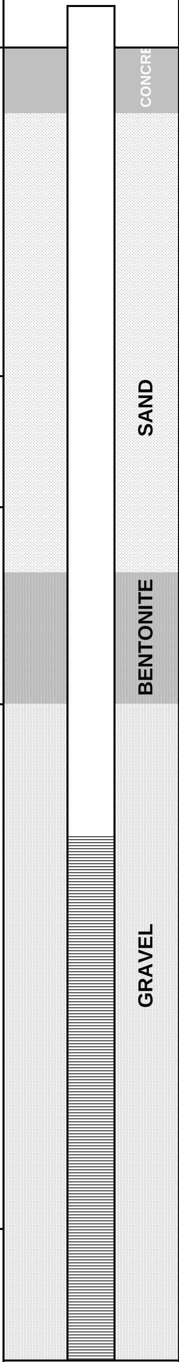
8 m

End of Hole 9.0 m

10 m

Monitoring Bore

monument cover



General Information

Standpipe - 0.65 m

Date: 7/5/12 - 10/5/12

Driller: Bannister Drilling & Irrigation

Location: 20 Adelaide Street, Hazelmere

Appendix D Field Sheets

MDW ENVIRONMENTAL SERVICES

Monitoring Well Field Record

Job #: E2012-031 Client: WASTEROCK Location: ADELAIDE ST

Well ID: MW1 Date: 18/5/12 Sampler: DA/FT

Monitoring Well Information

Depth to Water: 3700 (mm TOC) Depth to Bottom: 6.65 (m)

Standpipe: 0.45 (m) Monument Cover ☑

Lock: ☑ None ☐ Padlock (YL) ☐ Enviro Cap ☐ Gatic

Equipment IDs

Water Quality Meter: ECO YSI TTA Kit: Lab Kit

Pump: LOW FLOW TALK Kit: Lab Kit

Dipper: DIPPER-T

Sampling

Sample ID: WR MW1-001 COC No: E20

Time	pH	EC	DO	Temp	Redox	TTA	TALK
1130	5.64	805	3.78	23.6	110.2		
1135	5.53	775	0.72	23.6	128.6		
1140	5.37	749	0.46	23.5	157.6		
1145	5.36	748	0.49	23.5	159.5	0.6	0.06
1150							
1155							

Bottles

ASSESSMENT SUITE 2

x 1000mL plastic GREEN ☑	2 x 40mL vials MAROON ☑	1 x 500mL plastic GREEN** ☑
x 125mL plastic YELLOW ☑	1 x 500mL glass ORANGE ☑	**BRING BACK &FILTER INTO:
x 125mL plastic PURPLE ☑	2 x 500mL glass ORANGE per sample set (Lab Dups) ☒	1 x 60mL plastic MAROON ☑
x 60mL plastic BLUE ☑		1 x 60mL plastic RED/GREEN ☑
x 60mL plastic RED/GREEN ☑	1 x 500mL plastic GREEN ☑	

Comments

– SAMPLE TAKEN FOR MICRO + CYANIDE

MDW
ENVIRONMENTAL SERVICES

Monitoring Well Field Record

Job #: ______ Client: WASTE ROCK Location: ADELAIDE ST

Well ID: MW2 Date: 18/5/12 Sampler: DA|PT

Monitoring Well Information

Depth to Water: 7666 (mm TOC) Depth to Bottom: 10.443 (m)

Standpipe: 0.68 (m) Monument Cover ☑

Lock: ☑ None ☐ Padlock (YL) ☐ Enviro Cap ☐ Gatic

Equipment IDs

Water Quality Meter: ECO4SI TTA Kit: ______

Pump: LOW FLOW 2 TALK Kit: ______

Dipper: DIPPER-T

Sampling

Sample ID: WR MW2-001 COC No: ______

	Time	pH	EC	DO	Temp	Redox	TTA	TALK
0	1033	5.41	349.2	0.74	22.0	90.0		
5	1038	5.10	344.3	0.49	22.1	86.2		
10	1043	5.07	342.6	0.53	22.2	97.5		
15	1048	5.04	342.9	0.54	22.2	125.0		
	1053	5.03	346.6	0.53	22.0	129.5		
25	1058	5.02	347.4	0.56	22.0	136.0	0.6	0.14

Bottles — ASSESSMENT SUITE 2

1 x 1000mL plastic GREEN ☑	2 x 40mL vials MAROON ☑	1 x 500mL plastic GREEN** ☑
1 x 125mL plastic YELLOW ☑	1 x 500mL glass ORANGE ☑	**BRING BACK &FILTER INTO:
1 x 125mL plastic PURPLE ☑	2 x 500mL glass ORANGE per sample set (Lab Dups) ☒	1 x 60mL plastic MAROON ☑
1 x 60mL plastic BLUE ☑		1 x 60mL plastic RED/GREEN ☑
1 x 60mL plastic RED/GREEN ☑	1 x 500mL plastic GREEN ☑	

Comments

SAMPLE TAKEN FOR CYANIDE + MICRO.

~~#~~ STANDPIPE SUNK.

MDW
ENVIRONMENTAL SERVICES

Monitoring Well Field Record

Job #:______ Client: WASTE ROCK Location: ADELAIDE ST HIGH WYCOMBE

Well ID: MW3 Date: 18/5/12 Sampler: DA/FT

Monitoring Well Information			
Depth to Water:	11846 (mm TOC)	Depth to Bottom:	14.58 (m)
Standpipe:	.51 (m)	Monument Cover	☑
Lock: ☑ None	☐ Padlock (YL)	☐ Enviro Cap	☐ Gatic

Equipment IDs			
Water Quality Meter:	~~EA~~ ~~[illegible]~~ ECO YSI	TTA Kit:	
Pump:	LOW FLOW	TALK Kit:	
Dipper:	DIPPER -T		

Sampling

Sample ID: WR MW3-001 COC No:______

	Time	pH	EC	DO	Temp	Redox	TTA	TALK
0	908	6.58	1347	0.56	22.0	[illegible] -120.0	*	
5	913.	6.48	1373	0.73	22.0	-118.0		
10	918	6.46	1360	0.75	22.0	-110.8		
15.	923	6.48	1308	0.87	21.9	-102.4		
	928	6.44	1271	1.21	21.2	-93.8		
	~~931~~ 933	6.46	1274	2.15.	21.6	-80.2	0.62	0.03

Bottles — **ASSESSMENT SUITE 2**

1 x 1000mL plastic GREEN ☑	2 x 40mL vials MAROON ☑	1 x 500mL plastic GREEN** ☑
1 x 125mL plastic YELLOW ☑	1 x 500mL glass ORANGE ☑	**BRING BACK &FILTER INTO:
1 x 125mL plastic PURPLE ☑	2 x 500mL glass ORANGE per sample set (Lab Dups) ☒	1 x 60mL plastic MAROON ☑
1 x 60mL plastic BLUE ☑		1 x 60mL plastic RED/GREEN ☑
1 x 60mL plastic RED/GREEN ☑	1 x 500mL plastic GREEN ☑	

Comments

*SAMPLES TAKEN FOR CYANIDE & MICRO.

MDW

ENVIRONMENTAL SERVICES

Monitoring Well Field Record

Job #:________ Client: WASTE ROCK Location: ADELAIDE ST

Well ID: MW 4 Date: 18/5/12 Sampler: OA/FT

Monitoring Well Information

Depth to Water: 8509 (mm TOC) Depth to Bottom: 11.122 (m)

Standpipe: 0.64 (m) Monument Cover ☑

Lock: ☑ None ☐ Padlock (YL) ☐ Enviro Cap ☐ Gatic

Equipment IDs

Water Quality Meter: EL0431 TTA Kit: ________

Pump: LOW FLOW TALK Kit: ________

Dipper: DIPPER -T

Sampling

Sample ID: WR MW4 - 001 COC No: ________

Time	pH	EC	DO	Temp	Redox	TTA	TALK
0 12:20	4.95	405.4	3.22	22.7	200.1		
5 12:25	4.83	400.6	3.01	22.2	222.4		
10 12:30	4.80	398.5	3.10	22.2	229.4		
15 12:35.	4.78	388.9	3.21	22.2	232.9	0.28	0.08

Bottles — ASSESSMENT SUITE 2

1 x 1000mL plastic GREEN ☑	2 x 40mL vials MAROON ☑	1 x 500mL plastic GREEN** ☑
1 x 125mL plastic YELLOW ☑	1 x 500mL glass ORANGE ☑	**BRING BACK &FILTER INTO:
1 x 125mL plastic PURPLE ☑	2 x 500mL glass ORANGE per sample set (Lab Dups) ☑	1 x 60mL plastic MAROON ☑
1 x 60mL plastic BLUE ☑		1 x 60mL plastic RED/GREEN ☑
1 x 60mL plastic RED/GREEN ☑	1 x 500mL plastic GREEN ☑	

Comments

* SAMPLES TAKEN FOR CYANIDE + MICRO

* DUP + TRIP COMPLETED.

MDW
ENVIRONMENTAL SERVICES

Monitoring Well Field Record

Job #: ______ Client: WASTE ROCK Location: ADELAIDE ST

Well ID: MW5 Date: 18/5/12 Sampler: DA/FT

Monitoring Well Information

Depth to Water: 8836 (mm TOC) Depth to Bottom: 12.162 (m)

Standpipe: ______ (m) Monument Cover ☑

Lock: ☑ None ☐ Padlock (YL) ☐ Enviro Cap ☐ Gatic

Equipment IDs

Water Quality Meter: ECO YSI TTA Kit: ______

Pump: LOW FLOW TALK Kit: ______

Dipper: DIPPER-T

Sampling

Sample ID: WR MW5-001 COC No: ______

Time	pH	EC	DO	Temp	Redox	TTA	TALK
0 ~~1308~~ 1310	4.85 ~~4.97~~	513 ~~523~~	1.33	23.3 ~~24.4~~	227.3 ~~207.3~~		
5 ~~1313~~ 1315	4.75	507	0.37	23.1	238.6		
10 ~~1318~~ 1320	4.75	504	0.28	22.8	241.7		
15 ~~1323~~ 1325	4.74	496.2	0.29	22.8	244.0	0.42	0.07

Bottles

ASSESSMENT SUITE 2

1 x 1000mL plastic GREEN ☑	2 x 40mL vials MAROON ☑	1 x 500mL plastic GREEN** ☑
1 x 125mL plastic YELLOW ☑	1 x 500mL glass ORANGE ☑	**BRING BACK &FILTER INTO:
1 x 125mL plastic PURPLE ☑	2 x 500mL glass ORANGE per sample set (Lab Dups) ☑	1 x 60mL plastic MAROON ☑
1 x 60mL plastic BLUE ☑		1 x 60mL plastic RED/GREEN ☑
1 x 60mL plastic RED/GREEN ☑	1 x 500mL plastic GREEN ☑	

Comments

* SAMPLE TAKEN FOR CYANIDE + MICRO.

MDW ENVIRONMENTAL SERVICES

Monitoring Well Field Record

Job #: ____________ Client: WASTE ROCK Location: ADELAIDE ST

Well ID: MW6 Date: 18/5/12 Sampler: DA/FT

Monitoring Well Information

Depth to Water: 8759 (mm TOC) Depth to Bottom: 9.895 (m)

Standpipe: 0.647 (m) Monument Cover ☑

Lock: ☑ None ☐ Padlock (YL) ☐ Enviro Cap ☐ Gatic

Equipment IDs

Water Quality Meter: ECO YSI TTA Kit: ____________

Pump: LOW FLOW TALK Kit: ____________

Dipper: DIPPER T

Sampling

Sample ID: WR MW6-001 COC No: ____________

Time	pH	EC	DO	Temp	Redox	TTA	TALK
0 1350	4.84	906	1.41	24.3	186		
5 1355	4.83	894	1.05	23.7	187		
10 ~~135~~ 1400	4.83	898	0.93	24.0	189.6		
15 1405	4.84	899	0.74	24.0	191.9	1.76	0.11

Bottles

ASSESSMENT SUITE 2

1 x 1000mL plastic GREEN ☑	2 x 40mL vials MAROON ☑	1 x 500mL plastic GREEN** ☑
1 x 125mL plastic YELLOW ☑	1 x 500mL glass ORANGE ☑	**BRING BACK &FILTER INTO:
1 x 125mL plastic PURPLE ☑	2 x 500mL glass ORANGE per sample set (Lab Dups) ☐	1 x 60mL plastic MAROON ☑
1 x 60mL plastic BLUE ☑		1 x 60mL plastic RED/GREEN ☑
1 x 60mL plastic RED/GREEN ☑	1 x 500mL plastic GREEN ☑	

Comments

* SAMPLES TAKEN FOR CYANIDE + MICRO.

Appendix E Survey Results

REPORT

Midland Survey Services
3 Victoria Street MIDLAND WA 6056
Tel: (08) 9374 7777 | Fax: (08) 9374 7799
E-Mail: survey@midlandsurveys.com.au

<table>
<tr><td>DATE</td><td>29th June 2012</td><td>FAX No.</td><td colspan="3"></td></tr>
<tr><td>TO</td><td>Environmental Services</td><td>ATTENTION</td><td colspan="3">Greg Watts</td></tr>
<tr><td>FROM</td><td>Chew Chee Xun</td><td>JOB - DOCUMENT No.</td><td>11460-W1</td><td>REV</td><td>0</td></tr>
<tr><td>TOTAL PAGES INCLUDING THIS ONE</td><td>1</td><td colspan="3">REPLY REQUIRED</td><td>No</td></tr>
</table>

HEADING **Lot 20 Adelaide Street, Hazelmere**

CLIENT ORDER No.

1. Co-ordinates are in metres related to MGA on SSM MV75
2. Levels are in metres related to AHD based on SSM MV75 (RL: 23.0803m)
3. Levels are to **top of PVC pipe within outer casing**
4. Surveyor: **Chew Chee Xun**
5. Date of Survey: **29th June 2012**
6. Field Book Number: **1215**

Name	Easting	Northing	Casing RL(m)
MB1	406504.04	6467036.79	27.281
MB2	406693.90	6466947.24	30.607
MB3	406997.15	6466823.35	34.622
MB4	406617.75	6467311.73	27.751
MB5	406731.40	6467262.78	29.034
MB6	406998.45	6467183.20	31.611

Approved ___________________________

Training Manager

Appendix F Laboratory Documentation

Site: Hazelland - LT20 Adelaide St, Hazelmere	
Job #: E2012 - 031	
Sampler: DA + FT	
CoC #: E2012 - 031 - 001	
Quote #:	
Laboratory: ALS	
Date and time delivered: 18/5/12 1555	
Received by: M Dalvell	

MDW

ENVIRONMENTAL SERVICES

Mobile Dewatering Environmental S
22 Elmsfield Road
Midvale WA 6056
P: 08 9250 6960
F: 08 9250 8269
E: info@environmentalservices.com.a

Comments:

Analysis Detection Limits

Sample ID	Lab ID	Type	Sampling Date	Sampling Time	Assessment Suite 2	Cyanide (free + total)					
~~WR~~ MW1	1	water	18/5	1500							
WR MW2	2	water	18/5								
WR MW3	3	water	18/5								
WR MW4	4	water	18/5								
WR MW5	5	water	18/5								
WR MW6	6	water	18/5								
DUP	7	water	18/5								
~~TRIP~~ FIELD	8	water	18/5								
RINSATE	9	water	18/5								

Environmental Division
Perth
Work Order
EP1203954

Telephone : +61-8-9209 7655

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order : **EP1203954**

Client	: **MOBILE DEWATERING**	Laboratory	: Environmental Division Perth
Contact	: INFO	Contact	: Lauren Ockwell
Address	: PO BOX 239 MIDLAND WA, AUSTRALIA 6939	Address	: 10 Hod Way Malaga WA Australia 6090
E-mail	: info@environmentalservices.com.au	E-mail	: lauren.ockwell@alsenviro.com
Telephone	: +61 08 9250 4995	Telephone	: 08 9209 7606
Facsimile	: ----	Facsimile	: 08 9209 7600
Project	: E2012-031	Page	: 1 of 3
Order number	: ----		
C-O-C number	: E2012-031-001	Quote number	: EP2012MOBDEW0131 (EP/324/12)
Site	: Hazelland-LT20 Adelaide St, Ha		
Sampler	: DA+FT	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 18-MAY-2012	Issue Date	: 21-MAY-2012 08:09
Client Requested Due Date	: 29-MAY-2012	Scheduled Reporting Date	: **29-MAY-2012**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: 3.9 - Ice present
No. of coolers/boxes	: 4 medium hard eskies	No. of samples received	: 9
Security Seal	: Intact.	No. of samples analysed	: 9

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- Samples received in appropriately pretreated and preserved containers.
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- Sulphide analysis will be conducted by ALS Environmental, Melbourne, NATA accreditation No. 825, Site No. 13778.
- **Samples received in appropriately pretreated and preserved containers.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (SamplesPerth@alsenviro.com)
- Sample Disposal - Aqueous (14 days), Solid (90 days) from date of completion of Work Order.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exist.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process neccessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default to 15:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory for processing purposes and will be shown bracketed without a time component.

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EA005P pH (PC)	WATER - EA010P Conductivity (PC)	WATER - EA015H Total Dissolved Solids - High Level	WATER - EA025H Suspended Solids (High Level)	WATER - EA045 Turbidity	WATER - ED038 Acidity as CaCO3	WATER - EG020F Dissolved Metals by ICPMS	WATER - EG020T Total Recoverable Metals by ICPMS
EP1203954-001	18-MAY-2012 15:00	WRMW1	✓	✓	✓	✓	✓	✓	✓	✓
EP1203954-002	18-MAY-2012 15:00	WRMW2	✓	✓	✓	✓	✓	✓	✓	✓
EP1203954-003	18-MAY-2012 15:00	WRMW3	✓	✓	✓	✓	✓	✓	✓	✓
EP1203954-004	18-MAY-2012 15:00	WRMW4	✓	✓	✓	✓	✓	✓	✓	✓
EP1203954-005	18-MAY-2012 15:00	WRMW5	✓	✓	✓	✓	✓	✓	✓	✓
EP1203954-006	18-MAY-2012 15:00	WRMW6	✓	✓	✓	✓	✓	✓	✓	✓
EP1203954-007	18-MAY-2012 15:00	DUP	✓	✓	✓	✓	✓	✓	✓	✓
EP1203954-008	18-MAY-2012 15:00	FIELD	✓	✓	✓	✓	✓	✓	✓	✓
EP1203954-009	18-MAY-2012 15:00	RINSATE	✓	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EG035T Total Mercury by FIMS	WATER - EG050G-F Hexavalent Chromium by Discrete Analyser - Filtered	WATER - EG051G Ferrous Iron by Discrete Analyser	WATER - EK025G Free CN By Discrete Analyser	WATER - EK026G Total Cyanide by Discrete Analyser	WATER - EK085M Sulfide as S 2-	WATER - EP026ST COD- Sealed Tube	WATER - EP030 BOD
EP1203954-001	18-MAY-2012 15:00	WRMW1	✓	✓	✓	✓	✓	✓	✓	✓
EP1203954-002	18-MAY-2012 15:00	WRMW2	✓	✓	✓	✓	✓	✓	✓	✓
EP1203954-003	18-MAY-2012 15:00	WRMW3	✓	✓	✓	✓	✓	✓	✓	✓
EP1203954-004	18-MAY-2012 15:00	WRMW4	✓	✓	✓	✓	✓	✓	✓	✓
EP1203954-005	18-MAY-2012 15:00	WRMW5	✓	✓	✓	✓	✓	✓	✓	✓
EP1203954-006	18-MAY-2012 15:00	WRMW6	✓	✓	✓	✓	✓	✓	✓	✓
EP1203954-007	18-MAY-2012 15:00	DUP	✓	✓	✓	✓	✓	✓	✓	✓
EP1203954-008	18-MAY-2012 15:00	FIELD	✓	✓	✓	✓	✓	✓	✓	✓
EP1203954-009	18-MAY-2012 15:00	RINSATE	✓	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)	WATER - NT-08A Total Nitrogen + NO2 + NO3 + NH3 + Total P + Reactive P	WATER - W-09 TPH/VOC	WATER - W-12 OC/OP Pesticides	WATER - W-14A PAH/Phenols (SIM)
EP1203954-001	18-MAY-2012 15:00	WRMW1	✓	✓	✓	✓	✓
EP1203954-002	18-MAY-2012 15:00	WRMW2	✓	✓	✓	✓	✓
EP1203954-003	18-MAY-2012 15:00	WRMW3	✓	✓	✓	✓	✓
EP1203954-004	18-MAY-2012 15:00	WRMW4	✓	✓	✓	✓	✓
EP1203954-005	18-MAY-2012 15:00	WRMW5	✓	✓	✓	✓	✓
EP1203954-006	18-MAY-2012 15:00	WRMW6	✓	✓	✓	✓	✓
EP1203954-007	18-MAY-2012 15:00	DUP	✓	✓	✓	✓	✓
EP1203954-008	18-MAY-2012 15:00	FIELD	✓	✓	✓	✓	✓
EP1203954-009	18-MAY-2012 15:00	RINSATE	✓	✓	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ACCOUNTS PAYABLE (WA)		
- A4 - AU Tax Invoice (INV)	Email	deb@mobiledewatering.com.au
INFO		
- *AU Certificate of Analysis - NATA (COA)	Email	info@environmentalservices.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	info@environmentalservices.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	info@environmentalservices.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	info@environmentalservices.com.au
- Chain of Custody (CoC) (COC)	Email	info@environmentalservices.com.au
- EDI Format - ENMRG (ENMRG)	Email	info@environmentalservices.com.au
- EDI Format - ESDAT (ESDAT)	Email	info@environmentalservices.com.au
- EDI Format - XTab (XTAB)	Email	info@environmentalservices.com.au

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **EP1203954**	Page	: 1 of 18
Client	: **MOBILE DEWATERING**	Laboratory	: Environmental Division Perth
Contact	: INFO	Contact	: Lauren Ockwell
Address	: PO BOX 239 MIDLAND WA, AUSTRALIA 6939	Address	: 10 Hod Way Malaga WA Australia 6090
E-mail	: info@environmentalservices.com.au	E-mail	: lauren.ockwell@alsenviro.com
Telephone	: +61 08 9250 4995	Telephone	: 08 9209 7606
Facsimile	: ----	Facsimile	: 08 9209 7600
Project	: E2012-031	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: E2012-031-001	Date Samples Received	: 18-MAY-2012
Sampler	: D.A+F.T	Issue Date	: 30-MAY-2012
Site	: Hazelland-LT20 Adelaide St, Ha		
		No. of samples received	: 9
Quote number	: EP/324/12	No. of samples analysed	: 9

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

NATA
WORLD RECOGNISED ACCREDITATION

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Agnes Szilagyi	Senior Organic Chemist	Perth Organics
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Canhuang Ke	Metals Instrument Chemist	Perth Inorganics
Chas Tucker	Inorganic Chemist	Perth Inorganics
Cicelia Bartels	Metals Instrument Chemist	Perth Inorganics
Herman Lin	Laboratory Coordinator	Melbourne Inorganics
Sarah Millington	Senior Inorganic Chemist	Sydney Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **EK025G: Poor matrix spike recoveries due to matrix effects.**
- **EP068: DEF surrogate recoveries for various samples fall outside ALS dynamic control limits. However, they are within the acceptance criteria based on standard USEPA 8270 limits. No further action is required.**
- **EP075(sim): Various LCS analytes fall outside ALS dynamic control limits. However, they are within the acceptance criteria based on standard USEPA 8270 limits. No further action is required.**
- **It has been noted that Ammonia is greater than Total Kjeldahl Nitrogen for sample 'WRMW6' , however this difference is within the limits of experimental variation.**
- **Sulphide analysis conducted by ALS Melbourne, NATA accreditation no. 825, site no 13778**

Analytical Results

Sub-Matrix: WATER			Client sample ID	WRMW1	WRMW2	WRMW3	WRMW4	WRMW5
			Client sampling date / time	18-MAY-2012 15:00	18-MAY-2012 15:00	18-MAY-2012 15:00	18-MAY-2012 15:00	18-MAY-2012 15:00
Compound	CAS Number	LOR	Unit	EP1203954-001	EP1203954-002	EP1203954-003	EP1203954-004	EP1203954-005
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	6.58	6.14	7.41	6.04	5.86
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	635	307	1070	354	449
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	GIS-210-010	10	mg/L	434	244	704	226	341
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	582	292	425	144	59
EA045: Turbidity								
Turbidity	----	0.1	NTU	166	236	383	86.9	137
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	43	17	292	5	5
Total Alkalinity as CaCO3	----	1	mg/L	43	17	292	5	5
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	15	26	16	8	13
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	105	13	40	17	19
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	134	80	216	89	132
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.04	0.02	<0.01	0.02	0.19
Arsenic	7440-38-2	0.001	mg/L	<0.001	0.001	0.004	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	0.005	0.022	0.182	0.013	0.010
Nickel	7440-02-0	0.001	mg/L	<0.001	0.002	0.001	<0.001	0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	0.005	0.048	0.005	0.010	0.008
Iron	7439-89-6	0.05	mg/L	<0.05	0.68	2.16	0.11	0.08
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	11.1	16.2	34.4	4.30	10.0
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.010	0.001	0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	0.007	0.016	0.047	0.004	0.005
Copper	7440-50-8	0.001	mg/L	0.004	0.070	0.032	0.005	0.005

Analytical Results

Sub-Matrix: WATER			Client sample ID	WRMW1	WRMW2	WRMW3	WRMW4	WRMW5
			Client sampling date / time	18-MAY-2012 15:00	18-MAY-2012 15:00	18-MAY-2012 15:00	18-MAY-2012 15:00	18-MAY-2012 15:00
Compound	CAS Number	LOR	Unit	EP1203954-001	EP1203954-002	EP1203954-003	EP1203954-004	EP1203954-005
EG020T: Total Metals by ICP-MS - Continued								
Lead	7439-92-1	0.001	mg/L	**0.013**	**0.017**	**0.087**	**0.011**	**0.015**
Manganese	7439-96-5	0.001	mg/L	**0.006**	**0.026**	**0.191**	**0.016**	**0.010**
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	**0.002**	**0.005**	**0.014**	**0.001**	**0.003**
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	**0.008**	**0.080**	**0.068**	**0.017**	**0.011**
Iron	7439-89-6	0.05	mg/L	**0.29**	**4.82**	**11.9**	**0.88**	**0.49**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	**0.0001**	**0.0001**	<0.0001	<0.0001	<0.0001
EG050F: Dissolved Hexavalent Chromium								
Hexavalent Chromium	18540-29-9	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010
EG051G: Ferrous Iron by Discrete Analyser								
Ferrous Iron	----	0.05	mg/L	<0.05	**0.43**	**2.28**	<0.05	<0.05
EK025G: Free cyanide by Discrete Analyser								
Free Cyanide	----	0.004	mg/L	<0.004	<0.004	<0.004	<0.004	<0.004
EK026G: Total Cyanide By Discrete Analyser								
Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	<0.004	<0.004	<0.004
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.06**	**0.36**	**0.03**	**0.11**	**0.01**
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	----	0.01	mg/L	**0.03**	**0.02**	<0.01	**0.01**	**0.04**
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**5.15**	**0.62**	**0.17**	**3.75**	**0.45**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**5.18**	**0.64**	**0.17**	**3.76**	**0.49**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**0.5**	**0.5**	**0.3**	**0.5**	**0.1**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**5.7**	**1.1**	**0.5**	**4.3**	**0.6**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.01**	**0.15**	**0.24**	**0.04**	**0.02**
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	----	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EK085M: Sulfide as S2-								
Sulfide as S2-	18496-25-8	0.1	mg/L	**0.1**	<0.1	<0.1	<0.1	<0.1

Analytical Results

Sub-Matrix: WATER			Client sample ID	WRMW1	WRMW2	WRMW3	WRMW4	WRMW5
			Client sampling date / time	18-MAY-2012 15:00	18-MAY-2012 15:00	18-MAY-2012 15:00	18-MAY-2012 15:00	18-MAY-2012 15:00
Compound	CAS Number	LOR	Unit	EP1203954-001	EP1203954-002	EP1203954-003	EP1203954-004	EP1203954-005
EP026ST: Chemical Oxygen Demand (Sealed Tube)								
Chemical Oxygen Demand	----	5	mg/L	18	16	155	11	9
EP030: Biochemical Oxygen Demand (BOD)								
Biochemical Oxygen Demand	----	2	mg/L	<2	3	69	4	3
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
beta-BHC	319-85-7	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
gamma-BHC	58-89-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
delta-BHC	319-86-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Heptachlor	76-44-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Aldrin	309-00-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Dieldrin	60-57-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDE	72-55-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Endrin	72-20-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDD	72-54-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDT	50-29-3	2	µg/L	<2	<2	<2	<2	<2
Endrin ketone	53494-70-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Methoxychlor	72-43-5	2	µg/L	<2	<2	<2	<2	<2
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Monocrotophos	6923-22-4	2	µg/L	<2	<2	<2	<2	<2
Dimethoate	60-51-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Diazinon	333-41-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Parathion-methyl	298-00-0	2	µg/L	<2	<2	<2	<2	<2
Malathion	121-75-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Fenthion	55-38-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Parathion	56-38-2	2	µg/L	<2	<2	<2	<2	<2
Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: **WATER**			Client sample ID	WRMW1	WRMW2	WRMW3	WRMW4	WRMW5
			Client sampling date / time	18-MAY-2012 15:00	18-MAY-2012 15:00	18-MAY-2012 15:00	18-MAY-2012 15:00	18-MAY-2012 15:00
Compound	*CAS Number*	*LOR*	*Unit*	**EP1203954-001**	**EP1203954-002**	**EP1203954-003**	**EP1203954-004**	**EP1203954-005**
EP068B: Organophosphorus Pesticides (OP) - Continued								
Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Fenamiphos	22224-92-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Prothiofos	34643-46-4	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Ethion	563-12-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Carbophenothion	786-19-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
EP074A: Monocyclic Aromatic Hydrocarbons								
Styrene	100-42-5	5	µg/L	<5	<5	<5	<5	<5
Isopropylbenzene	98-82-8	5	µg/L	<5	<5	<5	<5	<5
n-Propylbenzene	103-65-1	5	µg/L	<5	<5	<5	<5	<5
1.3.5-Trimethylbenzene	108-67-8	5	µg/L	<5	<5	<5	<5	<5
sec-Butylbenzene	135-98-8	5	µg/L	<5	<5	<5	<5	<5
1.2.4-Trimethylbenzene	95-63-6	5	µg/L	<5	<5	<5	<5	<5
tert-Butylbenzene	98-06-6	5	µg/L	<5	<5	<5	<5	<5
p-Isopropyltoluene	99-87-6	5	µg/L	<5	<5	<5	<5	<5
n-Butylbenzene	104-51-8	5	µg/L	<5	<5	<5	<5	<5
EP074B: Oxygenated Compounds								
Vinyl Acetate	108-05-4	50	µg/L	<50	<50	<50	<50	<50
2-Butanone (MEK)	78-93-3	50	µg/L	<50	<50	<50	<50	<50
4-Methyl-2-pentanone (MIBK)	108-10-1	50	µg/L	<50	<50	<50	<50	<50
2-Hexanone (MBK)	591-78-6	50	µg/L	<50	<50	<50	<50	<50
EP074C: Sulfonated Compounds								
Carbon disulfide	75-15-0	5	µg/L	<5	<5	<5	<5	<5
EP074D: Fumigants								
2.2-Dichloropropane	594-20-7	5	µg/L	<5	<5	<5	<5	<5
1.2-Dichloropropane	78-87-5	5	µg/L	<5	<5	<5	<5	<5
cis-1.3-Dichloropropylene	10061-01-5	5	µg/L	<5	<5	<5	<5	<5
trans-1.3-Dichloropropylene	10061-02-6	5	µg/L	<5	<5	<5	<5	<5
1.2-Dibromoethane (EDB)	106-93-4	5	µg/L	<5	<5	<5	<5	<5
EP074E: Halogenated Aliphatic Compounds								
Dichlorodifluoromethane	75-71-8	50	µg/L	<50	<50	<50	<50	<50
Chloromethane	74-87-3	50	µg/L	<50	<50	<50	<50	<50
Vinyl chloride	75-01-4	50	µg/L	<50	<50	<50	<50	<50
Bromomethane	74-83-9	50	µg/L	<50	<50	<50	<50	<50
Chloroethane	75-00-3	50	µg/L	<50	<50	<50	<50	<50
Trichlorofluoromethane	75-69-4	50	µg/L	<50	<50	<50	<50	<50

Analytical Results

Sub-Matrix: WATER			Client sample ID	WRMW1	WRMW2	WRMW3	WRMW4	WRMW5
			Client sampling date / time	18-MAY-2012 15:00	18-MAY-2012 15:00	18-MAY-2012 15:00	18-MAY-2012 15:00	18-MAY-2012 15:00
Compound	CAS Number	LOR	Unit	EP1203954-001	EP1203954-002	EP1203954-003	EP1203954-004	EP1203954-005
EP074E: Halogenated Aliphatic Compounds - Continued								
1.1-Dichloroethene	75-35-4	5	µg/L	<5	<5	<5	<5	<5
Iodomethane	74-88-4	5	µg/L	<5	<5	<5	<5	<5
trans-1.2-Dichloroethene	156-60-5	5	µg/L	<5	<5	<5	<5	<5
1.1-Dichloroethane	75-34-3	5	µg/L	<5	<5	<5	<5	<5
cis-1.2-Dichloroethene	156-59-2	5	µg/L	<5	<5	<5	<5	<5
1.1.1-Trichloroethane	71-55-6	5	µg/L	<5	<5	<5	<5	<5
1.1-Dichloropropylene	563-58-6	5	µg/L	<5	<5	<5	<5	<5
Carbon Tetrachloride	56-23-5	5	µg/L	<5	<5	<5	<5	<5
1.2-Dichloroethane	107-06-2	5	µg/L	<5	<5	<5	<5	<5
Trichloroethene	79-01-6	5	µg/L	<5	<5	<5	<5	<5
Dibromomethane	74-95-3	5	µg/L	<5	<5	<5	<5	<5
1.1.2-Trichloroethane	79-00-5	5	µg/L	<5	<5	<5	<5	<5
1.3-Dichloropropane	142-28-9	5	µg/L	<5	<5	<5	<5	<5
Tetrachloroethene	127-18-4	5	µg/L	<5	<5	<5	<5	<5
1.1.1.2-Tetrachloroethane	630-20-6	5	µg/L	<5	<5	<5	<5	<5
trans-1.4-Dichloro-2-butene	110-57-6	5	µg/L	<5	<5	<5	<5	<5
cis-1.4-Dichloro-2-butene	1476-11-5	5	µg/L	<5	<5	<5	<5	<5
1.1.2.2-Tetrachloroethane	79-34-5	5	µg/L	<5	<5	<5	<5	<5
1.2.3-Trichloropropane	96-18-4	5	µg/L	<5	<5	<5	<5	<5
Pentachloroethane	76-01-7	5	µg/L	<5	<5	<5	<5	<5
1.2-Dibromo-3-chloropropane	96-12-8	5	µg/L	<5	<5	<5	<5	<5
Hexachlorobutadiene	87-68-3	5	µg/L	<5	<5	<5	<5	<5
EP074F: Halogenated Aromatic Compounds								
Chlorobenzene	108-90-7	5	µg/L	<5	<5	<5	<5	<5
Bromobenzene	108-86-1	5	µg/L	<5	<5	<5	<5	<5
2-Chlorotoluene	95-49-8	5	µg/L	<5	<5	<5	<5	<5
4-Chlorotoluene	106-43-4	5	µg/L	<5	<5	<5	<5	<5
1.3-Dichlorobenzene	541-73-1	5	µg/L	<5	<5	<5	<5	<5
1.4-Dichlorobenzene	106-46-7	5	µg/L	<5	<5	<5	<5	<5
1.2-Dichlorobenzene	95-50-1	5	µg/L	<5	<5	<5	<5	<5
1.2.4-Trichlorobenzene	120-82-1	5	µg/L	<5	<5	<5	<5	<5
1.2.3-Trichlorobenzene	87-61-6	5	µg/L	<5	<5	<5	<5	<5
EP074G: Trihalomethanes								
Chloroform	67-66-3	5	µg/L	<5	<5	<5	<5	<5
Bromodichloromethane	75-27-4	5	µg/L	<5	<5	<5	<5	**5**
Dibromochloromethane	124-48-1	5	µg/L	<5	<5	<5	**12**	**20**
Bromoform	75-25-2	5	µg/L	<5	<5	<5	**13**	**22**
EP075(SIM)A: Phenolic Compounds								

Analytical Results

Sub-Matrix: WATER			Client sample ID	WRMW1	WRMW2	WRMW3	WRMW4	WRMW5
			Client sampling date / time	18-MAY-2012 15:00	18-MAY-2012 15:00	18-MAY-2012 15:00	18-MAY-2012 15:00	18-MAY-2012 15:00
Compound	CAS Number	LOR	Unit	EP1203954-001	EP1203954-002	EP1203954-003	EP1203954-004	EP1203954-005
EP075(SIM)A: Phenolic Compounds - Continued								
Phenol	108-95-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chlorophenol	95-57-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2-Methylphenol	95-48-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
3- & 4-Methylphenol	1319-77-3	2.0	µg/L	<2.0	**2.6**	<2.0	<2.0	<2.0
2-Nitrophenol	88-75-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.4-Dimethylphenol	105-67-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.4-Dichlorophenol	120-83-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.6-Dichlorophenol	87-65-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
4-Chloro-3-Methylphenol	59-50-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.4.6-Trichlorophenol	88-06-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.4.5-Trichlorophenol	95-95-4	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Pentachlorophenol	87-86-5	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(b)fluoranthene	205-99-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L	<50	<50	**270**	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	**270**	<50	<50
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.1	%	**68.5**	**53.4**	**58.3**	**65.7**	**56.5**
EP068T: Organophosphorus Pesticide Surrogate								

Analytical Results

Sub-Matrix: WATER			Client sample ID	WRMW1	WRMW2	WRMW3	WRMW4	WRMW5
			Client sampling date / time	18-MAY-2012 15:00	18-MAY-2012 15:00	18-MAY-2012 15:00	18-MAY-2012 15:00	18-MAY-2012 15:00
Compound	CAS Number	LOR	Unit	EP1203954-001	EP1203954-002	EP1203954-003	EP1203954-004	EP1203954-005
EP068T: Organophosphorus Pesticide Surrogate - Continued								
DEF	78-48-8	0.1	%	22.9	17.3	24.6	20.6	17.7
EP074S: VOC Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	98.6	101	101	100	100
Toluene-D8	2037-26-5	0.1	%	98.8	97.5	97.6	98.7	97.6
4-Bromofluorobenzene	460-00-4	0.1	%	94.4	93.1	96.1	91.8	91.3
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	21.6	21.7	20.2	22.7	21.7
2-Chlorophenol-D4	93951-73-6	0.1	%	54.0	49.3	46.9	55.9	49.0
2.4.6-Tribromophenol	118-79-6	0.1	%	84.1	59.1	70.5	74.3	75.2
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	72.9	62.8	50.3	61.1	58.1
Anthracene-d10	1719-06-8	0.1	%	91.8	82.9	74.7	82.3	82.6
4-Terphenyl-d14	1718-51-0	0.1	%	96.9	103	74.9	78.0	77.9
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	96.9	98.5	99.0	97.8	98.3
Toluene-D8	2037-26-5	0.1	%	102	102	101	103	101
4-Bromofluorobenzene	460-00-4	0.1	%	95.8	96.0	98.3	94.8	96.5

Analytical Results

Sub-Matrix: WATER			Client sample ID	WRMW6	DUP	FIELD	RINSATE	----
			Client sampling date / time	18-MAY-2012 15:00	18-MAY-2012 15:00	18-MAY-2012 15:00	18-MAY-2012 15:00	----
Compound	CAS Number	LOR	Unit	EP1203954-006	EP1203954-007	EP1203954-008	EP1203954-009	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**5.83**	**5.88**	**5.70**	**5.70**	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**808**	**334**	**1**	<1	----
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	GIS-210-010	10	mg/L	**492**	**194**	<10	<10	----
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	**50**	**34**	<5	<5	----
EA045: Turbidity								
Turbidity	----	0.1	NTU	**76.6**	**20.8**	**0.1**	<0.1	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**38**	**4**	<1	<1	----
Total Alkalinity as CaCO3	----	1	mg/L	**38**	**4**	<1	<1	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**22**	**8**	**5**	<1	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**173**	**16**	<1	<1	----
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	**124**	**84**	**1**	<1	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.01**	**0.05**	<0.01	<0.01	----
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Manganese	7439-96-5	0.001	mg/L	**0.035**	**0.010**	<0.001	<0.001	----
Nickel	7440-02-0	0.001	mg/L	**0.001**	<0.001	<0.001	**0.002**	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Zinc	7440-66-6	0.005	mg/L	**0.010**	**0.010**	<0.005	**0.047**	----
Iron	7439-89-6	0.05	mg/L	**1.42**	**0.09**	<0.05	<0.05	----
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.74**	**2.34**	<0.01	<0.01	----
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
Chromium	7440-47-3	0.001	mg/L	<0.001	**0.002**	<0.001	<0.001	----
Copper	7440-50-8	0.001	mg/L	**0.002**	**0.003**	**0.004**	**0.004**	----

Analytical Results

Sub-Matrix: WATER		Client sample ID		WRMW6	DUP	FIELD	RINSATE	----
		Client sampling date / time		18-MAY-2012 15:00	18-MAY-2012 15:00	18-MAY-2012 15:00	18-MAY-2012 15:00	----
Compound	CAS Number	LOR	Unit	EP1203954-006	EP1203954-007	EP1203954-008	EP1203954-009	----
EG020T: Total Metals by ICP-MS - Continued								
Lead	7439-92-1	0.001	mg/L	**0.007**	**0.006**	<0.001	<0.001	----
Manganese	7439-96-5	0.001	mg/L	**0.034**	**0.012**	<0.001	<0.001	----
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Nickel	7440-02-0	0.001	mg/L	**0.002**	<0.001	<0.001	**0.002**	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Zinc	7440-66-6	0.005	mg/L	**0.012**	**0.013**	<0.005	**0.045**	----
Iron	7439-89-6	0.05	mg/L	**10.4**	**0.51**	<0.05	<0.05	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
EG050F: Dissolved Hexavalent Chromium								
Hexavalent Chromium	18540-29-9	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	----
EG051G: Ferrous Iron by Discrete Analyser								
Ferrous Iron	----	0.05	mg/L	**0.35**	**0.05**	<0.05	<0.05	----
EK025G: Free cyanide by Discrete Analyser								
Free Cyanide	----	0.004	mg/L	<0.004	<0.004	<0.004	<0.004	----
EK026G: Total Cyanide By Discrete Analyser								
Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	<0.004	<0.004	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**1.64**	**0.12**	**0.01**	<0.01	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	----	0.01	mg/L	**0.05**	**0.01**	<0.01	<0.01	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.17**	**3.79**	<0.01	<0.01	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.22**	**3.80**	<0.01	<0.01	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**1.6**	**0.7**	<0.1	<0.1	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**1.8**	**4.5**	<0.1	<0.1	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.03**	**0.04**	**0.01**	<0.01	----
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	----	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
EK085M: Sulfide as S2-								
Sulfide as S2-	18496-25-8	0.1	mg/L	<0.1	<0.1	<0.1	<0.1	----

Analytical Results

Sub-Matrix: WATER			Client sample ID	WRMW6	DUP	FIELD	RINSATE	----
			Client sampling date / time	18-MAY-2012 15:00	18-MAY-2012 15:00	18-MAY-2012 15:00	18-MAY-2012 15:00	----
Compound	CAS Number	LOR	Unit	EP1203954-006	EP1203954-007	EP1203954-008	EP1203954-009	----
EP026ST: Chemical Oxygen Demand (Sealed Tube)								
Chemical Oxygen Demand	----	5	mg/L	**25**	**13**	<5	<5	----
EP030: Biochemical Oxygen Demand (BOD)								
Biochemical Oxygen Demand	----	2	mg/L	**26**	**7**	**4**	**3**	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
beta-BHC	319-85-7	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
gamma-BHC	58-89-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
delta-BHC	319-86-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Heptachlor	76-44-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Aldrin	309-00-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Dieldrin	60-57-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
4.4`-DDE	72-55-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Endrin	72-20-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
4.4`-DDD	72-54-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
4.4`-DDT	50-29-3	2	µg/L	<2	<2	<2	<2	----
Endrin ketone	53494-70-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Methoxychlor	72-43-5	2	µg/L	<2	<2	<2	<2	----
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Monocrotophos	6923-22-4	2	µg/L	<2	<2	<2	<2	----
Dimethoate	60-51-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Diazinon	333-41-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Parathion-methyl	298-00-0	2	µg/L	<2	<2	<2	<2	----
Malathion	121-75-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Fenthion	55-38-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Parathion	56-38-2	2	µg/L	<2	<2	<2	<2	----
Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----

Analytical Results

Sub-Matrix: **WATER**			Client sample ID	WRMW6	DUP	FIELD	RINSATE	----
			Client sampling date / time	18-MAY-2012 15:00	18-MAY-2012 15:00	18-MAY-2012 15:00	18-MAY-2012 15:00	----
Compound	*CAS Number*	*LOR*	*Unit*	**EP1203954-006**	**EP1203954-007**	**EP1203954-008**	**EP1203954-009**	**----**
EP068B: Organophosphorus Pesticides (OP) - Continued								
Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Fenamiphos	22224-92-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Prothiofos	34643-46-4	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Ethion	563-12-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Carbophenothion	786-19-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
EP074A: Monocyclic Aromatic Hydrocarbons								
Styrene	100-42-5	5	µg/L	<5	<5	<5	<5	----
Isopropylbenzene	98-82-8	5	µg/L	<5	<5	<5	<5	----
n-Propylbenzene	103-65-1	5	µg/L	<5	<5	<5	<5	----
1.3.5-Trimethylbenzene	108-67-8	5	µg/L	<5	<5	<5	<5	----
sec-Butylbenzene	135-98-8	5	µg/L	<5	<5	<5	<5	----
1.2.4-Trimethylbenzene	95-63-6	5	µg/L	<5	<5	<5	<5	----
tert-Butylbenzene	98-06-6	5	µg/L	<5	<5	<5	<5	----
p-Isopropyltoluene	99-87-6	5	µg/L	<5	<5	<5	<5	----
n-Butylbenzene	104-51-8	5	µg/L	<5	<5	<5	<5	----
EP074B: Oxygenated Compounds								
Vinyl Acetate	108-05-4	50	µg/L	<50	<50	<50	<50	----
2-Butanone (MEK)	78-93-3	50	µg/L	<50	<50	<50	<50	----
4-Methyl-2-pentanone (MIBK)	108-10-1	50	µg/L	<50	<50	<50	<50	----
2-Hexanone (MBK)	591-78-6	50	µg/L	<50	<50	<50	<50	----
EP074C: Sulfonated Compounds								
Carbon disulfide	75-15-0	5	µg/L	<5	<5	<5	<5	----
EP074D: Fumigants								
2.2-Dichloropropane	594-20-7	5	µg/L	<5	<5	<5	<5	----
1.2-Dichloropropane	78-87-5	5	µg/L	<5	<5	<5	<5	----
cis-1.3-Dichloropropylene	10061-01-5	5	µg/L	<5	<5	<5	<5	----
trans-1.3-Dichloropropylene	10061-02-6	5	µg/L	<5	<5	<5	<5	----
1.2-Dibromoethane (EDB)	106-93-4	5	µg/L	<5	<5	<5	<5	----
EP074E: Halogenated Aliphatic Compounds								
Dichlorodifluoromethane	75-71-8	50	µg/L	<50	<50	<50	<50	----
Chloromethane	74-87-3	50	µg/L	<50	<50	<50	<50	----
Vinyl chloride	75-01-4	50	µg/L	<50	<50	<50	<50	----
Bromomethane	74-83-9	50	µg/L	<50	<50	<50	<50	----
Chloroethane	75-00-3	50	µg/L	<50	<50	<50	<50	----
Trichlorofluoromethane	75-69-4	50	µg/L	<50	<50	<50	<50	----

Analytical Results

Sub-Matrix: WATER			Client sample ID	WRMW6	DUP	FIELD	RINSATE	----
			Client sampling date / time	18-MAY-2012 15:00	18-MAY-2012 15:00	18-MAY-2012 15:00	18-MAY-2012 15:00	----
Compound	CAS Number	LOR	Unit	EP1203954-006	EP1203954-007	EP1203954-008	EP1203954-009	----
EP074E: Halogenated Aliphatic Compounds - Continued								
1.1-Dichloroethene	75-35-4	5	µg/L	<5	<5	<5	<5	----
Iodomethane	74-88-4	5	µg/L	<5	<5	<5	<5	----
trans-1.2-Dichloroethene	156-60-5	5	µg/L	<5	<5	<5	<5	----
1.1-Dichloroethane	75-34-3	5	µg/L	<5	<5	<5	<5	----
cis-1.2-Dichloroethene	156-59-2	5	µg/L	<5	<5	<5	<5	----
1.1.1-Trichloroethane	71-55-6	5	µg/L	<5	<5	<5	<5	----
1.1-Dichloropropylene	563-58-6	5	µg/L	<5	<5	<5	<5	----
Carbon Tetrachloride	56-23-5	5	µg/L	<5	<5	<5	<5	----
1.2-Dichloroethane	107-06-2	5	µg/L	<5	<5	<5	<5	----
Trichloroethene	79-01-6	5	µg/L	<5	<5	<5	<5	----
Dibromomethane	74-95-3	5	µg/L	<5	<5	<5	<5	----
1.1.2-Trichloroethane	79-00-5	5	µg/L	<5	<5	<5	<5	----
1.3-Dichloropropane	142-28-9	5	µg/L	<5	<5	<5	<5	----
Tetrachloroethene	127-18-4	5	µg/L	<5	<5	<5	<5	----
1.1.1.2-Tetrachloroethane	630-20-6	5	µg/L	<5	<5	<5	<5	----
trans-1.4-Dichloro-2-butene	110-57-6	5	µg/L	<5	<5	<5	<5	----
cis-1.4-Dichloro-2-butene	1476-11-5	5	µg/L	<5	<5	<5	<5	----
1.1.2.2-Tetrachloroethane	79-34-5	5	µg/L	<5	<5	<5	<5	----
1.2.3-Trichloropropane	96-18-4	5	µg/L	<5	<5	<5	<5	----
Pentachloroethane	76-01-7	5	µg/L	<5	<5	<5	<5	----
1.2-Dibromo-3-chloropropane	96-12-8	5	µg/L	<5	<5	<5	<5	----
Hexachlorobutadiene	87-68-3	5	µg/L	<5	<5	<5	<5	----
EP074F: Halogenated Aromatic Compounds								
Chlorobenzene	108-90-7	5	µg/L	<5	<5	<5	<5	----
Bromobenzene	108-86-1	5	µg/L	<5	<5	<5	<5	----
2-Chlorotoluene	95-49-8	5	µg/L	<5	<5	<5	<5	----
4-Chlorotoluene	106-43-4	5	µg/L	<5	<5	<5	<5	----
1.3-Dichlorobenzene	541-73-1	5	µg/L	<5	<5	<5	<5	----
1.4-Dichlorobenzene	106-46-7	5	µg/L	<5	<5	<5	<5	----
1.2-Dichlorobenzene	95-50-1	5	µg/L	<5	<5	<5	<5	----
1.2.4-Trichlorobenzene	120-82-1	5	µg/L	<5	<5	<5	<5	----
1.2.3-Trichlorobenzene	87-61-6	5	µg/L	<5	<5	<5	<5	----
EP074G: Trihalomethanes								
Chloroform	67-66-3	5	µg/L	<5	<5	<5	<5	----
Bromodichloromethane	75-27-4	5	µg/L	<5	<5	<5	<5	----
Dibromochloromethane	124-48-1	5	µg/L	<5	**11**	<5	<5	----
Bromoform	75-25-2	5	µg/L	<5	**15**	<5	<5	----
EP075(SIM)A: Phenolic Compounds								

Analytical Results

Sub-Matrix: **WATER**			Client sample ID	**WRMW6**	**DUP**	**FIELD**	**RINSATE**	----
			Client sampling date / time	18-MAY-2012 15:00	18-MAY-2012 15:00	18-MAY-2012 15:00	18-MAY-2012 15:00	----
Compound	*CAS Number*	*LOR*	*Unit*	**EP1203954-006**	**EP1203954-007**	**EP1203954-008**	**EP1203954-009**	----
EP075(SIM)A: Phenolic Compounds - Continued								
Phenol	108-95-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
2-Chlorophenol	95-57-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
2-Methylphenol	95-48-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
3- & 4-Methylphenol	1319-77-3	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	----
2-Nitrophenol	88-75-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
2.4-Dimethylphenol	105-67-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
2.4-Dichlorophenol	120-83-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
2.6-Dichlorophenol	87-65-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
4-Chloro-3-Methylphenol	59-50-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
2.4.6-Trichlorophenol	88-06-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
2.4.5-Trichlorophenol	95-95-4	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Pentachlorophenol	87-86-5	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Benzo(b)fluoranthene	205-99-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	----
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	----
C15 - C28 Fraction	----	100	µg/L	**260**	<100	<100	<100	----
C29 - C36 Fraction	----	50	µg/L	**60**	<50	<50	<50	----
^ **C10 - C36 Fraction (sum)**	----	50	µg/L	**320**	<50	<50	<50	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.1	%	**69.0**	**73.7**	**51.9**	**69.1**	----
EP068T: Organophosphorus Pesticide Surrogate								

Analytical Results

Sub-Matrix: WATER			Client sample ID	WRMW6	DUP	FIELD	RINSATE	----
			Client sampling date / time	18-MAY-2012 15:00	18-MAY-2012 15:00	18-MAY-2012 15:00	18-MAY-2012 15:00	----
Compound	CAS Number	LOR	Unit	EP1203954-006	EP1203954-007	EP1203954-008	EP1203954-009	----
EP068T: Organophosphorus Pesticide Surrogate - Continued								
DEF	78-48-8	0.1	%	34.6	23.6	14.6	21.1	----
EP074S: VOC Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	101	99.2	102	101	----
Toluene-D8	2037-26-5	0.1	%	96.5	99.2	95.2	98.2	----
4-Bromofluorobenzene	460-00-4	0.1	%	91.2	94.6	91.1	92.4	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	23.5	26.4	19.0	25.6	----
2-Chlorophenol-D4	93951-73-6	0.1	%	56.8	61.5	43.9	58.4	----
2.4.6-Tribromophenol	118-79-6	0.1	%	89.3	89.4	59.5	61.9	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	72.8	73.6	56.1	75.0	----
Anthracene-d10	1719-06-8	0.1	%	89.2	91.2	71.5	83.6	----
4-Terphenyl-d14	1718-51-0	0.1	%	93.3	88.9	69.2	83.3	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	99.2	97.1	100	101	----
Toluene-D8	2037-26-5	0.1	%	101	103	100	102	----
4-Bromofluorobenzene	460-00-4	0.1	%	94.7	95.9	93.7	93.0	----

Surrogate Control Limits

Sub-Matrix: **WATER**

Compound	CAS Number	Recovery Limits (%) Low	High
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	50.0	146.3
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	26.8	153.4
EP074S: VOC Surrogates			
1.2-Dichloroethane-D4	17060-07-0	62.3	133.9
Toluene-D8	2037-26-5	74.5	124.3
4-Bromofluorobenzene	460-00-4	63.9	118.5
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10.0	67.2
2-Chlorophenol-D4	93951-73-6	29.4	119.5
2.4.6-Tribromophenol	118-79-6	10.0	130.8
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	33.8	130.7
Anthracene-d10	1719-06-8	42.7	126.5
4-Terphenyl-d14	1718-51-0	40.5	142.4
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	60.5	141.2
Toluene-D8	2037-26-5	73.4	126
4-Bromofluorobenzene	460-00-4	59.6	125.3

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

QUALITY CONTROL REPORT

Work Order	: **EP1203954**	Page	: 1 of 16
Client	: **MOBILE DEWATERING**	Laboratory	: Environmental Division Perth
Contact	: INFO	Contact	: Lauren Ockwell
Address	: PO BOX 239 MIDLAND WA, AUSTRALIA 6939	Address	: 10 Hod Way Malaga WA Australia 6090
E-mail	: info@environmentalservices.com.au	E-mail	: lauren.ockwell@alsenviro.com
Telephone	: +61 08 9250 4995	Telephone	: 08 9209 7606
Facsimile	: ----	Facsimile	: 08 9209 7600
Project	: E2012-031	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: Hazelland-LT20 Adelaide St, Ha		
C-O-C number	: E2012-031-001	Date Samples Received	: 18-MAY-2012
Sampler	: D.A+F.T	Issue Date	: 30-MAY-2012
Order number	: ----		
		No. of samples received	: 9
Quote number	: EP/324/12	No. of samples analysed	: 9

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

NATA
WORLD RECOGNISED ACCREDITATION

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Agnes Szilagyi	Senior Organic Chemist	Perth Organics
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Canhuang Ke	Metals Instrument Chemist	Perth Inorganics
Chas Tucker	Inorganic Chemist	Perth Inorganics
Cicelia Bartels	Metals Instrument Chemist	Perth Inorganics
Herman Lin	Laboratory Coordinator	Melbourne Inorganics
Sarah Millington	Senior Inorganic Chemist	Sydney Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA005P: pH by PC Titrator (QC Lot: 2314149)									
EP1203946-003	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.99	8.01	0.2	0% - 20%
EP1203946-012	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	5.46	5.44	0.4	0% - 20%
EA005P: pH by PC Titrator (QC Lot: 2314152)									
EP1203954-003	WRMW3	EA005-P: pH Value	----	0.01	pH Unit	7.41	7.45	0.5	0% - 20%
EP1203955-003	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	6.49	6.55	0.9	0% - 20%
EA010P: Conductivity by PC Titrator (QC Lot: 2314148)									
EP1203946-003	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	1130	1140	1.1	0% - 20%
EP1203946-012	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	90100	90400	0.4	0% - 20%
EA010P: Conductivity by PC Titrator (QC Lot: 2314151)									
EP1203954-003	WRMW3	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	1070	1120	4.2	0% - 20%
EP1203955-003	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	1020	1020	0.3	0% - 20%
EA015: Total Dissolved Solids (QC Lot: 2321314)									
EP1203954-001	WRMW1	EA015H: Total Dissolved Solids @180°C	GIS-210-010	10	mg/L	434	458	5.4	0% - 20%
EP1203954-009	RINSATE	EA015H: Total Dissolved Solids @180°C	GIS-210-010	10	mg/L	<10	<10	0.0	No Limit
EA025: Suspended Solids (QC Lot: 2315144)									
EP1203951-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	75	83	10.1	0% - 50%
EP1203954-008	FIELD	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
EA045: Turbidity (QC Lot: 2315356)									
EP1203951-001	Anonymous	EA045: Turbidity	----	0.1	NTU	66.7	65.4	2.0	0% - 20%
EP1203954-008	FIELD	EA045: Turbidity	----	0.1	NTU	0.1	0.1	0.0	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 2314150)									
EP1203954-003	WRMW3	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	292	293	0.3	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	292	293	0.3	0% - 20%
EP1203955-003	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	54	50	8.8	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	54	50	8.8	0% - 20%
ED038A: Acidity (QC Lot: 2327559)									
EP1203954-001	WRMW1	ED038: Acidity as CaCO3	----	1	mg/L	15	15	0.0	0% - 50%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 2314584)									
EP1203951-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	74	74	0.0	0% - 20%
EP1203954-008	FIELD	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	<1	0.0	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
ED045G: Chloride Discrete analyser (QC Lot: 2314583)									
EP1203951-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	658	655	0.4	0% - 20%
EP1203954-008	FIELD	ED045G: Chloride	16887-00-6	1	mg/L	1	1	0.0	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 2320962)									
EP1203954-001	WRMW1	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.005	0.005	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.005	0.006	0.0	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	0.04	0.04	0.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EP1203999-002	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.192	0.193	0.0	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	0.34	0.36	4.7	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 2318676)									
EP1203954-001	WRMW1	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	0.007	0.006	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.004	0.004	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	0.013	0.013	0.0	0% - 50%
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	0.006	0.007	0.0	No Limit
		EG020A-T: Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.008	0.008	0.0	No Limit
		EG020A-T: Aluminium	7429-90-5	0.01	mg/L	11.1	9.81	12.8	0% - 20%
		EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Iron	7439-89-6	0.05	mg/L	0.29	0.27	9.4	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 2318677)									
EP1203954-001	WRMW1	EG020B-T: Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 2319271)									
EP1203954-001	WRMW1	EG035T: Mercury	7439-97-6	0.0001	mg/L	0.0001	0.0001	0.0	No Limit
EG050F: Dissolved Hexavalent Chromium (QC Lot: 2326861)									

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG050F: Dissolved Hexavalent Chromium (QC Lot: 2326861) - continued									
EP1203954-001	WRMW1	EG050G-F: Hexavalent Chromium	18540-29-9	0.010	mg/L	0.025	<0.010	85.4	No Limit
EP1204000-001	Anonymous	EG050G-F: Hexavalent Chromium	18540-29-9	0.010	mg/L	<0.010	<0.010	0.0	No Limit
EG051G: Ferrous Iron by Discrete Analyser (QC Lot: 2319446)									
EP1203954-001	WRMW1	EG051G: Ferrous Iron	----	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EP1204008-001	Anonymous	EG051G: Ferrous Iron	----	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EK025G: Free cyanide by Discrete Analyser (QC Lot: 2331081)									
EP1203954-001	WRMW1	EK025G: Free Cyanide	----	0.004	mg/L	<0.004	<0.004	0.0	No Limit
EK026G: Total Cyanide By Discrete Analyser (QC Lot: 2327991)									
EP1203954-001	WRMW1	EK026G: Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	0.0	No Limit
EP1204025-002	Anonymous	EK026G: Total Cyanide	57-12-5	0.004	mg/L	0.596	0.542	9.5	0% - 20%
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 2314730)									
EP1203954-001	WRMW1	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.06	0.08	17.0	No Limit
EP1203955-002	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.02	0.02	0.0	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 2314581)									
EP1203951-001	Anonymous	EK057G: Nitrite as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EP1203954-008	FIELD	EK057G: Nitrite as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 2314729)									
EP1203954-001	WRMW1	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	5.18	5.20	0.4	0% - 20%
EP1203955-002	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	1.28	1.28	0.0	0% - 20%
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 2313580)									
EP1203876-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	1.6	1.3	22.4	0% - 50%
EP1203901-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	1.1	1.1	0.0	0% - 50%
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 2313582)									
EP1203954-003	WRMW3	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.3	0.3	0.0	No Limit
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 2313581)									
EP1203954-003	WRMW3	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.24	0.23	0.0	0% - 20%
EK071G: Reactive Phosphorus as P by discrete analyser (QC Lot: 2314582)									
EP1203951-001	Anonymous	EK071G: Reactive Phosphorus as P	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EP1203954-008	FIELD	EK071G: Reactive Phosphorus as P	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK085M: Sulfide as S2- (QC Lot: 2320626)									
EP1203936-001	Anonymous	EK085: Sulfide as S2-	18496-25-8	0.1	mg/L	<0.1	<0.1	0.0	No Limit
EP1203954-004	WRMW4	EK085: Sulfide as S2-	18496-25-8	0.1	mg/L	<0.1	<0.1	0.0	No Limit
EP026ST: Chemical Oxygen Demand (Sealed Tube) (QC Lot: 2317977)									
EP1203954-001	WRMW1	EP026ST: Chemical Oxygen Demand	----	5	mg/L	18	18	0.0	No Limit
ES1212225-011	Anonymous	EP026ST: Chemical Oxygen Demand	----	5	mg/L	11	11	0.0	No Limit
EP030: Biochemical Oxygen Demand (BOD) (QC Lot: 2319873)									
EP1203954-001	WRMW1	EP030: Biochemical Oxygen Demand	----	2	mg/L	<2	4	62.1	No Limit
EP074A: Monocyclic Aromatic Hydrocarbons (QC Lot: 2313529)									

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP074A: Monocyclic Aromatic Hydrocarbons (QC Lot: 2313529) - continued									
EP1203954-001	WRMW1	EP074: Styrene	100-42-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: Isopropylbenzene	98-82-8	5	µg/L	<5	<5	0.0	No Limit
		EP074: n-Propylbenzene	103-65-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.3.5-Trimethylbenzene	108-67-8	5	µg/L	<5	<5	0.0	No Limit
		EP074: sec-Butylbenzene	135-98-8	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2.4-Trimethylbenzene	95-63-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: tert-Butylbenzene	98-06-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: p-Isopropyltoluene	99-87-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: n-Butylbenzene	104-51-8	5	µg/L	<5	<5	0.0	No Limit
EP074B: Oxygenated Compounds (QC Lot: 2313529)									
EP1203954-001	WRMW1	EP074: Vinyl Acetate	108-05-4	50	µg/L	<50	<50	0.0	No Limit
		EP074: 2-Butanone (MEK)	78-93-3	50	µg/L	<50	<50	0.0	No Limit
		EP074: 4-Methyl-2-pentanone (MIBK)	108-10-1	50	µg/L	<50	<50	0.0	No Limit
		EP074: 2-Hexanone (MBK)	591-78-6	50	µg/L	<50	<50	0.0	No Limit
EP074C: Sulfonated Compounds (QC Lot: 2313529)									
EP1203954-001	WRMW1	EP074: Carbon disulfide	75-15-0	5	µg/L	<5	<5	0.0	No Limit
EP074D: Fumigants (QC Lot: 2313529)									
EP1203954-001	WRMW1	EP074: 2.2-Dichloropropane	594-20-7	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dichloropropane	78-87-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: cis-1.3-Dichloropropylene	10061-01-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: trans-1.3-Dichloropropylene	10061-02-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dibromoethane (EDB)	106-93-4	5	µg/L	<5	<5	0.0	No Limit
EP074E: Halogenated Aliphatic Compounds (QC Lot: 2313529)									
EP1203954-001	WRMW1	EP074: 1.1-Dichloroethene	75-35-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: Iodomethane	74-88-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: trans-1.2-Dichloroethene	156-60-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1-Dichloroethane	75-34-3	5	µg/L	<5	<5	0.0	No Limit
		EP074: cis-1.2-Dichloroethene	156-59-2	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1.1-Trichloroethane	71-55-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1-Dichloropropylene	563-58-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: Carbon Tetrachloride	56-23-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dichloroethane	107-06-2	5	µg/L	<5	<5	0.0	No Limit
		EP074: Trichloroethene	79-01-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: Dibromomethane	74-95-3	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1.2-Trichloroethane	79-00-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.3-Dichloropropane	142-28-9	5	µg/L	<5	<5	0.0	No Limit
		EP074: Tetrachloroethene	127-18-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1.1.2-Tetrachloroethane	630-20-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: trans-1.4-Dichloro-2-butene	110-57-6	5	µg/L	<5	<5	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP074E: Halogenated Aliphatic Compounds (QC Lot: 2313529) - continued									
EP1203954-001	WRMW1	EP074: cis-1.4-Dichloro-2-butene	1476-11-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1.2.2-Tetrachloroethane	79-34-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2.3-Trichloropropane	96-18-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: Pentachloroethane	76-01-7	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dibromo-3-chloropropane	96-12-8	5	µg/L	<5	<5	0.0	No Limit
		EP074: Hexachlorobutadiene	87-68-3	5	µg/L	<5	<5	0.0	No Limit
		EP074: Dichlorodifluoromethane	75-71-8	50	µg/L	<50	<50	0.0	No Limit
		EP074: Chloromethane	74-87-3	50	µg/L	<50	<50	0.0	No Limit
		EP074: Vinyl chloride	75-01-4	50	µg/L	<50	<50	0.0	No Limit
		EP074: Bromomethane	74-83-9	50	µg/L	<50	<50	0.0	No Limit
		EP074: Chloroethane	75-00-3	50	µg/L	<50	<50	0.0	No Limit
		EP074: Trichlorofluoromethane	75-69-4	50	µg/L	<50	<50	0.0	No Limit
EP074F: Halogenated Aromatic Compounds (QC Lot: 2313529)									
EP1203954-001	WRMW1	EP074: Chlorobenzene	108-90-7	5	µg/L	<5	<5	0.0	No Limit
		EP074: Bromobenzene	108-86-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 2-Chlorotoluene	95-49-8	5	µg/L	<5	<5	0.0	No Limit
		EP074: 4-Chlorotoluene	106-43-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.3-Dichlorobenzene	541-73-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.4-Dichlorobenzene	106-46-7	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dichlorobenzene	95-50-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2.4-Trichlorobenzene	120-82-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2.3-Trichlorobenzene	87-61-6	5	µg/L	<5	<5	0.0	No Limit
EP074G: Trihalomethanes (QC Lot: 2313529)									
EP1203954-001	WRMW1	EP074: Chloroform	67-66-3	5	µg/L	<5	<5	0.0	No Limit
		EP074: Bromodichloromethane	75-27-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: Dibromochloromethane	124-48-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: Bromoform	75-25-2	5	µg/L	<5	<5	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 2313530)									
EP1203954-001	WRMW1	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 2314149)								
EA005-P: pH Value	----	0.01	pH Unit	----	7.00 pH Unit	100	70	130
EA005P: pH by PC Titrator (QCLot: 2314152)								
EA005-P: pH Value	----	0.01	pH Unit	----	7.00 pH Unit	100	70	130
EA010P: Conductivity by PC Titrator (QCLot: 2314148)								
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	4000 µS/cm	101	93.2	107
EA010P: Conductivity by PC Titrator (QCLot: 2314151)								
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	4000 µS/cm	98.4	93.2	107
EA015: Total Dissolved Solids (QCLot: 2321314)								
EA015H: Total Dissolved Solids @180°C	GIS-210-010	10	mg/L	<10	2000 mg/L	101	79.8	116
EA025: Suspended Solids (QCLot: 2315144)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	104	82	122
EA045: Turbidity (QCLot: 2315356)								
EA045: Turbidity	----	0.1	NTU	<0.1	40 NTU	99.0	90.1	107
ED037P: Alkalinity by PC Titrator (QCLot: 2314150)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	200 mg/L	106	87	109
ED038A: Acidity (QCLot: 2327559)								
ED038: Acidity as CaCO3	----	1	mg/L	----	20 mg/L	108	85	119
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 2314584)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	91.0	85	130
ED045G: Chloride Discrete analyser (QCLot: 2314583)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	1000 mg/L	93.4	78	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 2320962)								
EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.50 mg/L	99.1	77	113
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.100 mg/L	94.6	79	111
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1000 mg/L	104	81	109
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.100 mg/L	98.6	81	109
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.100 mg/L	101	79	109
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.100 mg/L	93.7	79	109
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.10 mg/L	89.3	80	112

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 2320962) - continued								
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.100 mg/L	101	79	113
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.50 mg/L	101	76	112
EG020T: Total Metals by ICP-MS (QCLot: 2318676)								
EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	95.3	78	116
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	94.9	77	109
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	93.3	78	108
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	94.7	80	112
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	96.1	79	111
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	93.3	81	109
EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	94.3	80	112
EG020A-T: Molybdenum	7439-98-7	0.001	mg/L	<0.001	0.1 mg/L	94.4	86	118
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	97.0	80	112
EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	83.5	75	107
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	92.8	74	108
EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	94.6	75	115
EG020T: Total Metals by ICP-MS (QCLot: 2318677)								
EG020B-T: Silver	7440-22-4	0.001	mg/L	<0.001	0.01 mg/L	84.0	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2319271)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.0100 mg/L	108	82.3	118
EG050F: Dissolved Hexavalent Chromium (QCLot: 2326861)								
EG050G-F: Hexavalent Chromium	18540-29-9	0.01	mg/L	<0.010	0.5 mg/L	98.6	90	114
EG051G: Ferrous Iron by Discrete Analyser (QCLot: 2319446)								
EG051G: Ferrous Iron	----	0.05	mg/L	<0.05	2.00 mg/L	96.4	87	111
EK025G: Free cyanide by Discrete Analyser (QCLot: 2331081)								
EK025G: Free Cyanide	----	0.004	mg/L	<0.004	0.20 mg/L	114	64.3	126
EK026G: Total Cyanide By Discrete Analyser (QCLot: 2327991)								
EK026G: Total Cyanide	57-12-5	0.004	mg/L	<0.004	0.500 mg/L	99.2	72	122
EK055G: Ammonia as N by Discrete Analyser (QCLot: 2314730)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1 mg/L	93.6	87.5	124
EK057G: Nitrite as N by Discrete Analyser (QCLot: 2314581)								
EK057G: Nitrite as N	----	0.01	mg/L	<0.01	0.5 mg/L	105	86	124
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 2314729)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	96.6	75.6	124
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 2313580)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	10 mg/L	83.4	70	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 2313582)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	10 mg/L	78.6	70	130

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 2313581)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	92.6	70	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 2314582)								
EK071G: Reactive Phosphorus as P	----	0.01	mg/L	<0.01	0.5 mg/L	101	82	128
EK085M: Sulfide as S2- (QCLot: 2320626)								
EK085: Sulfide as S2-	18496-25-8	0.10	mg/L	<0.1	0.5 mg/L	92.6	82	116
EP026ST: Chemical Oxygen Demand (Sealed Tube) (QCLot: 2317977)								
EP026ST: Chemical Oxygen Demand	----	5	mg/L	<5	500 mg/L	104	88	114
EP030: Biochemical Oxygen Demand (BOD) (QCLot: 2319873)								
EP030: Biochemical Oxygen Demand	----	2	mg/L	<2	198 mg/L	97.3	84	114
EP068A: Organochlorine Pesticides (OC) (QCLot: 2319911)								
EP068: alpha-BHC	319-84-6	0.5	µg/L	<0.5	5 µg/L	81.4	49.9	119
EP068: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	5 µg/L	74.1	38.7	125
EP068: beta-BHC	319-85-7	0.5	µg/L	<0.5	5 µg/L	79.4	48.1	121
EP068: gamma-BHC	58-89-9	0.5	µg/L	<0.5	5 µg/L	83.7	50.1	119
EP068: delta-BHC	319-86-8	0.5	µg/L	<0.5	5 µg/L	81.3	51.2	127
EP068: Heptachlor	76-44-8	0.5	µg/L	<0.5	5 µg/L	84.5	45.5	130
EP068: Aldrin	309-00-2	0.5	µg/L	<0.5	5 µg/L	90.3	48.2	126
EP068: Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	5 µg/L	86.7	51.9	126
EP068: trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	5 µg/L	86.6	51.9	126
EP068: alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	5 µg/L	89.6	53.9	125
EP068: cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	5 µg/L	87.0	52.3	126
EP068: Dieldrin	60-57-1	0.5	µg/L	<0.5	5 µg/L	90.6	52.6	127
EP068: 4.4`-DDE	72-55-9	0.5	µg/L	<0.5	5 µg/L	89.1	51.9	126
EP068: Endrin	72-20-8	0.5	µg/L	<0.5	5 µg/L	68.7	50.4	132
EP068: beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	5 µg/L	90.6	53.6	126
EP068: 4.4`-DDD	72-54-8	0.5	µg/L	<0.5	5 µg/L	87.2	53.6	124
EP068: Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	5 µg/L	112	48.3	139
EP068: Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	5 µg/L	84.8	50	128
EP068: 4.4`-DDT	50-29-3	2.0	µg/L	<2	5 µg/L	101	41.8	135
EP068: Endrin ketone	53494-70-5	0.5	µg/L	<0.5	5 µg/L	103	52.3	127
EP068: Methoxychlor	72-43-5	2.0	µg/L	<2	5 µg/L	112	40.5	133
EP068B: Organophosphorus Pesticides (OP) (QCLot: 2319911)								
EP068: Dichlorvos	62-73-7	0.5	µg/L	<0.5	5 µg/L	65.7	42	124
EP068: Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	5 µg/L	59.8	34.6	125
EP068: Monocrotophos	6923-22-4	2.0	µg/L	<2	5 µg/L	19.2	14.2	51.8
EP068: Dimethoate	60-51-5	0.5	µg/L	<0.5	5 µg/L	60.0	32.6	110
EP068: Diazinon	333-41-5	0.5	µg/L	<0.5	5 µg/L	84.6	50.3	127
EP068: Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	5 µg/L	76.0	53	125

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP068B: Organophosphorus Pesticides (OP) (QCLot: 2319911) - continued								
EP068: Parathion-methyl	298-00-0	2.0	µg/L	<2	5 µg/L	76.1	47.4	128
EP068: Malathion	121-75-5	0.5	µg/L	<0.5	5 µg/L	77.9	46.6	133
EP068: Fenthion	55-38-9	0.5	µg/L	<0.5	5 µg/L	82.2	51.2	125
EP068: Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	5 µg/L	82.6	51.9	127
EP068: Parathion	56-38-2	2.0	µg/L	<2	5 µg/L	77.2	38.8	142
EP068: Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	5 µg/L	77.5	48	127
EP068: Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	5 µg/L	74.2	43.7	137
EP068: Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	5 µg/L	81.7	51.1	130
EP068: Fenamiphos	22224-92-6	0.5	µg/L	<0.5	5 µg/L	84.8	36.7	137
EP068: Prothiofos	34643-46-4	0.5	µg/L	<0.5	5 µg/L	81.2	51.3	126
EP068: Ethion	563-12-2	0.5	µg/L	<0.5	5 µg/L	79.4	51.1	127
EP068: Carbophenothion	786-19-6	0.5	µg/L	<0.5	5 µg/L	88.5	50.8	127
EP068: Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	5 µg/L	97.5	18.8	140
EP074A: Monocyclic Aromatic Hydrocarbons (QCLot: 2313529)								
EP074: Styrene	100-42-5	5	µg/L	<5	10 µg/L	112	80.8	117
EP074: Isopropylbenzene	98-82-8	5	µg/L	<5	10 µg/L	105	78	118
EP074: n-Propylbenzene	103-65-1	5	µg/L	<5	10 µg/L	104	77.9	120
EP074: 1.3.5-Trimethylbenzene	108-67-8	5	µg/L	<5	10 µg/L	100	77	121
EP074: sec-Butylbenzene	135-98-8	5	µg/L	<5	10 µg/L	104	74	120
EP074: 1.2.4-Trimethylbenzene	95-63-6	5	µg/L	<5	10 µg/L	105	77	117
EP074: tert-Butylbenzene	98-06-6	5	µg/L	<5	10 µg/L	103	78.6	119
EP074: p-Isopropyltoluene	99-87-6	5	µg/L	<5	10 µg/L	104	76.6	121
EP074: n-Butylbenzene	104-51-8	5	µg/L	<5	10 µg/L	103	73.8	123
EP074B: Oxygenated Compounds (QCLot: 2313529)								
EP074: Vinyl Acetate	108-05-4	50	µg/L	<50	100 µg/L	99.7	67	127
EP074: 2-Butanone (MEK)	78-93-3	50	µg/L	<50	100 µg/L	97.3	62	134
EP074: 4-Methyl-2-pentanone (MIBK)	108-10-1	50	µg/L	<50	100 µg/L	104	74.9	122
EP074: 2-Hexanone (MBK)	591-78-6	50	µg/L	<50	100 µg/L	110	74.6	120
EP074C: Sulfonated Compounds (QCLot: 2313529)								
EP074: Carbon disulfide	75-15-0	5	µg/L	<5	10 µg/L	107	68.4	134
EP074D: Fumigants (QCLot: 2313529)								
EP074: 2.2-Dichloropropane	594-20-7	5	µg/L	<5	10 µg/L	109	67	137
EP074: 1.2-Dichloropropane	78-87-5	5	µg/L	<5	10 µg/L	104	77.4	121
EP074: cis-1.3-Dichloropropylene	10061-01-5	5	µg/L	<5	10 µg/L	101	68	128
EP074: trans-1.3-Dichloropropylene	10061-02-6	5	µg/L	<5	10 µg/L	114	71.7	127
EP074: 1.2-Dibromoethane (EDB)	106-93-4	5	µg/L	<5	10 µg/L	99.8	77.9	118
EP074E: Halogenated Aliphatic Compounds (QCLot: 2313529)								
EP074: Dichlorodifluoromethane	75-71-8	50	µg/L	<50	100 µg/L	103	63	143

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High
EP074E: Halogenated Aliphatic Compounds (QCLot: 2313529) - continued								
EP074: Chloromethane	74-87-3	50	µg/L	<50	100 µg/L	105	72.1	125
EP074: Vinyl chloride	75-01-4	50	µg/L	<50	100 µg/L	103	71	131
EP074: Bromomethane	74-83-9	50	µg/L	<50	100 µg/L	87.3	63	137
EP074: Chloroethane	75-00-3	50	µg/L	<50	100 µg/L	108	65	135
EP074: Trichlorofluoromethane	75-69-4	50	µg/L	<50	100 µg/L	107	75	135
EP074: 1.1-Dichloroethene	75-35-4	5	µg/L	<5	10 µg/L	106	67	135
EP074: Iodomethane	74-88-4	5	µg/L	<5	10 µg/L	82.3	49	111
EP074: trans-1.2-Dichloroethene	156-60-5	5	µg/L	<5	10 µg/L	109	72	128
EP074: 1.1-Dichloroethane	75-34-3	5	µg/L	<5	10 µg/L	106	76.1	126
EP074: cis-1.2-Dichloroethene	156-59-2	5	µg/L	<5	10 µg/L	105	80.7	118
EP074: 1.1.1-Trichloroethane	71-55-6	5	µg/L	<5	10 µg/L	105	67	131
EP074: 1.1-Dichloropropylene	563-58-6	5	µg/L	<5	10 µg/L	106	72	124
EP074: Carbon Tetrachloride	56-23-5	5	µg/L	<5	10 µg/L	105	69	137
EP074: 1.2-Dichloroethane	107-06-2	5	µg/L	<5	10 µg/L	101	75.3	124
EP074: Trichloroethene	79-01-6	5	µg/L	<5	10 µg/L	103	75	125
EP074: Dibromomethane	74-95-3	5	µg/L	<5	10 µg/L	107	78.8	118
EP074: 1.1.2-Trichloroethane	79-00-5	5	µg/L	<5	10 µg/L	101	79.6	118
EP074: 1.3-Dichloropropane	142-28-9	5	µg/L	<5	10 µg/L	91.7	76	116
EP074: Tetrachloroethene	127-18-4	5	µg/L	<5	10 µg/L	100	74	122
EP074: 1.1.1.2-Tetrachloroethane	630-20-6	5	µg/L	<5	----	----	----	----
EP074: trans-1.4-Dichloro-2-butene	110-57-6	5	µg/L	<5	10 µg/L	112	39	149
EP074: cis-1.4-Dichloro-2-butene	1476-11-5	5	µg/L	<5	10 µg/L	107	63.4	135
EP074: 1.1.2.2-Tetrachloroethane	79-34-5	5	µg/L	<5	10 µg/L	94.8	79.6	117
EP074: 1.2.3-Trichloropropane	96-18-4	5	µg/L	<5	10 µg/L	113	66	114
EP074: Pentachloroethane	76-01-7	5	µg/L	<5	10 µg/L	107	60	138
EP074: 1.2-Dibromo-3-chloropropane	96-12-8	5	µg/L	<5	10 µg/L	102	69.2	129
EP074: Hexachlorobutadiene	87-68-3	5	µg/L	<5	10 µg/L	117	73	129
EP074F: Halogenated Aromatic Compounds (QCLot: 2313529)								
EP074: Chlorobenzene	108-90-7	5	µg/L	<5	10 µg/L	97.7	81.4	115
EP074: Bromobenzene	108-86-1	5	µg/L	<5	10 µg/L	100	78.6	119
EP074: 2-Chlorotoluene	95-49-8	5	µg/L	<5	10 µg/L	104	81.2	117
EP074: 4-Chlorotoluene	106-43-4	5	µg/L	<5	10 µg/L	100	79	117
EP074: 1.3-Dichlorobenzene	541-73-1	5	µg/L	<5	10 µg/L	105	78	120
EP074: 1.4-Dichlorobenzene	106-46-7	5	µg/L	<5	10 µg/L	102	77.4	122
EP074: 1.2-Dichlorobenzene	95-50-1	5	µg/L	<5	10 µg/L	99.0	81.3	116
EP074: 1.2.4-Trichlorobenzene	120-82-1	5	µg/L	<5	10 µg/L	110	69.9	126
EP074: 1.2.3-Trichlorobenzene	87-61-6	5	µg/L	<5	10 µg/L	103	69	125
EP074G: Trihalomethanes (QCLot: 2313529)								
EP074: Chloroform	67-66-3	5	µg/L	<5	10 µg/L	104	80.2	120

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High
EP074G: Trihalomethanes (QCLot: 2313529) - continued								
EP074: Bromodichloromethane	75-27-4	5	µg/L	<5	10 µg/L	103	74	130
EP074: Dibromochloromethane	124-48-1	5	µg/L	<5	10 µg/L	102	62	136
EP074: Bromoform	75-25-2	5	µg/L	<5	10 µg/L	100	65	131
EP075(SIM)A: Phenolic Compounds (QCLot: 2319913)								
EP075(SIM): Phenol	108-95-2	1	µg/L	<1.0	25 µg/L	18.4	17.6	57
EP075(SIM): 2-Chlorophenol	95-57-8	1	µg/L	<1.0	25 µg/L	40.7	37.6	118
EP075(SIM): 2-Methylphenol	95-48-7	1	µg/L	<1.0	25 µg/L	# 35.1	35.2	105
EP075(SIM): 3- & 4-Methylphenol	1319-77-3	2	µg/L	<2.0	50 µg/L	33.9	31.2	97.4
EP075(SIM): 2-Nitrophenol	88-75-5	1	µg/L	<1.0	25 µg/L	47.7	34.8	137
EP075(SIM): 2.4-Dimethylphenol	105-67-9	1	µg/L	<1.0	25 µg/L	# 35.1	38.2	126
EP075(SIM): 2.4-Dichlorophenol	120-83-2	1	µg/L	<1.0	25 µg/L	46.5	41.4	128
EP075(SIM): 2.6-Dichlorophenol	87-65-0	1	µg/L	<1.0	25 µg/L	50.8	44.1	122
EP075(SIM): 4-Chloro-3-Methylphenol	59-50-7	1	µg/L	<1.0	25 µg/L	54.7	41.4	117
EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	1	µg/L	<1.0	25 µg/L	52.4	41.3	125
EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	1	µg/L	<1.0	25 µg/L	63.1	41.3	125
EP075(SIM): Pentachlorophenol	87-86-5	2	µg/L	<2.0	25 µg/L	53.3	21.3	145
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2319913)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	25 µg/L	50.4	29.5	123
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	25 µg/L	55.2	41.4	127
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	25 µg/L	53.9	41.6	126
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	25 µg/L	56.6	48.9	126
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	25 µg/L	56.2	54.4	124
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	25 µg/L	57.9	53.1	125
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	25 µg/L	57.5	53.2	127
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	25 µg/L	59.8	54.1	126
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	25 µg/L	57.9	52	127
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	25 µg/L	84.4	55.4	127
EP075(SIM): Benzo(b)fluoranthene	205-99-2	1	µg/L	<1.0	25 µg/L	62.2	45.6	130
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	25 µg/L	73.4	48.9	128
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	25 µg/L	65.5	50.9	124
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	25 µg/L	60.6	47.4	127
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	25 µg/L	72.4	47.2	128
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	25 µg/L	76.4	47.7	127
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2313530)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	320 µg/L	96.7	74.2	142
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2319912)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	400 µg/L	98.1	44.5	122
EP071: C15 - C28 Fraction	----	100	µg/L	<100	400 µg/L	92.8	55.1	143

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2319912) - continued								
EP071: C29 - C36 Fraction	----	50	µg/L	<50	400 µg/L	77.9	53.6	128

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 2314584)							
EP1203951-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	91.1	70	130
ED045G: Chloride Discrete analyser (QCLot: 2314583)							
EP1203951-001	Anonymous	ED045G: Chloride	16887-00-6	250 mg/L	95.4	70	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 2320962)							
EP1203954-002	WRMW2	EG020A-F: Arsenic	7440-38-2	0.200 mg/L	99.3	70	130
		EG020A-F: Cadmium	7440-43-9	0.0500 mg/L	102	70	130
		EG020A-F: Chromium	7440-47-3	0.200 mg/L	94.8	70	130
		EG020A-F: Manganese	7439-96-5	0.200 mg/L	96.2	70	130
		EG020A-F: Nickel	7440-02-0	0.200 mg/L	93.2	70	130
		EG020A-F: Zinc	7440-66-6	0.200 mg/L	98.1	70	130
EG020T: Total Metals by ICP-MS (QCLot: 2318676)							
EP1203954-002	WRMW2	EG020A-T: Arsenic	7440-38-2	1.00 mg/L	86.2	70	130
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	98.9	70	130
		EG020A-T: Chromium	7440-47-3	1.00 mg/L	100	70	130
		EG020A-T: Copper	7440-50-8	1.00 mg/L	92.6	70	130
		EG020A-T: Lead	7439-92-1	1.00 mg/L	105	70	130
		EG020A-T: Manganese	7439-96-5	1.00 mg/L	101	70	130
		EG020A-T: Nickel	7440-02-0	1.00 mg/L	93.9	70	130
		EG020A-T: Zinc	7440-66-6	1.00 mg/L	93.7	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2319271)							
EP1203954-002	WRMW2	EG035T: Mercury	7439-97-6	0.0100 mg/L	102	70	130
EG050F: Dissolved Hexavalent Chromium (QCLot: 2326861)							
EP1203954-001	WRMW1	EG050G-F: Hexavalent Chromium	18540-29-9	0.5 mg/L	108	70	130
EG051G: Ferrous Iron by Discrete Analyser (QCLot: 2319446)							
EP1203954-001	WRMW1	EG051G: Ferrous Iron	----	2.5 mg/L	102	70	130
EK025G: Free cyanide by Discrete Analyser (QCLot: 2331081)							
EP1203954-002	WRMW2	EK025G: Free Cyanide	----	0.3 mg/L	# 10.0	70	130
EK026G: Total Cyanide By Discrete Analyser (QCLot: 2327991)							
EP1203954-002	WRMW2	EK026G: Total Cyanide	57-12-5	0.500 mg/L	106	70	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 2314730)							
EP1203954-001	WRMW1	EK055G: Ammonia as N	7664-41-7	1.00 mg/L	106	70	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 2314581)							
EP1203951-001	Anonymous	EK057G: Nitrite as N	----	0.6 mg/L	89.7	70	130

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report Spike Concentration	Spike Recovery (%) MS	Recovery Limits (%) Low	High
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 2314729)							
EP1203954-001	WRMW1	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	# Not Determined	70	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 2313580)							
EP1203876-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	5.0 mg/L	71.9	70	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 2313582)							
EP1203954-003	WRMW3	EK061G: Total Kjeldahl Nitrogen as N	----	5.0 mg/L	86.8	70	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 2313581)							
EP1203954-003	WRMW3	EK067G: Total Phosphorus as P	----	1 mg/L	120	70	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 2314582)							
EP1203951-001	Anonymous	EK071G: Reactive Phosphorus as P	----	0.5 mg/L	102	70	130
EP026ST: Chemical Oxygen Demand (Sealed Tube) (QCLot: 2317977)							
EP1203954-001	WRMW1	EP026ST: Chemical Oxygen Demand	----	143 mg/L	94.5	70	130
EP074E: Halogenated Aliphatic Compounds (QCLot: 2313529)							
EP1203954-002	WRMW2	EP074: 1.1-Dichloroethene	75-35-4	20 µg/L	103	73.7	126
		EP074: Trichloroethene	79-01-6	20 µg/L	86.0	79.1	120
EP074F: Halogenated Aromatic Compounds (QCLot: 2313529)							
EP1203954-002	WRMW2	EP074: Chlorobenzene	108-90-7	20 µg/L	91.2	81.4	115
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2313530)							
EP1203954-002	WRMW2	EP080: C6 - C9 Fraction	----	280 µg/L	83.1	77.0	137

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **EP1203954**	Page	: 1 of 16
Client	: MOBILE DEWATERING	Laboratory	: Environmental Division Perth
Contact	: INFO	Contact	: Lauren Ockwell
Address	: PO BOX 239 MIDLAND WA, AUSTRALIA 6939	Address	: 10 Hod Way Malaga WA Australia 6090
E-mail	: info@environmentalservices.com.au	E-mail	: lauren.ockwell@alsenviro.com
Telephone	: +61 08 9250 4995	Telephone	: 08 9209 7606
Facsimile	: ----	Facsimile	: 08 9209 7600
Project	: E2012-031	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: Hazelland-LT20 Adelaide St, Ha		
C-O-C number	: E2012-031-001	Date Samples Received	: 18-MAY-2012
Sampler	: D.A+F.T	Issue Date	: 30-MAY-2012
Order number	: ----		
		No. of samples received	: 9
Quote number	: EP/324/12	No. of samples analysed	: 9

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non-volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural								
WRMW1,	WRMW2,	**18-MAY-2012**	---	18-MAY-2012	----	**21-MAY-2012**	18-MAY-2012	×
WRMW3,	WRMW4,							
WRMW5,	WRMW6,							
DUP,	FIELD,							
RINSATE								
EA010P: Conductivity by PC Titrator								
Clear Plastic Bottle - Natural								
WRMW1,	WRMW2,	**18-MAY-2012**	---	15-JUN-2012	----	**21-MAY-2012**	15-JUN-2012	✓
WRMW3,	WRMW4,							
WRMW5,	WRMW6,							
DUP,	FIELD,							
RINSATE								
EA015: Total Dissolved Solids								
Clear Plastic Bottle - Natural								
WRMW1,	WRMW2,	**18-MAY-2012**	----	----	----	**24-MAY-2012**	25-MAY-2012	✓
WRMW3,	WRMW4,							
WRMW5,	WRMW6,							
DUP,	FIELD,							
RINSATE								
EA025: Suspended Solids								
Clear Plastic Bottle - Natural								
WRMW1,	WRMW2,	**18-MAY-2012**	----	----	----	**21-MAY-2012**	25-MAY-2012	✓
WRMW3,	WRMW4,							
WRMW5,	WRMW6,							
DUP,	FIELD,							
RINSATE								
EA045: Turbidity								
Clear Plastic Bottle - Natural								
WRMW1,	WRMW2,	**18-MAY-2012**	----	----	----	**22-MAY-2012**	20-MAY-2012	×
WRMW3,	WRMW4,							
WRMW5,	WRMW6,							
DUP,	FIELD,							
RINSATE								

Work Order : EP1203954
Client : MOBILE DEWATERING
Project : E2012-031

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural WRMW1, WRMW2, WRMW3, WRMW4, WRMW5, WRMW6, DUP, FIELD, RINSATE	**18-MAY-2012**	---	01-JUN-2012	----	**21-MAY-2012**	01-JUN-2012	✓
ED038A: Acidity							
Clear Plastic Bottle - Natural WRMW1, WRMW2, WRMW3, WRMW4, WRMW5, WRMW6, DUP, FIELD, RINSATE	**18-MAY-2012**	----	----	----	**29-MAY-2012**	01-JUN-2012	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural WRMW1, WRMW2, WRMW3, WRMW4, WRMW5, WRMW6, DUP, FIELD, RINSATE	**18-MAY-2012**	---	15-JUN-2012	----	**18-MAY-2012**	15-JUN-2012	✓
ED045G: Chloride Discrete analyser							
Clear Plastic Bottle - Natural WRMW1, WRMW2, WRMW3, WRMW4, WRMW5, WRMW6, DUP, FIELD, RINSATE	**18-MAY-2012**	---	15-JUN-2012	----	**18-MAY-2012**	15-JUN-2012	✓
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Filtered; Lab-acidified WRMW1, WRMW2, WRMW3, WRMW4, WRMW5, WRMW6, DUP, FIELD, RINSATE	**18-MAY-2012**	---	14-NOV-2012	----	**25-MAY-2012**	14-NOV-2012	✓
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Unfiltered; Lab-acidified WRMW1, WRMW2, WRMW3, WRMW4, WRMW5, WRMW6, DUP, FIELD, RINSATE	**18-MAY-2012**	**24-MAY-2012**	14-NOV-2012	✓	**24-MAY-2012**	14-NOV-2012	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation
EG035T: Total Recoverable Mercury by FIMS								
Clear Plastic Bottle - Unfiltered; Lab-acidified								
WRMW1,	WRMW2,	**18-MAY-2012**	**----**	----	----	**24-MAY-2012**	15-JUN-2012	✓
WRMW3,	WRMW4,							
WRMW5,	WRMW6,							
DUP,	FIELD,							
RINSATE								
EG050F: Dissolved Hexavalent Chromium								
Clear Plastic Bottle - NaOH								
WRMW1,	WRMW2,	**18-MAY-2012**	**----**	----	----	**29-MAY-2012**	15-JUN-2012	✓
WRMW3,	WRMW4,							
WRMW5,	WRMW6,							
DUP,	FIELD,							
RINSATE								
EG051G: Ferrous Iron by Discrete Analyser								
Clear Plastic Bottle - HCl - Filtered								
WRMW1,	WRMW2,	**18-MAY-2012**	**----**	----	----	**23-MAY-2012**	25-MAY-2012	✓
WRMW3,	WRMW4,							
WRMW5,	WRMW6,							
DUP,	FIELD,							
RINSATE								
EK025G: Free cyanide by Discrete Analyser								
White Plastic Bottle-NaOH								
WRMW1,	WRMW2,	**18-MAY-2012**	**30-MAY-2012**	01-JUN-2012	✓	**30-MAY-2012**	01-JUN-2012	✓
WRMW3,	WRMW4,							
WRMW5,	WRMW6,							
DUP,	FIELD,							
RINSATE								
EK026G: Total Cyanide By Discrete Analyser								
White Plastic Bottle-NaOH								
WRMW1,	WRMW2,	**18-MAY-2012**	**30-MAY-2012**	01-JUN-2012	✓	**30-MAY-2012**	01-JUN-2012	✓
WRMW3,	WRMW4,							
WRMW5,	WRMW6,							
DUP,	FIELD,							
RINSATE								
EK055G: Ammonia as N by Discrete Analyser								
Clear Plastic Bottle - Sulphuric Acid								
WRMW1,	WRMW2,	**18-MAY-2012**	**---**	15-JUN-2012	----	**18-MAY-2012**	15-JUN-2012	✓
WRMW3,	WRMW4,							
WRMW5,	WRMW6,							
DUP,	FIELD,							
RINSATE								

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)		Sample Date	Extraction / Preparation Date extracted	Due for extraction	Evaluation	Analysis Date analysed	Due for analysis	Evaluation
EK057G: Nitrite as N by Discrete Analyser								
Clear Plastic Bottle - Natural WRMW1, WRMW3, WRMW5, DUP, RINSATE	WRMW2, WRMW4, WRMW6, FIELD,	**18-MAY-2012**	---	20-MAY-2012	----	**18-MAY-2012**	20-MAY-2012	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Clear Plastic Bottle - Sulphuric Acid WRMW1, WRMW3, WRMW5, DUP, RINSATE	WRMW2, WRMW4, WRMW6, FIELD,	**18-MAY-2012**	---	15-JUN-2012	----	**18-MAY-2012**	15-JUN-2012	✓
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Clear Plastic Bottle - Sulphuric Acid WRMW1, WRMW3, WRMW5, DUP, RINSATE	WRMW2, WRMW4, WRMW6, FIELD,	**18-MAY-2012**	**22-MAY-2012**	15-JUN-2012	✓	**22-MAY-2012**	15-JUN-2012	✓
EK067G: Total Phosphorus as P by Discrete Analyser								
Clear Plastic Bottle - Sulphuric Acid WRMW1, WRMW3, WRMW5, DUP, RINSATE	WRMW2, WRMW4, WRMW6, FIELD,	**18-MAY-2012**	**22-MAY-2012**	15-JUN-2012	✓	**22-MAY-2012**	15-JUN-2012	✓
EK071G: Reactive Phosphorus as P by discrete analyser								
Clear Plastic Bottle - Natural WRMW1, WRMW3, WRMW5, DUP, RINSATE	WRMW2, WRMW4, WRMW6, FIELD,	**18-MAY-2012**	---	20-MAY-2012	----	**18-MAY-2012**	20-MAY-2012	✓
EK085M: Sulfide as S2-								
Clear Plastic Bottle - Zinc Acetate/NaOH WRMW1, WRMW3, WRMW5, DUP, RINSATE	WRMW2, WRMW4, WRMW6, FIELD,	**18-MAY-2012**	----	----	----	**24-MAY-2012**	25-MAY-2012	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation
EP026ST: Chemical Oxygen Demand (Sealed Tube)								
Clear Plastic Bottle - Sulfuric Acid								
WRMW1,	WRMW2,	**18-MAY-2012**	**----**	----	----	**23-MAY-2012**	15-JUN-2012	✓
WRMW3,	WRMW4,							
WRMW5,	WRMW6,							
DUP,	FIELD,							
RINSATE								
EP030: Biochemical Oxygen Demand (BOD)								
Clear Plastic Bottle - Natural								
WRMW1,	WRMW2,	**18-MAY-2012**	**----**	----	----	**23-MAY-2012**	20-MAY-2012	×
WRMW3,	WRMW4,							
WRMW5,	WRMW6,							
DUP,	FIELD,							
RINSATE								
EP068A: Organochlorine Pesticides (OC)								
Amber Glass Bottle - Unpreserved								
WRMW1,	WRMW2,	**18-MAY-2012**	**24-MAY-2012**	25-MAY-2012	✓	**25-MAY-2012**	03-JUL-2012	✓
WRMW3,	WRMW4,							
WRMW5,	WRMW6,							
DUP,	FIELD,							
RINSATE								
EP068B: Organophosphorus Pesticides (OP)								
Amber Glass Bottle - Unpreserved								
WRMW1,	WRMW2,	**18-MAY-2012**	**24-MAY-2012**	25-MAY-2012	✓	**25-MAY-2012**	03-JUL-2012	✓
WRMW3,	WRMW4,							
WRMW5,	WRMW6,							
DUP,	FIELD,							
RINSATE								
EP074A: Monocyclic Aromatic Hydrocarbons								
Amber VOC Vial - HCl								
WRMW1,	WRMW2,	**18-MAY-2012**	**21-MAY-2012**	01-JUN-2012	✓	**21-MAY-2012**	01-JUN-2012	✓
WRMW3,	WRMW4,							
WRMW5,	WRMW6,							
DUP,	FIELD,							
RINSATE								
EP074B: Oxygenated Compounds								
Amber VOC Vial - HCl								
WRMW1,	WRMW2,	**18-MAY-2012**	**21-MAY-2012**	01-JUN-2012	✓	**21-MAY-2012**	01-JUN-2012	✓
WRMW3,	WRMW4,							
WRMW5,	WRMW6,							
DUP,	FIELD,							
RINSATE								

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation
EP074C: Sulfonated Compounds							
Amber VOC Vial - HCl WRMW1, WRMW2, WRMW3, WRMW4, WRMW5, WRMW6, DUP, FIELD, RINSATE	**18-MAY-2012**	**21-MAY-2012**	01-JUN-2012	✓	**21-MAY-2012**	01-JUN-2012	✓
EP074D: Fumigants							
Amber VOC Vial - HCl WRMW1, WRMW2, WRMW3, WRMW4, WRMW5, WRMW6, DUP, FIELD, RINSATE	**18-MAY-2012**	**21-MAY-2012**	01-JUN-2012	✓	**21-MAY-2012**	01-JUN-2012	✓
EP074E: Halogenated Aliphatic Compounds							
Amber VOC Vial - HCl WRMW1, WRMW2, WRMW3, WRMW4, WRMW5, WRMW6, DUP, FIELD, RINSATE	**18-MAY-2012**	**21-MAY-2012**	01-JUN-2012	✓	**21-MAY-2012**	01-JUN-2012	✓
EP074F: Halogenated Aromatic Compounds							
Amber VOC Vial - HCl WRMW1, WRMW2, WRMW3, WRMW4, WRMW5, WRMW6, DUP, FIELD, RINSATE	**18-MAY-2012**	**21-MAY-2012**	01-JUN-2012	✓	**21-MAY-2012**	01-JUN-2012	✓
EP074G: Trihalomethanes							
Amber VOC Vial - HCl WRMW1, WRMW2, WRMW3, WRMW4, WRMW5, WRMW6, DUP, FIELD, RINSATE	**18-MAY-2012**	**21-MAY-2012**	01-JUN-2012	✓	**21-MAY-2012**	01-JUN-2012	✓
EP075(SIM)A: Phenolic Compounds							
Amber Glass Bottle - Unpreserved WRMW1, WRMW2, WRMW3, WRMW4, WRMW5, WRMW6, DUP, FIELD, RINSATE	**18-MAY-2012**	**24-MAY-2012**	25-MAY-2012	✓	**25-MAY-2012**	03-JUL-2012	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Amber Glass Bottle - Unpreserved WRMW1, WRMW3, WRMW5, DUP, RINSATE	WRMW2, WRMW4, WRMW6, FIELD,	**18-MAY-2012**	**24-MAY-2012**	25-MAY-2012	✓	**25-MAY-2012**	03-JUL-2012	✓
EP080/071: Total Petroleum Hydrocarbons								
Amber Glass Bottle - Unpreserved WRMW1, WRMW3, WRMW5, DUP, RINSATE	WRMW2, WRMW4, WRMW6, FIELD,	**18-MAY-2012**	**24-MAY-2012**	25-MAY-2012	✓	**25-MAY-2012**	03-JUL-2012	✓
Amber VOC Vial - HCl WRMW1, WRMW3, WRMW5, DUP, RINSATE	WRMW2, WRMW4, WRMW6, FIELD,	**18-MAY-2012**	**21-MAY-2012**	01-JUN-2012	✓	**21-MAY-2012**	01-JUN-2012	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Acidity as Calcium Carbonate	ED038	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Alkalinity by PC Titrator	ED037-P	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ammonia as N by Discrete analyser	EK055G	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Biochemical Oxygen Demand (BOD)	EP030	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chemical Oxygen Demand (Sealed Tube)	EP026ST	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	4	40	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	18	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ferrous Iron by Discrete Analyser	EG051G	2	19	**10.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Free CN by Discrete Analyser	EK025G	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Hexavalent Chromium by Discrete Analyser - Dissolved	EG050G-F	2	17	**11.8**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	2	19	**10.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
pH by PC Titrator	EA005-P	4	40	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P-By Discrete Analyser	EK071G	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Sulfide as S2-	EK085	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	2	12	**16.7**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Cyanide By Discrete Analyser	EK026G	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids (High Level)	EA015H	2	9	**22.2**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	3	27	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite B	EG020B-T	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	1	14	**7.1**	**10.0**	✗	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Turbidity	EA045	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Volatile Organic Compounds	EP074	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Acidity as Calcium Carbonate	ED038	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Alkalinity by PC Titrator	ED037-P	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ammonia as N by Discrete analyser	EK055G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Biochemical Oxygen Demand (BOD)	EP030	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chemical Oxygen Demand (Sealed Tube)	EP026ST	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	2	40	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ferrous Iron by Discrete Analyser	EG051G	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Free CN by Discrete Analyser	EK025G	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Control Samples (LCS) - Continued							
Hexavalent Chromium by Discrete Analyser - Dissolved	EG050G-F	1	17	**5.9**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
pH by PC Titrator	EA005-P	4	40	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Sulfide as S2-	EK085	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	1	12	**8.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Cyanide By Discrete Analyser	EK026G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids (High Level)	EA015H	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	4	27	**14.8**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite B	EG020B-T	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	2	14	**14.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Turbidity	EA045	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Volatile Organic Compounds	EP074	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ammonia as N by Discrete analyser	EK055G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Biochemical Oxygen Demand (BOD)	EP030	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chemical Oxygen Demand (Sealed Tube)	EP026ST	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	2	40	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ferrous Iron by Discrete Analyser	EG051G	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Free CN by Discrete Analyser	EK025G	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Hexavalent Chromium by Discrete Analyser - Dissolved	EG050G-F	1	17	**5.9**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Sulfide as S2-	EK085	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	1	12	**8.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Cyanide By Discrete Analyser	EK026G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids (High Level)	EA015H	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	27	**7.4**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
Total Mercury by FIMS	EG035T	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite B	EG020B-T	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Turbidity	EA045	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Volatile Organic Compounds	EP074	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Chemical Oxygen Demand (Sealed Tube)	EP026ST	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	18	**5.6**	**5.0**	✓	ALS QCS3 requirement
Ferrous Iron by Discrete Analyser	EG051G	1	19	**5.3**	**5.0**	✓	ALS QCS3 requirement
Free CN by Discrete Analyser	EK025G	1	9	**11.1**	**5.0**	✓	ALS QCS3 requirement
Hexavalent Chromium by Discrete Analyser - Dissolved	EG050G-F	1	17	**5.9**	**5.0**	✓	ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	1	19	**5.3**	**5.0**	✓	ALS QCS3 requirement
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Total Cyanide By Discrete Analyser	EK026G	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	27	**7.4**	**5.0**	✓	ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	9	**11.1**	**5.0**	✓	ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	1	9	**11.1**	**5.0**	✓	ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	1	14	**7.1**	**5.0**	✓	ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	9	**11.1**	**5.0**	✓	ALS QCS3 requirement
Volatile Organic Compounds	EP074	1	9	**11.1**	**5.0**	✓	ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	APHA 21st ed. 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Conductivity by PC Titrator	EA010-P	WATER	APHA 21st ed., 2510 B This procedure determines conductivity by automated ISE. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Dissolved Solids (High Level)	EA015H	WATER	In-House, APHA 21st ed., 2540C A gravimetric procedure that determines the amount of \`filterable\` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Suspended Solids (High Level)	EA025H	WATER	In-House, APHA 21st ed., 2540D A gravimetric procedure employed to determine the amount of \`non-filterable\` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Turbidity	EA045	WATER	APHA 21st ed., 2130 B. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Alkalinity by PC Titrator	ED037-P	WATER	APHA 21st ed., 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Acidity as Calcium Carbonate	ED038	WATER	APHA 21st ed., 2310 B Acidity is determined by titration with a standardised alkali to an end-point pH of 8.3. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	APHA 21st ed., 4500-SO4 Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Chloride by Discrete Analyser	ED045G	WATER	APHA 21st ed., 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA 21st edition seal method 2 017-1-L april 2003
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): Samples are 0.45 um filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite B	EG020B-T	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.

Analytical Methods	Method	Matrix	Method Descriptions
Total Mercury by FIMS	EG035T	WATER	AS 3550, APHA 21st ed. 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the unfiltered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Hexavalent Chromium by Discrete Analyser - Dissolved	EG050G-F	WATER	APHA 21st ed., 3500 Cr-A & B. Samples are 0.45 um filtered prior to analysis. Hexavalent chromium is determined directly on water sample by Descrete Analyser as received by pH adjustment and colour development using dephenylcarbazide. Each run of samples is measured against a five-point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ferrous Iron by Discrete Analyser	EG051G	WATER	APHA 21st ed., 3500 Fe-B. A colorimetric determination based on the reaction between phenanthroline and ferrous iron at pH 3.2-3.3 to form an orange-red complex that is measured against a five-point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Free CN by Discrete Analyser	EK025G	WATER	APHA 21st ed., 4500-CN-C&N Free Cyanide is determined on samples after distillation using a pyridine- barbituric acid colouring reagent followed with an Discrete Analyser finish. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Cyanide By Discrete Analyser	EK026G	WATER	APHA 21st ed., 4500-CN-C & N Total Cyanide is determined from aqueous solutions after distillation with sulphuric acid. The resultant distillate is then captured in a caustic absorber solution followed by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ammonia as N by Discrete analyser	EK055G	WATER	APHA 21st ed., 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrite as N by Discrete Analyser	EK057G	WATER	APHA 21st ed., 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrate as N by Discrete Analyser	EK058G	WATER	APHA 21st ed., 4500-NO3- F. Nitrate is reduced to nitrite by way of a cadmium reduction column followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	APHA 21st ed., 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Cadmium Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	APHA 21st ed., 4500-Norg D. 25mL water samples are digested using a traditional Kjeldahl digestion followed by determination by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	APHA 21st ed., 4500-Norg / 4500-NO3-. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	APHA 21st ed., 4500-P B&F This procedure involves sulphuric acid digestion of a 100mL sample to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Reactive Phosphorus as P-By Discrete Analyser	EK071G	WATER	APHA 21st ed., 4500-P F Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Sulfide as S2-	EK085	WATER	APHA 21st ed., 4500-S2- D Sulfide species present in water samples are immediately precipitated when collected in pretreated caustic/zinc acetate preserved sample containers. After the supernatant is discarded, the resultant precipitate is then coloured using methylene blue indicator and measured using UV-VIS detection at 664nm. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Analytical Methods	Method	Matrix	Method Descriptions
Chemical Oxygen Demand (Sealed Tube)	EP026ST	WATER	(APHA 21st ed., 5220C, ALS QWI-EN/EP026) Samples are digested with a known excess of an acidic potassium dichromate solution using silver sulfate as a catalyst. The chromium is reduced from the Cr (VI) oxidation state to the Cr (III) state by the oxygen present in the organic material. The unreacted Cr (VI) can then be titrated with ferrous ammonium sulfate to determine the amount of Cr (VI) consumed. The oxidisable organic matter can be calculated in terms of oxygen equivalents.
Biochemical Oxygen Demand (BOD)	EP030	WATER	APHA 21st ed., 5210 B The 5-Day BOD test provides an empirical measure of the oxygen consumption capacity of a given water. A portion of the sample is diluted into oxygenated, nutrient rich water, and a seed added to begin biological decay. The initial dissolved oxygen content is measured, then the bottle is sealed and incubated for five days. The remaining dissolved oxygen is measured, and from the difference, the demand for oxygen, by biological decay, is determined. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Pesticides by GCMS	EP068	WATER	USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
TPH - Semivolatile Fraction	EP071	WATER	USEPA SW 846 - 8015A The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Volatile Organic Compounds	EP074	WATER	USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
TPH Volatiles/BTEX	EP080	WATER	USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Preparation Methods	Method	Matrix	Method Descriptions
Free Cyanide	EK025-PR	WATER	APHA 21st ed., 4500 CN- C&N. The sample is distilled at natural pH. The CN is trapped in a caustic solution, and quanitified by colourimetry on FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Cyanide	EK026-PR	WATER	APHA 21st ed., 4500 CN- C&N. The sample is distilled with H2SO4 releasing all bound cyanides as HCN. The CN is trapped in a caustic solution, and quanitified by colourimetry on FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
TKN/TP Digestion	EK061/EK067	WATER	APHA 21st ed., 4500 Norg - D; APHA 21st ed., 4500 P - H. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Digestion for Total Recoverable Metals	EN25	WATER	USEPA SW846-3005 Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Separatory Funnel Extraction of Liquids	ORG14	WATER	USEPA SW 846 - 3510B 500 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2). ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for sparging.

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Laboratory Control Spike (LCS) Recoveries							
EP075(SIM)A: Phenolic Compounds	2747061-008	----	**2-Methylphenol**	95-48-7	35.1 %	35.2-105%	**Recovery less than lower control limit**
EP075(SIM)A: Phenolic Compounds	2747061-008	----	**2.4-Dimethylphenol**	105-67-9	35.1 %	38.2-126%	**Recovery less than lower control limit**
Matrix Spike (MS) Recoveries							
EK025G: Free cyanide by Discrete Analyser	EP1203954-002	WRMW2	**Free Cyanide**	----	10.0 %	70-130%	**Recovery less than lower data quality objective**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Ar	EP1203954-001	WRMW1	**Nitrite + Nitrate as N**	----	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**

Regular Sample Surrogates

Sub-Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Samples Submitted							
EP068T: Organophosphorus Pesticide Surrogate	EP1203954-003	WRMW3	**DEF**	78-48-8	24.6 %	26.8-153.4 %	**Recovery less than lower data quality objective**
EP068T: Organophosphorus Pesticide Surrogate	EP1203954-005	WRMW5	**DEF**	78-48-8	17.7 %	26.8-153.4 %	**Recovery less than lower data quality objective**
EP068T: Organophosphorus Pesticide Surrogate	EP1203954-001	WRMW1	**DEF**	78-48-8	22.9 %	26.8-153.4 %	**Recovery less than lower data quality objective**
EP068T: Organophosphorus Pesticide Surrogate	EP1203954-007	DUP	**DEF**	78-48-8	23.6 %	26.8-153.4 %	**Recovery less than lower data quality objective**
EP068T: Organophosphorus Pesticide Surrogate	EP1203954-009	RINSATE	**DEF**	78-48-8	21.1 %	26.8-153.4 %	**Recovery less than lower data quality objective**
EP068T: Organophosphorus Pesticide Surrogate	EP1203954-002	WRMW2	**DEF**	78-48-8	17.3 %	26.8-153.4 %	**Recovery less than lower data quality objective**
EP068T: Organophosphorus Pesticide Surrogate	EP1203954-004	WRMW4	**DEF**	78-48-8	20.6 %	26.8-153.4 %	**Recovery less than lower data quality objective**
EP068T: Organophosphorus Pesticide Surrogate	EP1203954-008	FIELD	**DEF**	78-48-8	14.6 %	26.8-153.4 %	**Recovery less than lower data quality objective**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

Matrix: **WATER**

Method Container / Client Sample ID(s)		Extraction / Preparation Date extracted	Due for extraction	Days overdue	Analysis Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
WRMW1,	WRMW2,	----	----	----	21-MAY-2012	18-MAY-2012	**3**
WRMW3,	WRMW4,						
WRMW5,	WRMW6,						
DUP,	FIELD,						
RINSATE							
EA045: Turbidity							
Clear Plastic Bottle - Natural							
WRMW1,	WRMW2,	----	----	----	22-MAY-2012	20-MAY-2012	**2**
WRMW3,	WRMW4,						
WRMW5,	WRMW6,						
DUP,	FIELD,						
RINSATE							
EP030: Biochemical Oxygen Demand (BOD)							
Clear Plastic Bottle - Natural							
WRMW1,	WRMW2,	----	----	----	23-MAY-2012	20-MAY-2012	**3**
WRMW3,	WRMW4,						
WRMW5,	WRMW6,						
DUP,	FIELD,						
RINSATE							

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

Matrix: **WATER**

Quality Control Sample Type Method	Count QC	Regular	Rate (%) Actual	Expected	Quality Control Specification
Laboratory Duplicates (DUP)					
Total Phosphorus as P By Discrete Analyser	1	14	7.1	10.0	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

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ADDENDUM 1

Groundwater Monitoring Event #2 Report

Lot 20 Adelaide Street
Hazelmere

PREPARED FOR:

Wasterock Pty Ltd

Mobile Dewatering Environmental Services Pty Ltd as trustee for
Mobile Dewatering Environmental Services Unit Trust
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Environmental Services

DOCUMENT DETAILS

Title:	Groundwater Monitoring Event #2 - Hazelland Landfill Site, Lot 20 Adelaide Street, Hazelmere
Author:	D. Andrews
Status:	Addendum 1
Job number:	E2012-031
Email:	dale@environmentalservices.com.au
Synopsis:	This document has been prepared to report on the detailed groundwater sampling completed on the Hazelland Landfill Site.

DOCUMENT DISTRIBUTION

Version No	Checked by Date	Issued by Date	Distributed to	Copies
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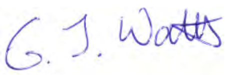
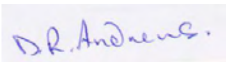
Signed				

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Table of Contents

1 INTRODUCTION 4
2 SCOPE OF WORK 4
2.1 Objectives 4
3 SITE IDENTIFICATION 4
4 BACKGROUND INFORMATION 7
4.1 Site History 7
4.2 Land Owner 7
4.3 Land Use 7
4.4 Site Boundary 7
4.5 Groundwater Use 7
4.6 Previous Studies 7
4.7 Contaminated Sites Database 7
5 POTENTIAL CONTAMINANTS OF CONCERN (PCOC) 9
5.1 Preferential Contaminant Pathways 9
6 SAMPLING ANALYSIS PLAN AND METHODOLOGY 10
6.1 Groundwater Sampling 10
7 QUALITY ASSURANCE / QUALITY CONTROL 10
7.1 Quality Assurance 10
7.1.1 Groundwater Sampling Procedure 11
7.1.2 Decontamination of Sampling Equipment 11
7.2 Laboratory 11
7.3 Quality Control 11
7.4 Waste Disposal 12
8 RESULTS 17
8.1 Laboratory Results 17
8.2 Historical Data 19
8.3 Groundwater Levels 32
9 DISCUSSION 34
10 REFERENCES 35

List of Figures

Figure 1 Site location Plan 6
Figure 2 Detailed Site View and Monitoring Well Locations. 8
Figure 3 Groundwater Contours 33

List of Tables

Table 1 Groundwater Quality Control Results. 13
Table 2 Laboratory Analysis of Field Blank and Rinsate Samples............................15
Table 3 MW1 Groundwater Laboratory Analysis Results 20
Table 4 MW2 Groundwater Laboratory Analysis Results 22
Table 5 MW3 Groundwater Laboratory Analysis Results 24
Table 6 MW4 Groundwater Laboratory Analysis Results 26
Table 7 MW5 Groundwater Laboratory Analysis Results 28
Table 8 MW6 Groundwater Laboratory Analysis Results 30
Table 4 Groundwater Measurements 32

1 INTRODUCTION

This report has been prepared to detail the sampling methodology and results from Groundwater Monitoring Event #2 (GME) completed at the Hazelland Landfill in Hazelmere, herein referred to as the Site. MDW Environmental Services (MDWES) were commissioned by Wasterock Pty Ltd to complete groundwater investigations and compile a Groundwater Investigation Report in support of Section 3.7 of the *Site Remediation Works Agreement and Site Management Plan.*

2 SCOPE OF WORK

The Scope of Work for this project is as follows:

- Collect and analyse representative samples from six groundwater monitoring wells. Samples will be analysed by a NATA certified laboratory for:
    - Total Petroleum Hydrocarbon (TPH);
    - Benzene, Toluene, Ethyl Benzene and Xylene (BTEX);
    - Phenols;
    - Metalloids (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn); and,
    - Organochlorine and Organophosphorous Pesticides,
- Data interpretation and reporting.

2.1 Objectives

The technical objectives of the investigation are to:

- Identify the directional flow of the groundwater below the site; and,
- To identify and determine the extent of the risk that any identified contamination may pose to human health and the environment;
- Establish baseline groundwater data from the Site prior to the proposed remediation works;
- To determine the suitability of water abstraction from the superficial aquifer for the purposes of dust suppression and compaction.

3 SITE IDENTIFICATION

Address:	Lot 20 Adelaide Street, Hazelmere.
Land description:	Industrial
Lots	20
Volume:	2054
Folio:	299
Certificates of Title:	20/D76128 (Appendix A)
Local government authority:	City of Swan
Locality view:	Figure 1
UTM Co-ordinates:	The Site is bounded by the following coordinates.

BOUNDARY CORNERS	MGA94 Zone 50	
	Easting (E)	Northing (N)
North west corner	406595	6467321
North east corner	407034	6467190
North east corner (mid)	406939	6467172
South east corner	407015	6466812
South west corner	406476	6467046
Eastern Corner	407078	6467020

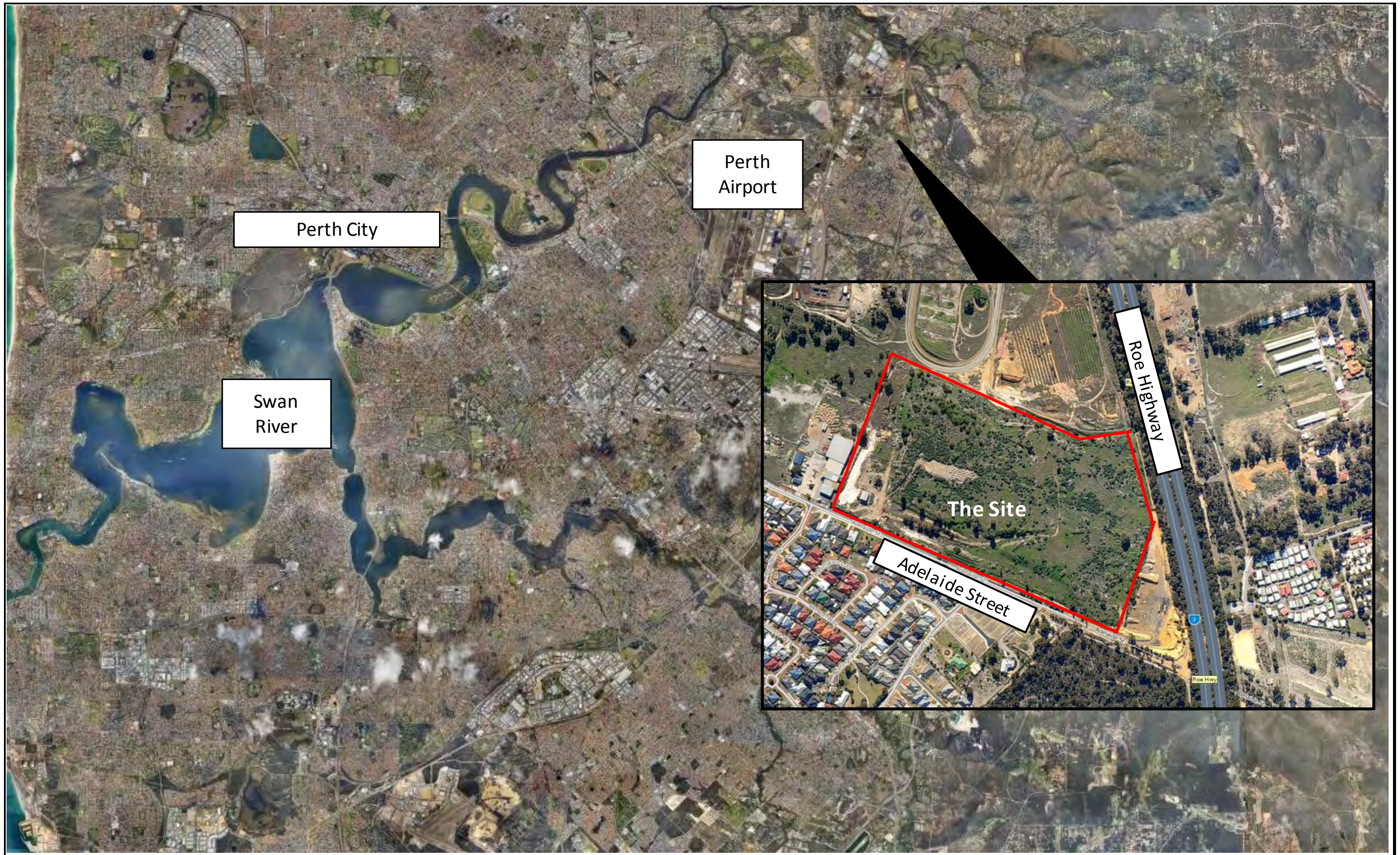

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Figure:	Site Location
Project:	Hazelland Landfill Site
Job No:	E2012-031
Date:	6/07/2012
Source	Nearmap

Figure 1 Site location Plan

4 BACKGROUND INFORMATION

The site (Figure 1) is located within the City of Swan, approximately 14 km east north east of Perth CBD. Situated between Talbot Road and Adelaide Street access is gained from the south of the Site off Adelaide Street. Historically the Site was occupied and used as a licenced inert waste landfill in which potentially contaminating wastes were dumped. Following investigation by Parsons Brinckerhoff (2006) the site was classified "Contaminated – Remediation Required" by the Department of Environment and Conservation (DEC). The Parsons Brinckerhoff report contains substantial amounts of background information regarding this property and the Groundwater Investigation Report should be read in conjunction with this previously completed soil investigation.

4.1 Site History

A detailed historical investigation was not completed as part of this Groundwater Investigation Report.

4.2 Land Owner

The Site is currently vested with Hazelland Pty Ltd and has been so since 2006 under the Land Title City of Swan Location Lot 20 Volume 2054 Folio 299. A copy of the Certificate of Title is in Appendix A.

4.3 Land Use

The Site has been used for collection and storage of inert demolition waste as landfill with some potentially contaminating waste.

4.4 Site Boundary

The Site is surrounded by private land to the north and south with industrial proprieties to the west and Roe Highway runs along the eastern boundary.

4.5 Groundwater Use

The site does not currently make use of groundwater.

4.6 Previous Studies

Soil investigations were completed on the site during 1992 (Dames and Moore) and 2006 (Parsons Brinckerhoff).

4.7 Contaminated Sites Database

The site is currently classed as "*Contaminated – Remediation Required*" as per DEC Contaminated Sites Database.

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Figure: Detailed Site View
Project: Hazelland Landfill
Job No: E2012-031
Date: 18/06/2011
Source Nearmap

Figure 2 Detailed Site View and Monitoring Well Locations.

5 POTENTIAL CONTAMINANTS OF CONCERN (PCOC)

The land is proposed for development into industrial lots. The following list of PCOC is based on proposed use, historical and current Site activities, regional soil and issues, proximity to Contaminated Sites and off-site sources of impacts:

- Metalloids: Arsenic (As), barium (Ba), beryllium (Be), Cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), manganese (Mn), molybdenum (Mo), nickel (Ni), silver (Ag), selenium (Se), vanadium (V), zinc (Zn), and mercury (Hg);
- Polynuclear Aromatic Hydrocarbons (PAH);
- Monocyclic Aromatic Hydrocarbons (MAH);
- Phenolic compounds;
- Total Petroleum Hydrocarbons (TPH);
- Organochlorine and Organophosphorous Pesticides.

5.1 Preferential Contaminant Pathways

Many of the PCOC identified at the Site have the potential to impact soil and groundwater at the Site and surrounding areas. Listed above are the contaminants most likely to be found within the fill and most likely to present a risk to human health and the environment. The PCOC have been identified due to the wide range of inert demolition waste likely to have been deposited at the Site. The preferential contaminant pathways can be summarized as soil, air and groundwater; notwithstanding that the Scope of Works for this investigation only includes assessment of potential groundwater contamination.

6 SAMPLING ANALYSIS PLAN AND METHODOLOGY

The sampling and analysis of the GME were completed to determine whether imported fill on the site had adversely affected the groundwater. The results within this report will complement previous groundwater data and be used to highlight any changes in groundwater quality during the proposed site remediation works.

6.1 Groundwater Sampling

Sampling was completed on the 30th September 2012; the standing water level was recorded using an electronic water level indicator. Sampling was then undertaken using a 12V GeoTech Low Flow Bladder pump, coupled to a YSI Quattro low flow sampler to enable continuous measurement of field parameters. Once stabilisation of the parameters was reached, samples were collected and submitted to a National Association of Testing Authorities (NATA) accredited laboratory for analysis. Field Sheets are attached in Appendix D.

Surveying was completed on the groundwater monitoring wells post installation to establish accurate water levels and enable further characterization of the groundwater below the site. Certificate of Survey is attached in Appendix E.

7 QUALITY ASSURANCE / QUALITY CONTROL

The following Quality Assurance / Quality Control (QA/QC) program was implemented throughout the investigation to ensure the accuracy and precision of the data obtained. QC measures the effectiveness of the procedures of the QA program.

7.1 Quality Assurance

All procedures including staff selection, sampling methodologies, equipment, analysis methods and data transfer were based on:

- *AS/NZS 5667.11:1998: Water Quality, Part 1: Guidance on the design of sampling programs, sampling techniques, and the preservation and handling of samples. (AS/NZS 5667.11:1998),* and
- *AS/NZS 5667.11:1998 Water Quality, Part 11: Guidance on Sampling of Groundwaters (AS/NZS 5667.11:1998)*.

Particularly, the following actions applied:

- Samples were collected by a trained, experienced field technician,
- Samples were collected by the same personnel, ensuring that techniques used were consistent across the sampling program.

Following discussions with the primary laboratory and a review of their laboratory certificates of analysis, the following laboratory QC protocols occurred:

- At least 5% of samples are split into internal laboratory duplicate samples. These samples are homogenised prior to splitting into sub samples;
- At least 5% of samples are run with Matrix Spikes of known additions.
- Laboratory Control Samples (LCS) are run at the required rate; minimum 1 LCS per batch of samples. The LCS results are reported in the laboratory certificates named 'Interpretive Quality Control Report' and the 'Quality Control Report'.

7.1.1 Groundwater Sampling Procedure

All groundwater samples were subject to the following procedures:

- Dedicated tubing was used for each well and the pump and low flow cell were decontaminated between wells;
- Samples were collected within an eight hour period into new, laboratory supplied sample bottles. Preservatives (if required) were provided by the laboratory in the appropriate sample bottle;
- Samples were filled to the top to ensure no headspace remained;
- All samples were marked in the field using permanent marker with a label showing sample location, date and job number;
- Samples were immediately placed on ice within an esky for transport to the laboratory accompanied with standard chain of custody documentation.

7.1.2 Decontamination of Sampling Equipment

All sampling and drilling equipment were decontaminated prior to use and between each sample location. Decontamination was completed using the following procedure:

- Equipment washed in water;
- Equipment thoroughly scrubbed in water with Decon 90;
- Equipment rinsed in tap water;
- Equipment rinsed in de-ionised water.

7.2 Laboratory

Two NATA certificated laboratories were selected to analyse the samples. ALS Laboratory Group was selected as the primary laboratory. ARLWA; the secondary laboratory, was used for the analysis of replicate samples and for inter-laboratory quality control (QC).

7.3 Quality Control

To ensure the quality of the sampling method and laboratory analysis Quality Control (QC) samples were collected consisting of one (1) Rinsate Blank, one (1) Field Blank, one set of (1) duplicate and triplicate samples of groundwater.

- A rinsate sample was collected for each day of field sampling (RINSATE-002);
- A field blank was collected for each day of field sampling (BLANK-002);

- WRMW4-002 was used as the DUP and TRIP.

Laboratory certificates of analysis including sample receipt notification, chain of custody, and laboratory quality control are available in Appendix F.

The reproducibility of the sampling and analytical methodology is measured as precision. Laboratory and field precision is measured using the Relative Percent Difference (RPD) between the sample and its duplicates. For those RPD values which exceed a generally acceptable 30% - 50% (Australian Standard AS 4482.1), data precision is considered poor, however, consideration needs to be given to sample homogeneity and the concentrations detected. Therefore, the acceptable ranges adopted for the RPDs are based on the laboratories RPD acceptance criteria and are dependent on the magnitude of results in comparison to the limits of reporting (LOR) as follows:

Result < 10 times LOR = No limit

Result 10 – 20 times LOR = 0% - 50%

Result > 20 times LOR = 0% - 20%

Groundwater QC results (Table 1) indicated exceedances of RPD limits of the triplicate sample. Exceedances were noted of total dissolved solids, suspended solids, turbidity, total iron and total phosphorus. As RPD limits between the primary and secondary samples were within allowable limits it is MDWES opinion that the variances noted between the primary and triplicate sample could be due to differing laboratory techniques. ALS Laboratory Group QC documentation indicates the lab's internal QC were observed.

Laboratory analysis of QA samples indicates exceedances of adopted criteria for pH within the Field and Rinsate samples. Detailed results are found in Table 2.

7.4 Waste Disposal

Sampling was completed in consultation with MDWES Standard Operating Procedure and all waste was disposed of appropriately as to not impose a risk or cause contamination.

Table 1 Groundwater Quality Control Results.

Analyte grouping/Analyte	Units	WRMW4	DUP	DUP RL (%)	DUP RPD (%)	TRIP	TRIP RL (%)	TRIP RPD
pH Value	pH Unit	5.96	5.49	20	7.89	5.1	20	14.43
Electrical Conductivity	µS/cm	144	151	20	4.64	170	50	15.29
Total Dissolved Solids	mg/L	83	85	N/L	2.35	120	20	30.83
Suspended Solids	mg/L	9	16	N/L	43.75	48	N/L	81.25
Turbidity	NTU	10.8	9.6	20	11.11	40	20	73.00
Total Alkalinity $CaCO_3$	mg/L	1	<1	N/L	0.00	<5	N/L	-
Acidity as $CaCO_3$	mg/L	21	8	50	61.90	13	N/L	38.10
Sulfate as SO_4^{2-}	mg/L	2	3	N/L	33.33	-	-	-
Alkalinity : Sulfate	ratio	0.50	0.00	N/L	100.00	-	-	-
Chloride	mg/L	30	31	20	3.23	34	N/L	-
Sulfate : Chloride	ratio	0.07	0.10	N/L	31.11	-	-	-
Dissolved Metals								
Aluminium	mg/L	0.06	0.06	N/L	0.00	0.3	N/L	80.00
Arsenic	mg/L	<0.001	<0.001	N/L	-	<0.001	N/L	-
Cadmium	mg/L	0.0001	<0.0001	N/L	-	<0.002	N/L	-
Chromium	mg/L	<0.001	<0.001	N/L	-	<0.01	N/L	-
Manganese	mg/L	0.005	0.004	N/L	20.00	<0.01	N/L	-
Nickel	mg/L	0.003	0.002	N/L	33.33	<0.01	N/L	-
Selenium	mg/L	<0.01	<0.01	N/L	-	<0.001	N/L	-
Zinc	mg/L	0.01	0.008	N/L	20.00	0.02	N/L	50.00
Iron	mg/L	<0.05	0.06	N/L	-	0.1	N/L	-
Ferrous Iron	mg/L	<0.010	<0.010	N/L	-	-	-	-
Chromium VI	mg/L	<0.05	<0.05	N/L	-	-	-	-
Total Metals								
Aluminium	mg/L	1.61	1.43	20	11.18	2.2	20	26.82
Arsenic	mg/L	<0.001	<0.001	N/L	-	0.001	N/L	-
Cadmium	mg/L	<0.0001	<0.0001	N/L	-	<0.002	N/L	-
Chromium	mg/L	0.001	<0.001	N/L	-	<0.01	N/L	-
Copper	mg/L	0.003	0.003	N/L	0.00	-	-	-
Lead	mg/L	0.005	0.004	N/L	20.00	-	-	-
Manganese	mg/L	0.006	0.006	N/L	0.00	<0.01	N/L	-
Molybdenum	mg/L	<0.001	<0.001	N/L	-	-	-	-
Nickel	mg/L	0.003	0.003	N/L	0.00	<0.01	N/L	-
Selenium	mg/L	<0.01	<0.01	N/L	-	<0.001	N/L	-
Silver	mg/L	<0.001	<0.001	N/L	-	-	-	-
Zinc	mg/L	0.011	0.011	N/L	0.00	0.02	N/L	45.00
Iron	mg/L	0.4	0.32	N/L	20.00	0.62	20	35.48
Mercury	mg/L	<0.0001	<0.0001	N/L	-	-	-	-
Nutrients								
Ammonia as N	mg/L	0.05	0.04	N/L	20.00	<0.2	N/L	0.00
Nitrite as N	mg/L	<0.01	0.01	N/L	-	0.01	N/L	-
Nitrate as N	mg/L	4.92	4.89	20	0.61	6	20	18.00
Kjeldhal Nitrogen	mg/L	1.1	1.5	50	26.67	<0.2	N/L	0.00
Total Nitrogen	mg/L	6	6.4	20	6.25	6.1	20	1.64
Total Phosphorus	mg/L	0.12	0.09	50	25.00	0.02	50	83.33
Reactive Phosphorus	mg/L	<0.01	<0.01	N/L	-	<0.01	N/L	-
Sulfide	mg/L	<0.1	<0.1	N/L	-	<0.1	N/L	-
COD	mg/L	7	7	N/L	0.00	40	N/L	82.50
BOD	mg/L	<2	<2	N/L	-	<5	N/L	-
Organochlorine Pesticides (OC)								
alpha-BHC	µg/L	<0.5	<0.5	N/L	-	<0.001	N/L	-
Hexachlorobenzene (HCB)	µg/L	<0.5	<0.5	N/L	-	<0.001	N/L	-
beta-BHC	µg/L	<0.5	<0.5	N/L	-	<0.001	N/L	-
gamma-BHC	µg/L	<0.5	<0.5	N/L	-	-	-	-
delta-BHC	µg/L	<0.5	<0.5	N/L	-	<0.001	N/L	-
Heptachlor	µg/L	<0.5	<0.5	N/L	-	<0.001	N/L	-
Aldrin	µg/L	<0.5	<0.5	N/L	-	<0.001	N/L	-
Heptachlor epoxide	µg/L	<0.5	<0.5	N/L	-	<0.001	N/L	-
trans-Chlordane	µg/L	<0.5	<0.5	N/L	-	-	-	-
alpha-Endosulfan	µg/L	<0.5	<0.5	N/L	-	-	-	-
cis-Chlordane	µg/L	<0.5	<0.5	N/L	-	-	-	-
Dieldrin	µg/L	<0.5	<0.5	N/L	-	0.054	N/L	-
4.4`-DDE	µg/L	<0.5	<0.5	N/L	-	<0.001	N/L	-
Endrin	µg/L	<0.5	<0.5	N/L	-	<0.01	N/L	-
beta-Endosulfan	µg/L	<0.5	<0.5	N/L	-	-	-	-
4.4`-DDD	µg/L	<0.5	<0.5	N/L	-	<0.001	N/L	-
Endrin aldehyde	µg/L	<0.5	<0.5	N/L	-	-	-	-
Endosulfan sulfate	µg/L	<0.5	<0.5	N/L	-	<0.001	N/L	-
4.4`-DDT	µg/L	<2	<2	N/L	-	<0.001	N/L	-
Endrin ketone	µg/L	<0.5	<0.5	N/L	-	-	-	-
Methoxychlor	µg/L	<2	<2	N/L	-	<0.02	N/L	-
Organophosphorus Pesticides (OP)								
Dichlorvos	µg/L	<0.5	<0.5	N/L	-	-	-	-
Demeton-S-methyl	µg/L	<0.5	<0.5	N/L	-	-	-	-
Monocrotophos	µg/L	<2	<2	N/L	-	-	-	-
Dimethoate	µg/L	<0.5	<0.5	N/L	-	-	-	-
Diazinon	µg/L	<0.5	<0.5	N/L	-	<0.01	N/L	-
Chlorpyrifos-methyl	µg/L	<0.5	<0.5	N/L	-	-	-	-
Parathion-methyl	µg/L	<2	<2	N/L	-	<0.02	N/L	-
Malathion	µg/L	<0.5	<0.5	N/L	-	<0.01	N/L	-
Fenthion	µg/L	<0.5	<0.5	N/L	-	-	-	-
Chlorpyrifos	µg/L	<0.5	<0.5	N/L	-	<0.005	N/L	-
Parathion	µg/L	<2	<2	N/L	-	-	-	-
Pirimphos-ethyl	µg/L	<0.5	<0.5	N/L	-	<0.02	N/L	-
Chlorfenvinphos	µg/L	<0.5	<0.5	N/L	-	-	-	-
Bromophos-ethyl	µg/L	<0.5	<0.5	N/L	-	<0.005	N/L	-
Fenamiphos	µg/L	<0.5	<0.5	N/L	-	-	-	-
Prothiofos	µg/L	<0.5	<0.5	N/L	-	-	-	-
Ethion	µg/L	<0.5	<0.5	N/L	-	<0.01	N/L	-
Carbophenothion	µg/L	<0.5	<0.5	N/L	-	-	-	-
Azinphos Methyl	µg/L	<0.5	<0.5	N/L	-	-	-	-
Monocyclic Aromatic Hydrocarbons								
Benzene	µg/L	<1	<1	N/L	-	<0.001	N/L	-
Toluene	µg/L	<2	<2	N/L	-	<0.001	N/L	-
Ethylbenzene	µg/L	<2	<2	N/L	-	<0.001	N/L	-
meta- & para-Xylene	µg/L	<2	<2	N/L	-	-	-	-
Styrene	µg/L	<5	<5	N/L	-	-	-	-
ortho-Xylene	µg/L	<2	<2	N/L	-	-	-	-
Isopropylbenzene	µg/L	<5	<5	N/L	-	-	-	-
n-Propylbenzene	µg/L	<5	<5	N/L	-	-	-	-
1.3.5-Trimethylbenzene	µg/L	<5	<5	N/L	-	-	-	-
sec-Butylbenzene	µg/L	<5	<5	N/L	-	-	-	-
1.2.4-Trimethylbenzene	µg/L	<5	<5	N/L	-	-	-	-
tert-Butylbenzene	µg/L	<5	<5	N/L	-	-	-	-
p-Isopropyltoluene	µg/L	<5	<5	N/L	-	-	-	-
n-Butylbenzene	µg/L	<5	<5	N/L	-	-	-	-

Oxygenated Compounds								
Vinyl Acetate	µg/L	<50	<50	N/L	-	-	-	-
2-Butanone (MEK)	µg/L	<50	<50	N/L	-	-	-	-
4-Methyl-2-pentanone (MIBK)	µg/L	<50	<50	N/L	-	-	-	-
2-Hexanone (MBK)	µg/L	<50	<50	N/L	-	-	-	-
Sulfonated Compounds								
Carbon disulfide	µg/L	<5	<5	N/L	-	-	-	-
Fumigants								
2.2-Dichloropropane	µg/L	<5	<5	N/L	-	-	-	-
1.2-Dichloropropane	µg/L	<5	<5	N/L	-	-	-	-
cis-1.3-Dichloropropylene	µg/L	<5	<5	N/L	-	-	-	-
trans-1.3-Dichloropropylene	µg/L	<5	<5	N/L	-	-	-	-
1.2-Dibromoethane (EDB)	µg/L	<5	<5	N/L	-	-	-	-
Halogenated Aliphatic Compounds								
Dichlorodifluoromethane	µg/L	<50	<50	N/L	-	-	-	-
Chloromethane	µg/L	<50	<50	N/L	-	-	-	-
Vinyl chloride	µg/L	<50	<50	N/L	-	-	-	-
Bromomethane	µg/L	<50	<50	N/L	-	-	-	-
Chloroethane	µg/L	<50	<50	N/L	-	-	-	-
Trichlorofluoromethane	µg/L	<50	<50	N/L	-	-	-	-
1.1-Dichloroethene	µg/L	<5	<5	N/L	-	-	-	-
Iodomethane	µg/L	<5	<5	N/L	-	-	-	-
trans-1.2-Dichloroethene	µg/L	<5	<5	N/L	-	-	-	-
1.1-Dichloroethane	µg/L	<5	<5	N/L	-	-	-	-
cis-1.2-Dichloroethene	µg/L	<5	<5	N/L	-	-	-	-
1.1.1-Trichloroethane	µg/L	<5	<5	N/L	-	-	-	-
1.1-Dichloropropylene	µg/L	<5	<5	N/L	-	-	-	-
Carbon Tetrachloride	µg/L	<5	<5	N/L	-	-	-	-
1.2-Dichloroethane	µg/L	<5	<5	N/L	-	-	-	-
Trichloroethene	µg/L	<5	<5	N/L	-	-	-	-
Dibromomethane	µg/L	<5	<5	N/L	-	-	-	-
1.1.2-Trichloroethane	µg/L	<5	<5	N/L	-	-	-	-
1.3-Dichloropropane	µg/L	<5	<5	N/L	-	-	-	-
Tetrachloroethene	µg/L	<5	<5	N/L	-	-	-	-
1.1.1.2-Tetrachloroethane	µg/L	<5	<5	N/L	-	-	-	-
trans-1.4-Dichloro-2-butene	µg/L	<5	<5	N/L	-	-	-	-
cis-1.4-Dichloro-2-butene	µg/L	<5	<5	N/L	-	-	-	-
1.1.2.2-Tetrachloroethane	µg/L	<5	<5	N/L	-	-	-	-
1.2.3-Trichloropropane	µg/L	<5	<5	N/L	-	-	-	-
Pentachloroethane	µg/L	<5	<5	N/L	-	-	-	-
1.2-Dibromo-3-chloropropane	µg/L	<5	<5	N/L	-	-	-	-
Hexachlorobutadiene	µg/L	<5	<5	N/L	-	-	-	-
Halogenated Aromatic Compounds								
Chlorobenzene	µg/L	<5	<5	N/L	-	-	-	-
Bromobenzene	µg/L	<5	<5	N/L	-	-	-	-
2-Chlorotoluene	µg/L	<5	<5	N/L	-	-	-	-
4-Chlorotoluene	µg/L	<5	<5	N/L	-	-	-	-
1.3-Dichlorobenzene	µg/L	<5	<5	N/L	-	-	-	-
1.4-Dichlorobenzene	µg/L	<5	<5	N/L	-	-	-	-
1.2-Dichlorobenzene	µg/L	<5	<5	N/L	-	-	-	-
1.2.4-Trichlorobenzene	µg/L	<5	<5	N/L	-	-	-	-
1.2.3-Trichlorobenzene	µg/L	<5	<5	N/L	-	-	-	-
Trihalomethanes								
Chloroform	µg/L	<5	<5	N/L	-	-	-	-
Bromodichloromethane	µg/L	<5	<5	N/L	-	-	-	-
Dibromochloromethane	µg/L	<5	<5	N/L	-	-	-	-
Bromoform	µg/L	<5	<5	N/L	-	-	-	-
Phenolic Compounds								
Phenol	µg/L	<1.0	<1.0	N/L	-	<0.05	N/L	-
2-Chlorophenol	µg/L	<1.0	<1.0	N/L	-	-	-	-
2-Methylphenol	µg/L	<1.0	<1.0	N/L	-	-	-	-
3- & 4-Methylphenol	µg/L	<2.0	<2.0	N/L	-	-	-	-
2-Nitrophenol	µg/L	<1.0	<1.0	N/L	-	-	-	-
2.4-Dimethylphenol	µg/L	<1.0	<1.0	N/L	-	-	-	-
2.4-Dichlorophenol	µg/L	<1.0	<1.0	N/L	-	-	-	-
2.6-Dichlorophenol	µg/L	<1.0	<1.0	N/L	-	-	-	-
4-Chloro-3-Methylphenol	µg/L	<1.0	<1.0	N/L	-	-	-	-
2.4.6-Trichlorophenol	µg/L	<1.0	<1.0	N/L	-	-	-	-
2.4.5-Trichlorophenol	µg/L	<1.0	<1.0	N/L	-	-	-	-
Pentachlorophenol	µg/L	<2.0	<2.0	N/L	-	-	-	-
Polynuclear Aromatic Hydrocarbons								
Naphthalene	µg/L	<1.0	<1.0	N/L	-	<0.1	N/L	-
Acenaphthylene	µg/L	<1.0	<1.0	N/L	-	<0.1	N/L	-
Acenaphthene	µg/L	<1.0	<1.0	N/L	-	<0.1	N/L	-
Fluorene	µg/L	<1.0	<1.0	N/L	-	<0.1	N/L	-
Phenanthrene	µg/L	<1.0	<1.0	N/L	-	<0.1	N/L	-
Anthracene	µg/L	<1.0	<1.0	N/L	-	<0.1	N/L	-
Fluoranthene	µg/L	<1.0	<1.0	N/L	-	<0.1	N/L	-
Pyrene	µg/L	<1.0	<1.0	N/L	-	<0.1	N/L	-
Benz(a)anthracene	µg/L	<1.0	<1.0	N/L	-	<0.1	N/L	-
Chrysene	µg/L	<1.0	<1.0	N/L	-	<0.1	N/L	-
Benzo(b)fluoranthene	µg/L	<1.0	<1.0	N/L	-	<0.1	N/L	-
Benzo(k)fluoranthene	µg/L	<1.0	<1.0	N/L	-	<0.1	N/L	-
Benzo(a)pyrene	µg/L	<0.5	<0.5	N/L	-	<0.1	N/L	-
Indeno(1.2.3.cd)pyrene	µg/L	<1.0	<1.0	N/L	-	<0.1	N/L	-
Dibenz(a.h)anthracene	µg/L	<1.0	<1.0	N/L	-	<0.1	N/L	-
Benzo(g.h.i)perylene	µg/L	<1.0	<1.0	N/L	-	<0.1	N/L	-
Total Petroleum Hydrocarbons								
C6 - C9 Fraction	µg/L	<20	<20	N/L	-	<0.02	N/L	-
C10 - C14 Fraction	µg/L	<50	<50	N/L	-	<0.02	N/L	-
C15 - C28 Fraction	µg/L	<100	<100	N/L	-	<0.04	N/L	-
C29 - C36 Fraction	µg/L	<50	<50	N/L	-	<0.04	N/L	-
C10 - C36 Fraction (sum)	µg/L	<50	<50	N/L	-	<0.04	N/L	-

Table 2 Laboratory Analysis of Field Blank and Rinsate Samples

Analyte grouping/Analyte	Units	ANZECC & ARMCANZ (2000)[1]		ADWG (2004)[2]		DOH (2006)[3]	ANZECC & ARMCANZ (2000)[1]		18/05/2012	18/05/2012
		Fresh Waters[4]	Marine Waters[4]	Drinking Water Health Value (HV)	Drinking Water Aesthetic Value	Domestic non-potable	Short-term Irrigation Water	Long-term Irrigation Water[5]	FIELD	RINSATE
pH Value	pH Unit	6.5-8.5	8.0-8.4		6.5-8.5			6.0-8.5	5.63	5.91
Electrical Conductivity	µS/cm								<1	<1
Total Dissolved Solids	mg/L								<10	<10
Suspended Solids	mg/L								<5	<5
Turbidity	NTU								0.3	<0.1
Total Alkalinity $CaCO_3$	mg/L								<1	<1
Acidity as $CaCO_3$	mg/L								4	2
Sulfate as SO_4^{2-}	mg/L								<1	<1
Alkalinity : Sulfate	ratio			500	250	5000			<1	<1
Chloride	mg/L								<1	<1
Sulfate : Chloride	ratio				250	2500			<1	<1
Total Metals										
Aluminium	mg/L	0.055			0.2	2	20	5	<0.01	<0.01
Arsenic	mg/L	0.013		0.01		0.07	2	0.1	<0.001	<0.001
Cadmium	mg/L	0.0002	0.0007	0.002		0.02	0.05	0.01	<0.0001	<0.0001
Chromium	mg/L						1	0.1	0.003	<0.001
Copper	mg/L	0.0014	0.0013	2	1	20	5	0.2	0.001	0.001
Lead	mg/L	0.0034	0.0044	0.01		0.1	5	2	<0.001	<0.001
Manganese	mg/L	1.9		0.5	0.1	5	10	0.2	<0.001	<0.001
Molybdenum	mg/L			0.05		0.5	0.05	0.01	<0.001	<0.001
Nickel	mg/L	0.011	0.02	0.02		0.2	2	0.2	0.002	<0.001
Selenium	mg/L	0.005		0.01		0.1	0.05	0.02	<0.01	<0.01
Silver	mg/L	0.00005	0.0014	0.1		1			<0.001	<0.001
Zinc	mg/L	0.008	0.015		3	30	5	2	<0.005	<0.005
Iron	mg/L	0.3	1.0 / 0.35		0.33	3	10	0.2	0.08	<0.05
Mercury	mg/L	0.00006	0.0001	0.001		0.01	0.002	0.002	<0.0001	<0.0001
Nutrients										
Ammonia as N	mg/L	0.9	0.91						0.03	0.04
Nitrite as N	mg/L			3.0		30			<0.01	<0.01
Nitrate as N	mg/L			50		500			<0.01	<0.01
Kjeldhal Nitrogen	mg/L								<0.1	<0.1
Total Nitrogen	mg/L	1.0 / 2.0[1]							<0.1	<0.1
Total Phosphorus	mg/L	0.1 / 0.2[1]							<0.01	<0.01
Reactive Phosphorus	mg/L								<0.01	<0.01
Sulfide	mg/L	0.001							<0.1	<0.1
COD	mg/L								<5	<5
BOD	mg/L								3	<2
Organochlorine Pesticides (OC)										
alpha-BHC	µg/L								<0.5	<0.5
Hexachlorobenzene (HCB)	µg/L								<0.5	<0.5
beta-BHC	µg/L								<0.5	<0.5
gamma-BHC	µg/L								<0.5	<0.5
delta-BHC	µg/L								<0.5	<0.5
Heptachlor	µg/L	0.01							<0.5	<0.5
Aldrin	µg/L								<0.5	<0.5
Heptachlor epoxide	µg/L			0.05	0.3	3			<0.5	<0.5
trans-Chlordane	µg/L	0.03 [2]		0.01	1	10			<0.5	<0.5
alpha-Endosulfan	µg/L	0.03 [3]	0.005 [3]	0.05	30	30			<0.5	<0.5
cis-Chlordane	µg/L	0.03 [2]		0.01	1	10			<0.5	<0.5
Dieldrin	µg/L								<0.5	<0.5
4.4`-DDE	µg/L								<0.5	<0.5
Endrin	µg/L	0.01	0.004						<0.5	<0.5
beta-Endosulfan	µg/L	0.03 [3]	0.005 [3]						<0.5	<0.5
4.4`-DDD	µg/L								<0.5	<0.5
Endrin aldehyde	µg/L								<0.5	<0.5
Endosulfan sulfate	µg/L								<0.5	<0.5
4.4`-DDT	µg/L	0.006		0.06	30	0.1			<2	<2
Endrin ketone	µg/L								<0.5	<0.5
Methoxychlor	µg/L								<2	<2
Organophosphorus Pesticides (OP)										
Dichlorvos	µg/L								<0.5	<0.5
Demeton-S-methyl	µg/L								<0.5	<0.5
Monocrotophos	µg/L								<2	<2
Dimethoate	µg/L	0.15			50	50			<0.5	<0.5
Diazinon	µg/L	0.01		1	3	1			<0.5	<0.5
Chlorpyrifos-methyl	µg/L	0.01	0.009		10	100			<0.5	<0.5
Parathion-methyl	µg/L								<2	<2
Malathion	µg/L	0.05							<0.5	<0.5
Fenthion	µg/L								<0.5	<0.5
Chlorpyrifos	µg/L	0.01	0.009						<0.5	<0.5
Parathion	µg/L	0.004			10	10			<2	<2
Pirimphos-ethyl	µg/L								<0.5	<0.5
Chlorfenvinphos	µg/L								<0.5	<0.5
Bromophos-ethyl	µg/L								<0.5	<0.5
Fenamiphos	µg/L								<0.5	<0.5
Prothiofos	µg/L								<0.5	<0.5
Ethion	µg/L								<0.5	<0.5
Carbophenothion	µg/L								<0.5	<0.5
Azinphos Methyl	µg/L	0.02							<0.5	<0.5
Monocyclic Aromatic Hydrocarbons										
Benzene	µg/L	0.95	0.5	0.001		0.01			-	-
Toluene	µg/L			0.80	0.025	0.025			-	-
Ethylbenzene	µg/L			0.30	0.003	0.003			-	-
meta- & para-Xylene	µg/L	200							-	-
Styrene	µg/L			0.03	0.004	0.004			<5	<5
ortho-Xylene	µg/L	350							-	-
Isopropylbenzene	µg/L								<5	<5
n-Propylbenzene	µg/L								<5	<5
1.3.5-Trimethylbenzene	µg/L								<5	<5
sec-Butylbenzene	µg/L								<5	<5
1.2.4-Trimethylbenzene	µg/L								<5	<5
tert-Butylbenzene	µg/L								<5	<5
p-Isopropyltoluene	µg/L								<5	<5
n-Butylbenzene	µg/L								<5	<5

Oxygenated Compounds										
Vinyl Acetate	µg/L								<50	<50
2-Butanone (MEK)	µg/L								<50	<50
4-Methyl-2-pentanone (MIBK)	µg/L								<50	<50
2-Hexanone (MBK)	µg/L								<50	<50
Sulfonated Compounds										
Carbon disulfide	µg/L								<5	<5
Fumigants										
2.2-Dichloropropane	µg/L								<5	<5
1.2-Dichloropropane	µg/L								<5	<5
cis-1.3-Dichloropropylene	µg/L								<5	<5
trans-1.3-Dichloropropylene	µg/L								<5	<5
1.2-Dibromoethane (EDB)	µg/L								<5	<5
Halogenated Aliphatic Compounds										
Dichlorodifluoromethane	µg/L								<50	<50
Chloromethane	µg/L								<50	<50
Vinyl chloride	µg/L			0.0003		0.003			<50	<50
Bromomethane	µg/L								<50	<50
Chloroethane	µg/L								<50	<50
Trichlorofluoromethane	µg/L								<50	<50
1.1-Dichloroethene	µg/L			0.03		0.3			<5	<5
Iodomethane	µg/L								<5	<5
trans-1.2-Dichloroethene	µg/L								<5	<5
1.1-Dichloroethane	µg/L								<5	<5
cis-1.2-Dichloroethene	µg/L								<5	<5
1.1.1-Trichloroethane	µg/L								<5	<5
1.1-Dichloropropylene	µg/L								<5	<5
Carbon Tetrachloride	µg/L								<5	<5
1.2-Dichloroethane	µg/L			0.003		0.03			<5	<5
Trichloroethene	µg/L								<5	<5
Dibromomethane	µg/L								<5	<5
1.1.2-Trichloroethane	µg/L	6500	1900						<5	<5
1.3-Dichloropropane	µg/L								<5	<5
Tetrachloroethene	µg/L			0.05		0.5			<5	<5
1.1.1.2-Tetrachloroethane	µg/L								<5	<5
trans-1.4-Dichloro-2-butene	µg/L								<5	<5
cis-1.4-Dichloro-2-butene	µg/L								<5	<5
1.1.2.2-Tetrachloroethane	µg/L								<5	<5
1.2.3-Trichloropropane	µg/L								<5	<5
Pentachloroethane	µg/L								<5	<5
1.2-Dibromo-3-chloropropane	µg/L								<5	<5
Hexachlorobutadiene	µg/L								<5	<5
Halogenated Aromatic Compounds										
Chlorobenzene	µg/L			0.30	0.01	0.01			<5	<5
Bromobenzene	µg/L								<5	<5
2-Chlorotoluene	µg/L								<5	<5
4-Chlorotoluene	µg/L								<5	<5
1.3-Dichlorobenzene	µg/L	0.26			0.02	0.02			<5	<5
1.4-Dichlorobenzene	µg/L	0.06		0.04	0.003	0.003			<5	<5
1.2-Dichlorobenzene	µg/L	0.16		1.5	0.001	0.001			<5	<5
1.2.4-Trichlorobenzene	µg/L	0.085	80	0.03	0.005	0.005			<5	<5
1.2.3-Trichlorobenzene	µg/L	0.003		0.03	0.005	0.005			<5	<5
Trihalomethanes										
Chloroform	µg/L								<5	<5
Bromodichloromethane	µg/L								<5	<5
Dibromochloromethane	µg/L								<5	<5
Bromoform	µg/L								<5	<5
Phenolic Compounds										
Phenol	µg/L	320	400						<1.0	<1.0
2-Chlorophenol	µg/L	340		300	0.1	3000			<1.0	<1.0
2-Methylphenol	µg/L								<1.0	<1.0
3- & 4-Methylphenol	µg/L								<2.0	<2.0
2-Nitrophenol	µg/L								<1.0	<1.0
2.4-Dimethylphenol	µg/L								<1.0	<1.0
2.4-Dichlorophenol	µg/L	120		200	0.3	2000			<1.0	<1.0
2.6-Dichlorophenol	µg/L								<1.0	<1.0
4-Chloro-3-Methylphenol	µg/L								<1.0	<1.0
2.4.6-Trichlorophenol	µg/L	3		20	2	200			<1.0	<1.0
2.4.5-Trichlorophenol	µg/L								<1.0	<1.0
Pentachlorophenol	µg/L	3.6	11						<2.0	<2.0
Polynuclear Aromatic Hydrocarbons										
Naphthalene	µg/L	16	50						<1.0	<1.0
Acenaphthylene	µg/L								<1.0	<1.0
Acenaphthene	µg/L								<1.0	<1.0
Fluorene	µg/L								<1.0	<1.0
Phenanthrene	µg/L								<1.0	<1.0
Anthracene	µg/L								<1.0	<1.0
Fluoranthene	µg/L								<1.0	<1.0
Pyrene	µg/L								<1.0	<1.0
Benz(a)anthracene	µg/L								<1.0	<1.0
Chrysene	µg/L								<1.0	<1.0
Benzo(b)fluoranthene	µg/L								<1.0	<1.0
Benzo(k)fluoranthene	µg/L								<1.0	<1.0
Benzo(a)pyrene	µg/L			0.01		0.1			<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L								<1.0	<1.0
Dibenz(a.h)anthracene	µg/L								<1.0	<1.0
Benzo(g.h.i)perylene	µg/L								<1.0	<1.0
Total Petroleum Hydrocarbons										
C6 - C9 Fraction	µg/L								<20	<20
C10 - C14 Fraction	µg/L								<50	<50
C15 - C28 Fraction	µg/L								<100	<100
C29 - C36 Fraction	µg/L								<50	<50
C10 - C36 Fraction (sum)	µg/L	600 [4]							<50	<50

NOTES:
1. SRT Healthy Rivers Action Plan Long Term / Short Term Targets
2. ANZECC 99% protection level for Chlordane
3. ANZECC 99% protection level for Endosulfan
4. Dutch intervention values (2000).
5. pH > 6 / pH < 6
6. ASS disturbance indicators
7. Effluent treatment triggers

8 RESULTS

8.1 Laboratory Results

Field results and laboratory analysis of groundwater samples undertaken onsite are presented in Table 3 through to Table 8. To assess the groundwater quality at the Site, water quality results were compared against the criteria outlined within the DEC's *Contaminated Site Management Series - Assessment Levels for Soil, Sediment and Water* (DEC, 2010). Laboratory results were compared against the following criteria;

- Freshwater Ecosystem Trigger Values, Marine Ecosystem Trigger Values, Short-term Irrigation Water and the Long-term Irrigation Water from the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* prepared by the Australian and New Zealand Environment and Conservation Council (ANZECC, 2000);
- Drinking Water Health Value and Drinking Water Aesthetic Value from the *Australian Drinking Water Guidelines* (NHMRC & ARMCANZ, 2004); and,
- Domestic Non-potable Groundwater Use from the Department of Health's (DoH) Contaminated Sites Reporting Guideline for Chemicals in Groundwater (DoH, 2006).

The following notes are the summaries of laboratory results and the comparison to assessment criteria.

Total Petroleum Hydrocarbons (TPH)
Laboratory results indicate the presence of TPH with in WRMW6 however concentrations are below assessment criteria. TPH concentrations within the remaining monitoring wells were below LOR.

Monocyclic Aromatic Hydrocarbons (MAH)
MAHs were not detected in any of the samples analysed.

Polycyclic Aromatic Hydrocarbons
PAHs were not detected in any of the samples analysed.

Phenols
Laboratory results indicate the presence of 3-&4-Methylphenol within WRMW3 all other samples were below laboratory detection limits.

Metals
The following dissolved metals exceedances were detected:

- Dissolved aluminium exceeded the following assessment criteria at the associated locations;
    - WRMW1, WRMW4 and WRMW6 exceeded Fresh Waters assessment criteria for;
    - WRMW5 exceeded both Fresh Waters and ADWG AV assessment criteria.
- Dissolved zinc exceeded the following assessment criteria at the associated locations;

    - WRMW1 And WRMW4 exceeded Fresh Waters assessment criteria;
    - WRMW2, WRMW5 and WRMW6 exceeded Fresh Waters and Marine Waters assessment criteria.
- Dissolved iron exceeded Fresh Waters assessment criteria at WRMW1, WRMW2, and WRMW5.

The following total metals exceedances were detected:

- Total aluminium exceeded the following assessment criteria at the associated locations;
    - WRMW4 and WRMW6 exceeded Fresh Waters and ADWH AV assessment criteria;
    - WRMW2 and WRMW5 exceeded Fresh Waters, ADWG AV and DoH assessment criteria;
    - WRMW1 exceeded all assessment criteria excluding Short Term Irrigation assessment criteria;
    - WRMW3 exceeded all assessment criteria,
- Total copper exceeded the Fresh assessment criteria for all locations,
- Total lead exceeded the following assessment criteria at the associated location;
    - WRMW4 and WRMW6 exceeded Fresh Waters and Marine Waters assessment criteria;
    - WRMW1 and WRMW3 exceeded Fresh Waters, Marine Waters and ADWG HV assessment criteria;
- Total manganese exceeded ADWG AV assessment criteria at WRMW3;
- Total nickel exceeded Fresh Waters assessment criteria within WRMW3;
- Total zinc exceeded the following assessment criteria at the associated location;
    - Fresh Water assessment criteria were exceeded at WRMW4 and WRMW6;
    - WRMW2 and WRMW3 exceeded Fresh Waters and Marine Waters assessment criteria;
- Total iron exceeded the following assessment criteria at the associated locations;
    - WRMW1 exceeded Long-term Irrigation Water assessment criteria;
    - WRMW2 and WRMW4 exceeded Long-term Irrigation Water and Marine Water assessment criteria;
    - WRMW6 exceeded Long-term Irrigation Water, Fresh Waters, Marine Waters and DoH assessment criteria;
    - WRMW3 exceeded all assessment criteria.

OC Pesticides

OC pesticides were below laboratory assessment criteria for all laboratory samples.

OP Pesticides

OP pesticides were not detected in any of the samples analysed. It is noted that the primary laboratory detection limits were not low enough to detect methyl parathion at DNPGW trigger values.

Major Anions and Cations

No exceedances were identified.

Nutrients

Total Nitrogen exceeded Fresh water assessment criteria for all monitoring well locations tested.

Total Phosphorus exceeded Fresh waters criteria at WRMW1, WRMW3, WRMW4 and WRMW5.

8.2 Historical Data

Laboratory analysis of samples completed for GME#2 are tabulated against historical monitoring events to identify changes in groundwater quality. The following points are comparisons of current results from GME#2 against historical data.

- Laboratory results of MW1 samples indicates a decrease in Total Aluminium and an increase in Total Phosphorus, all other analytes remained similar throughout both monitoring events.
- MW2 laboratory results indicate that Total Dissolved Solids (TDS), Suspended Solids (SS), Turbidity, Total Alkalinity, Total Aluminium, Total Copper, Total Iron and 3-&4- Methylphenol have decreased between monitoring events while Acidity has increased; all other analytes have remained similar.
- Results for MW3 show that Electrical Conductivity (EC), TDS, Total Alkalinity, Sulfate, Total Aluminium, Total Manganese and TPH fraction C29-C36 have decreased however SS, Turbidity, Total Nitrogen, Total Phosphorus and 3-&4- Methylphenol have increased. All other analytes remained similar through both monitoring events.
- Laboratory results of MW4 indicate a decrease in EC, TDS, SS, Turbidity, Total Alkalinity, Sulfate, Chloride, Total Aluminium, Total Lead, Total Iron and Trihalomethanes however an increase of Acidity, Total Nitrogen and Total Phosphorus was noted. All other analytes remained similar over the monitoring events.
- Comparison of MW5 results indicate a decrease in EC, TDS, Total Alkalinity, Sulfate, Chloride, Total Aluminium, Total Iron and Trihalomethanes, increases were noted in SS, Turbidity, Total Copper, Total Nitrogen and Total Phosphorus. All other analytes remained similar throughout the monitoring events.
- MW6 laboratory results show a decrease in SS, Turbidity,, Total Alkalinity, Total Aluminium, Total Iron, Ammonia and TPH within the C29-*C36 fraction. An increase was noted of EC, TDS, Acidity, Sulfate, Chloride, Total Nitrogen and TPH within the C15-C28 fraction. All other analytes remained similar throughout the monitoring event.

Table 3 MW1 Groundwater Laboratory Analysis Results

Analyte grouping/Analyte	Units	ANZECC & ARMCANZ		ADWG		DoH	ANZECC & ARMCANZ			
		Fresh Waters	Marine Waters	Drinking Water Health Value (HV)	Drinking Water Aesthetic Value (AV)	Domestic non-potable groundwater use	Short-term Irrigation Water	Long-term Irrigation Water	18/05/2012 WRMW1	30/08/2012 WRMW1
pH Value	pH Unit	6.5-8.5	8.0-8.4		6.5-8.5			6.0-8.5	6.58	6.77
Electrical Conductivity	µS/cm								635	716
Total Dissolved Solids	mg/L								434	474
Suspended Solids	mg/L								582	950
Turbidity	NTU								166	202
Total Alkalinity $CaCO_3$	mg/L								43	36
Acidity as $CaCO_3$	mg/L								15	35
Sulfate as SO_4^{2-}	mg/L			500	250	5000			105	123
Chloride	mg/L				250	2500			134	138
Total Metals										
Aluminium	mg/L	0.055			0.2	2	20	5	11.1	7.69
Arsenic	mg/L	0.013		0.01		0.07	2	0.1	<0.001	<0.001
Cadmium	mg/L	0.0002	0.0007	0.002		0.02	0.05	0.01	<0.0001	<0.0001
Chromium	mg/L						1	0.1	0.007	0.005
Copper	mg/L	0.0014	0.0013	2	1	20	5	0.2	0.004	0.002
Lead	mg/L	0.0034	0.0044	0.01		0.1	5	2	0.013	0.015
Manganese	mg/L	1.9		0.5	0.1	5	10	0.2	0.006	0.004
Molybdenum	mg/L			0.05		0.5	0.05	0.01	<0.001	<0.001
Nickel	mg/L	0.011	0.02	0.02		0.2	2	0.2	0.002	0.003
Selenium	mg/L	0.005		0.01		0.1	0.05	0.02	<0.01	<0.01
Silver	mg/L	0.00005	0.0014	0.1		1			<0.001	<0.001
Zinc	mg/L	0.008	0.015		3	30	5	2	0.008	0.007
Iron	mg/L	0.3	1.0 / 0.35		0.33	3	10	0.2	0.29	0.21
Mercury	mg/L	0.00006	0.0001	0.001		0.01	0.002	0.002	0.0001	0.0001
Nutrients										
Ammonia as N	mg/L	0.9	0.91						0.06	0.03
Nitrite as N	mg/L			3.0		30			0.03	0.02
Nitrate as N	mg/L			50		500			5.15	4.91
Kjeldhal Nitrogen	mg/L								0.5	1.4
Total Nitrogen	mg/L	1.0 / 2.0[1]							5.7	6.3
Total Phosphorus	mg/L	0.1 / 0.2[1]							0.01	0.19
Reactive Phosphorus	mg/L								<0.01	<0.01
Sulfide	mg/L	0.001							0.1	<0.1
COD	mg/L								18	14
BOD	mg/L								<2	<2
Organochlorine Pesticides (OC)										
alpha-BHC	µg/L								<0.5	<0.5
Hexachlorobenzene (HCB)	µg/L								<0.5	<0.5
beta-BHC	µg/L								<0.5	<0.5
gamma-BHC	µg/L								<0.5	<0.5
delta-BHC	µg/L								<0.5	<0.5
Heptachlor	µg/L	0.01							<0.5	<0.5
Aldrin	µg/L								<0.5	<0.5
Heptachlor epoxide	µg/L			0.05	0.3	3			<0.5	<0.5
trans-Chlordane	µg/L	0.03 [2]		0.01	1	10			<0.5	<0.5
alpha-Endosulfan	µg/L	0.03[3]	0.005 [3]	0.05	30	30			<0.5	<0.5
cis-Chlordane	µg/L	0.03 [2]		0.01	1	10			<0.5	<0.5
Dieldrin	µg/L								<0.5	<0.5
4.4`-DDE	µg/L								<0.5	<0.5
Endrin	µg/L	0.01	0.004						<0.5	<0.5
beta-Endosulfan	µg/L	0.03[3]	0.005 [3]						<0.5	<0.5
4.4`-DDD	µg/L								<0.5	<0.5
Endrin aldehyde	µg/L								<0.5	<0.5
Endosulfan sulfate	µg/L								<0.5	<0.5
4.4`-DDT	µg/L	0.006		0.06	30	0.1			<2	<2
Endrin ketone	µg/L								<0.5	<0.5
Methoxychlor	µg/L								<2	<2
Aldrin plus dieldrin	µg/L			0.010	0.3	3			<1	<0.5
Organophosphorus Pesticides (OP)										
Dichlorvos	µg/L								<0.5	<0.5
Demeton-S-methyl	µg/L								<0.5	<0.5
Monocrotophos	µg/L								<2	<2
Dimethoate	µg/L	0.15			50	50			<0.5	<0.5
Diazinon	µg/L	0.01		1	3	1			<0.5	<0.5
Chlorpyrifos-methyl	µg/L	0.01	0.009		10	100			<0.5	<0.5
Parathion-methyl	µg/L								<2	<2
Malathion	µg/L	0.05							<0.5	<0.5
Fenthion	µg/L								<0.5	<0.5
Chlorpyrifos	µg/L	0.01	0.009						<0.5	<0.5
Parathion	µg/L	0.004			10	10			<2	<2
Pirimphos-ethyl	µg/L								<0.5	<0.5
Chlorfenvinphos	µg/L								<0.5	<0.5
Bromophos-ethyl	µg/L								<0.5	<0.5
Fenamiphos	µg/L								<0.5	<0.5
Prothiofos	µg/L								<0.5	<0.5
Ethion	µg/L								<0.5	<0.5
Carbophenothion	µg/L								<0.5	<0.5
Azinphos Methyl	µg/L	0.02							<0.5	<0.5
Monocyclic Aromatic Hydrocarbons										
Benzene	µg/L	0.95	0.5	0.001		0.01			-	-
Toluene	µg/L			0.80	0.025	0.025			-	-
Ethylbenzene	µg/L			0.30	0.003	0.003			-	-
meta- & para-Xylene	µg/L	200							-	-
Styrene	µg/L			0.03	0.004	0.004			<5	<5
ortho-Xylene	µg/L	350							-	-
Isopropylbenzene	µg/L								<5	<5
n-Propylbenzene	µg/L								<5	<5
1.3.5-Trimethylbenzene	µg/L								<5	<5
sec-Butylbenzene	µg/L								<5	<5
1.2.4-Trimethylbenzene	µg/L								<5	<5
tert-Butylbenzene	µg/L								<5	<5
p-Isopropyltoluene	µg/L								<5	<5
n-Butylbenzene	µg/L								<5	<5

Oxygenated Compounds										
Vinyl Acetate	µg/L								<50	<50
2-Butanone (MEK)	µg/L								<50	<50
4-Methyl-2-pentanone (MIBK)	µg/L								<50	<50
2-Hexanone (MBK)	µg/L								<50	<50
Sulfonated Compounds										
Carbon disulfide	µg/L								<5	<5
Fumigants										
2.2-Dichloropropane	µg/L								<5	<5
1.2-Dichloropropane	µg/L								<5	<5
cis-1.3-Dichloropropylene	µg/L								<5	<5
trans-1.3-Dichloropropylene	µg/L								<5	<5
1.2-Dibromoethane (EDB)	µg/L								<5	<5
Halogenated Aliphatic Compounds										
Dichlorodifluoromethane	µg/L								<50	<50
Chloromethane	µg/L								<50	<50
Vinyl chloride	µg/L			0.0003		0.003			<50	<50
Bromomethane	µg/L								<50	<50
Chloroethane	µg/L								<50	<50
Trichlorofluoromethane	µg/L								<50	<50
1.1-Dichloroethene	µg/L			0.03		0.3			<5	<5
Iodomethane	µg/L								<5	<5
trans-1.2-Dichloroethene	µg/L								<5	<5
1.1-Dichloroethane	µg/L								<5	<5
cis-1.2-Dichloroethene	µg/L								<5	<5
1.1.1-Trichloroethane	µg/L								<5	<5
1.1-Dichloropropylene	µg/L								<5	<5
Carbon Tetrachloride	µg/L								<5	<5
1.2-Dichloroethane	µg/L			0.003		0.03			<5	<5
Trichloroethene	µg/L								<5	<5
Dibromomethane	µg/L								<5	<5
1.1.2-Trichloroethane	µg/L	6500	1900						<5	<5
1.3-Dichloropropane	µg/L								<5	<5
Tetrachloroethene	µg/L			0.05		0.5			<5	<5
1.1.1.2-Tetrachloroethane	µg/L								<5	<5
trans-1.4-Dichloro-2-butene	µg/L								<5	<5
cis-1.4-Dichloro-2-butene	µg/L								<5	<5
1.1.2.2-Tetrachloroethane	µg/L								<5	<5
1.2.3-Trichloropropane	µg/L								<5	<5
Pentachloroethane	µg/L								<5	<5
1.2-Dibromo-3-chloropropane	µg/L								<5	<5
Hexachlorobutadiene	µg/L								<5	<5
Halogenated Aromatic Compounds										
Chlorobenzene	µg/L			0.30	0.01	0.01			<5	<5
Bromobenzene	µg/L								<5	<5
2-Chlorotoluene	µg/L								<5	<5
4-Chlorotoluene	µg/L								<5	<5
1.3-Dichlorobenzene	µg/L	0.26			0.02	0.02			<5	<5
1.4-Dichlorobenzene	µg/L	0.06		0.04	0.003	0.003			<5	<5
1.2-Dichlorobenzene	µg/L	0.16		1.5	0.001	0.001			<5	<5
1.2.4-Trichlorobenzene	µg/L	0.085	80	0.03	0.005	0.005			<5	<5
1.2.3-Trichlorobenzene	µg/L	0.003		0.03	0.005	0.005			<5	<5
Trihalomethanes										
Chloroform	µg/L								<5	<5
Bromodichloromethane	µg/L								<5	<5
Dibromochloromethane	µg/L								<5	<5
Bromoform	µg/L								<5	<5
Phenolic Compounds										
Phenol	µg/L	320	400						<1.0	<1.0
2-Chlorophenol	µg/L	340		300	0.1	3000			<1.0	<1.0
2-Methylphenol	µg/L								<1.0	<1.0
3- & 4-Methylphenol	µg/L								<2.0	<2.0
2-Nitrophenol	µg/L								<1.0	<1.0
2.4-Dimethylphenol	µg/L								<1.0	<1.0
2.4-Dichlorophenol	µg/L	120		200	0.3	2000			<1.0	<1.0
2.6-Dichlorophenol	µg/L								<1.0	<1.0
4-Chloro-3-Methylphenol	µg/L								<1.0	<1.0
2.4.6-Trichlorophenol	µg/L	3		20	2	200			<1.0	<1.0
2.4.5-Trichlorophenol	µg/L								<1.0	<1.0
Pentachlorophenol	µg/L	3.6	11						<2.0	<2.0
Polynuclear Aromatic Hydrocarbons										
Naphthalene	µg/L	16	50						<1.0	<1.0
Acenaphthylene	µg/L								<1.0	<1.0
Acenaphthene	µg/L								<1.0	<1.0
Fluorene	µg/L								<1.0	<1.0
Phenanthrene	µg/L								<1.0	<1.0
Anthracene	µg/L								<1.0	<1.0
Fluoranthene	µg/L								<1.0	<1.0
Pyrene	µg/L								<1.0	<1.0
Benz(a)anthracene	µg/L								<1.0	<1.0
Chrysene	µg/L								<1.0	<1.0
Benzo(b)fluoranthene	µg/L								<1.0	<1.0
Benzo(k)fluoranthene	µg/L								<1.0	<1.0
Benzo(a)pyrene	µg/L			0.01		0.1			<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L								<1.0	<1.0
Dibenz(a.h)anthracene	µg/L								<1.0	<1.0
Benzo(g.h.i)perylene	µg/L								<1.0	<1.0
Total Petroleum Hydrocarbons										
C6 - C9 Fraction	µg/L								<20	<20
C10 - C14 Fraction	µg/L								<50	<50
C15 - C28 Fraction	µg/L								<100	<100
C29 - C36 Fraction	µg/L								<50	<50
C10 - C36 Fraction (sum)	µg/L	600 [4]							<50	<50

NOTES:
1. SRT Healthy Rivers Action Plan Long Term / Short Term Targets
2. ANZECC 99% protection level for Chlordane
3. ANZECC 99% protection level for Endosulfan
4. Dutch intervention values (2000).
5. pH > 6 / pH < 6
6. ASS disturbance indicators
7. Effluent treatment triggers

Table 4 MW2 Groundwater Laboratory Analysis Results

Analyte grouping/Analyte	Units	ANZECC & ARMCANZ		ADWG		DoH	ANZECC & ARMCANZ		18/05/2012	30/08/2012
		Fresh Waters	Marine Waters	Drinking Water Health Value (HV)	Drinking Water Aesthetic Value (AV)	Domestic non-potable groundwater use	Short-term Irrigation Water	Long-term Irrigation Water	WRMW2	WRMW2
pH Value	pH Unit	6.5-8.5	8.0-8.4		6.5-8.5			6.0-8.5	6.14	5.72
Electrical Conductivity	µS/cm								307	292
Total Dissolved Solids	mg/L								244	169
Suspended Solids	mg/L								292	106
Turbidity	NTU								236	32
Total Alkalinity $CaCO_3$	mg/L								17	3
Acidity as $CaCO_3$	mg/L								26	42
Sulfate as SO_4^{2-}	mg/L			500	250	5000			13	11
Chloride	mg/L				250	2500			80	82
Total Metals										
Aluminium	mg/L	0.055			0.2	2	20	5	16.2	3.15
Arsenic	mg/L	0.013		0.01		0.07	2	0.1	<0.001	<0.001
Cadmium	mg/L	0.0002	0.0007	0.002		0.02	0.05	0.01	<0.0001	<0.0001
Chromium	mg/L						1	0.1	0.016	0.003
Copper	mg/L	0.0014	0.0013	2	1	20	5	0.2	0.07	0.005
Lead	mg/L	0.0034	0.0044	0.01		0.1	5	2	0.017	0.003
Manganese	mg/L	1.9		0.5	0.1	5	10	0.2	0.026	0.004
Molybdenum	mg/L			0.05		0.5	0.05	0.01	<0.001	<0.001
Nickel	mg/L	0.011	0.02	0.02		0.2	2	0.2	0.005	0.006
Selenium	mg/L	0.005		0.01		0.1	0.05	0.02	<0.01	<0.01
Silver	mg/L	0.00005	0.0014	0.1		1			<0.001	<0.001
Zinc	mg/L	0.008	0.015		3	30	5	2	0.08	0.079
Iron	mg/L	0.3	1.0 / 0.35		0.33	3	10	0.2	4.82	2.12
Mercury	mg/L	0.00006	0.0001	0.001		0.01	0.002	0.002	0.0001	<0.0001
Nutrients										
Ammonia as N	mg/L	0.9	0.91						0.36	0.03
Nitrite as N	mg/L			3.0		30			0.02	0.01
Nitrate as N	mg/L			50		500			0.62	1.09
Kjeldhal Nitrogen	mg/L								0.5	0.3
Total Nitrogen	mg/L	1.0 / 2.0[1]							1.1	1.4
Total Phosphorus	mg/L	0.1 / 0.2[1]							0.15	0.03
Reactive Phosphorus	mg/L								<0.01	<0.01
Sulfide	mg/L	0.001							<0.1	<0.1
COD	mg/L								16	<5
BOD	mg/L								3	<2
Organochlorine Pesticides (OC)										
alpha-BHC	µg/L								<0.5	<0.5
Hexachlorobenzene (HCB)	µg/L								<0.5	<0.5
beta-BHC	µg/L								<0.5	<0.5
gamma-BHC	µg/L								<0.5	<0.5
delta-BHC	µg/L								<0.5	<0.5
Heptachlor	µg/L	0.01							<0.5	<0.5
Aldrin	µg/L								<0.5	<0.5
Heptachlor epoxide	µg/L			0.05	0.3	3			<0.5	<0.5
trans-Chlordane	µg/L	0.03 [2]		0.01	1	10			<0.5	<0.5
alpha-Endosulfan	µg/L	0.03 [3]	0.005 [3]	0.05	30	30			<0.5	<0.5
cis-Chlordane	µg/L	0.03 [2]		0.01	1	10			<0.5	<0.5
Dieldrin	µg/L								<0.5	<0.5
4.4`-DDE	µg/L								<0.5	<0.5
Endrin	µg/L	0.01	0.004						<0.5	<0.5
beta-Endosulfan	µg/L	0.03 [3]	0.005 [3]						<0.5	<0.5
4.4`-DDD	µg/L								<0.5	<0.5
Endrin aldehyde	µg/L								<0.5	<0.5
Endosulfan sulfate	µg/L								<0.5	<0.5
4.4`-DDT	µg/L	0.006		0.06	30	0.1			<2	<2
Endrin ketone	µg/L								<0.5	<0.5
Methoxychlor	µg/L								<2	<2
Aldrin plus dieldrin	µg/L			0.010	0.3	3			<1	<0.5
Organophosphorus Pesticides (OP)										
Dichlorvos	µg/L								<0.5	<0.5
Demeton-S-methyl	µg/L								<0.5	<0.5
Monocrotophos	µg/L								<2	<2
Dimethoate	µg/L	0.15			50	50			<0.5	<0.5
Diazinon	µg/L	0.01		1	3	1			<0.5	<0.5
Chlorpyrifos-methyl	µg/L	0.01	0.009		10	100			<0.5	<0.5
Parathion-methyl	µg/L								<2	<2
Malathion	µg/L	0.05							<0.5	<0.5
Fenthion	µg/L								<0.5	<0.5
Chlorpyrifos	µg/L	0.01	0.009						<0.5	<0.5
Parathion	µg/L	0.004			10	10			<2	<2
Pirimphos-ethyl	µg/L								<0.5	<0.5
Chlorfenvinphos	µg/L								<0.5	<0.5
Bromophos-ethyl	µg/L								<0.5	<0.5
Fenamiphos	µg/L								<0.5	<0.5
Prothiofos	µg/L								<0.5	<0.5
Ethion	µg/L								<0.5	<0.5
Carbophenothion	µg/L								<0.5	<0.5
Azinphos Methyl	µg/L	0.02							<0.5	<0.5
Monocyclic Aromatic Hydrocarbons										
Benzene	µg/L	0.95	0.5	0.001		0.01			-	-
Toluene	µg/L			0.80	0.025	0.025			-	-
Ethylbenzene	µg/L			0.30	0.003	0.003			-	-
meta- & para-Xylene	µg/L	200							-	-
Styrene	µg/L			0.03	0.004	0.004			<5	<5
ortho-Xylene	µg/L	350							-	-
Isopropylbenzene	µg/L								<5	<5
n-Propylbenzene	µg/L								<5	<5
1.3.5-Trimethylbenzene	µg/L								<5	<5
sec-Butylbenzene	µg/L								<5	<5
1.2.4-Trimethylbenzene	µg/L								<5	<5
tert-Butylbenzene	µg/L								<5	<5
p-Isopropyltoluene	µg/L								<5	<5
n-Butylbenzene	µg/L								<5	<5

Oxygenated Compounds										
Vinyl Acetate	µg/L								<50	<50
2-Butanone (MEK)	µg/L								<50	<50
4-Methyl-2-pentanone (MIBK)	µg/L								<50	<50
2-Hexanone (MBK)	µg/L								<50	<50
Sulfonated Compounds										
Carbon disulfide	µg/L								<5	<5
Fumigants										
2.2-Dichloropropane	µg/L								<5	<5
1.2-Dichloropropane	µg/L								<5	<5
cis-1.3-Dichloropropylene	µg/L								<5	<5
trans-1.3-Dichloropropylene	µg/L								<5	<5
1.2-Dibromoethane (EDB)	µg/L								<5	<5
Halogenated Aliphatic Compounds										
Dichlorodifluoromethane	µg/L								<50	<50
Chloromethane	µg/L								<50	<50
Vinyl chloride	µg/L			0.0003		0.003			<50	<50
Bromomethane	µg/L								<50	<50
Chloroethane	µg/L								<50	<50
Trichlorofluoromethane	µg/L								<50	<50
1.1-Dichloroethene	µg/L			0.03		0.3			<5	<5
Iodomethane	µg/L								<5	<5
trans-1.2-Dichloroethene	µg/L								<5	<5
1.1-Dichloroethane	µg/L								<5	<5
cis-1.2-Dichloroethene	µg/L								<5	<5
1.1.1-Trichloroethane	µg/L								<5	<5
1.1-Dichloropropylene	µg/L								<5	<5
Carbon Tetrachloride	µg/L								<5	<5
1.2-Dichloroethane	µg/L			0.003		0.03			<5	<5
Trichloroethene	µg/L								<5	<5
Dibromomethane	µg/L								<5	<5
1.1.2-Trichloroethane	µg/L	6500	1900						<5	<5
1.3-Dichloropropane	µg/L								<5	<5
Tetrachloroethene	µg/L			0.05		0.5			<5	<5
1.1.1.2-Tetrachloroethane	µg/L								<5	<5
trans-1.4-Dichloro-2-butene	µg/L								<5	<5
cis-1.4-Dichloro-2-butene	µg/L								<5	<5
1.1.2.2-Tetrachloroethane	µg/L								<5	<5
1.2.3-Trichloropropane	µg/L								<5	<5
Pentachloroethane	µg/L								<5	<5
1.2-Dibromo-3-chloropropane	µg/L								<5	<5
Hexachlorobutadiene	µg/L								<5	<5
Halogenated Aromatic Compounds										
Chlorobenzene	µg/L			0.30	0.01	0.01			<5	<5
Bromobenzene	µg/L								<5	<5
2-Chlorotoluene	µg/L								<5	<5
4-Chlorotoluene	µg/L								<5	<5
1.3-Dichlorobenzene	µg/L	0.26			0.02	0.02			<5	<5
1.4-Dichlorobenzene	µg/L	0.06		0.04	0.003	0.003			<5	<5
1.2-Dichlorobenzene	µg/L	0.16		1.5	0.001	0.001			<5	<5
1.2.4-Trichlorobenzene	µg/L	0.085	80	0.03	0.005	0.005			<5	<5
1.2.3-Trichlorobenzene	µg/L	0.003		0.03	0.005	0.005			<5	<5
Trihalomethanes										
Chloroform	µg/L								<5	<5
Bromodichloromethane	µg/L								<5	<5
Dibromochloromethane	µg/L								<5	<5
Bromoform	µg/L								<5	<5
Phenolic Compounds										
Phenol	µg/L	320	400						<1.0	<1.0
2-Chlorophenol	µg/L	340		300	0.1	3000			<1.0	<1.0
2-Methylphenol	µg/L								<1.0	<1.0
3- & 4-Methylphenol	µg/L								**2.6**	<2.0
2-Nitrophenol	µg/L								<1.0	<1.0
2.4-Dimethylphenol	µg/L								<1.0	<1.0
2.4-Dichlorophenol	µg/L	120		200	0.3	2000			<1.0	<1.0
2.6-Dichlorophenol	µg/L								<1.0	<1.0
4-Chloro-3-Methylphenol	µg/L								<1.0	<1.0
2.4.6-Trichlorophenol	µg/L	3		20	2	200			<1.0	<1.0
2.4.5-Trichlorophenol	µg/L								<1.0	<1.0
Pentachlorophenol	µg/L	3.6	11						<2.0	<2.0
Polynuclear Aromatic Hydrocarbons										
Naphthalene	µg/L	16	50						<1.0	<1.0
Acenaphthylene	µg/L								<1.0	<1.0
Acenaphthene	µg/L								<1.0	<1.0
Fluorene	µg/L								<1.0	<1.0
Phenanthrene	µg/L								<1.0	<1.0
Anthracene	µg/L								<1.0	<1.0
Fluoranthene	µg/L								<1.0	<1.0
Pyrene	µg/L								<1.0	<1.0
Benz(a)anthracene	µg/L								<1.0	<1.0
Chrysene	µg/L								<1.0	<1.0
Benzo(b)fluoranthene	µg/L								<1.0	<1.0
Benzo(k)fluoranthene	µg/L								<1.0	<1.0
Benzo(a)pyrene	µg/L			0.01		0.1			<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L								<1.0	<1.0
Dibenz(a.h)anthracene	µg/L								<1.0	<1.0
Benzo(g.h.i)perylene	µg/L								<1.0	<1.0
Total Petroleum Hydrocarbons										
C6 - C9 Fraction	µg/L								<20	<20
C10 - C14 Fraction	µg/L								<50	<50
C15 - C28 Fraction	µg/L								<100	<100
C29 - C36 Fraction	µg/L								<50	<50
C10 - C36 Fraction (sum)	µg/L	600 [4]							<50	<50

NOTES:
1. SRT Healthy Rivers Action Plan Long Term / Short Term Targets
2. ANZECC 99% protection level for Chlordane
3. ANZECC 99% protection level for Endosulfan
4. Dutch intervention values (2000).
5. pH > 6 / pH < 6
6. ASS disturbance indicators
7. Effluent treatment triggers

Table 5 MW3 Groundwater Laboratory Analysis Results

Analyte grouping/Analyte	Units	ANZECC & ARMCANZ		ADWG		DoH	ANZECC & ARMCANZ		18/05/2012	30/08/2012
		Fresh Waters	Marine Waters	Drinking Water Health Value (HV)	Drinking Water Aesthetic Value (AV)	Domestic non-potable groundwater use	Short-term Irrigation Water	Long-term Irrigation Water	WRMW3	WRMW3
pH Value	pH Unit	6.5-8.5	8.0-8.4		6.5-8.5			6.0-8.5	7.41	7.83
Electrical Conductivity	µS/cm								1070	901
Total Dissolved Solids	mg/L								704	567
Suspended Solids	mg/L								425	1610
Turbidity	NTU								383	1120
Total Alkalinity $CaCO_3$	mg/L								292	157
Acidity as $CaCO_3$	mg/L								16	18
Sulfate as SO_4^{2-}	mg/L			500	250	5000			40	18
Chloride	mg/L				250	2500			216	219
Total Metals										
Aluminium	mg/L	0.055			0.2	2	20	5	34.4	24.9
Arsenic	mg/L	0.013		0.01		0.07	2	0.1	0.01	0.007
Cadmium	mg/L	0.0002	0.0007	0.002		0.02	0.05	0.01	0.0001	0.0002
Chromium	mg/L						1	0.1	0.047	0.044
Copper	mg/L	0.0014	0.0013	2	1	20	5	0.2	0.032	0.036
Lead	mg/L	0.0034	0.0044	0.01		0.1	5	2	0.087	0.079
Manganese	mg/L	1.9		0.5	0.1	5	10	0.2	0.191	0.129
Molybdenum	mg/L			0.05		0.5	0.05	0.01	<0.001	0.001
Nickel	mg/L	0.011	0.02	0.02		0.2	2	0.2	0.014	0.019
Selenium	mg/L	0.005		0.01		0.1	0.05	0.02	<0.01	<0.01
Silver	mg/L	0.00005	0.0014	0.1		1			<0.001	<0.001
Zinc	mg/L	0.008	0.015		3	30	5	2	0.068	0.079
Iron	mg/L	0.3	1.0 / 0.35		0.33	3	10	0.2	11.9	12.4
Mercury	mg/L	0.00006	0.0001	0.001		0.01	0.002	0.002	<0.0001	<0.0001
Nutrients										
Ammonia as N	mg/L	0.9	0.91						0.03	0.45
Nitrite as N	mg/L			3.0		30			<0.01	0.02
Nitrate as N	mg/L			50		500			0.17	0.31
Kjeldhal Nitrogen	mg/L								0.3	1.4
Total Nitrogen	mg/L	1.0 / 2.0[1]							0.5	1.7
Total Phosphorus	mg/L	0.1 / 0.2[1]							0.24	0.51
Reactive Phosphorus	mg/L								<0.01	<0.01
Sulfide	mg/L	0.001							<0.1	<0.1
COD	mg/L								155	21
BOD	mg/L								69	5
Organochlorine Pesticides (OC)										
alpha-BHC	µg/L								<0.5	<0.5
Hexachlorobenzene (HCB)	µg/L								<0.5	<0.5
beta-BHC	µg/L								<0.5	<0.5
gamma-BHC	µg/L								<0.5	<0.5
delta-BHC	µg/L								<0.5	<0.5
Heptachlor	µg/L	0.01							<0.5	<0.5
Aldrin	µg/L								<0.5	<0.5
Heptachlor epoxide	µg/L			0.05	0.3	3			<0.5	<0.5
trans-Chlordane	µg/L	0.03 [2]		0.01	1	10			<0.5	<0.5
alpha-Endosulfan	µg/L	0.03 [3]	0.005 [3]	0.05	30	30			<0.5	<0.5
cis-Chlordane	µg/L	0.03 [2]		0.01	1	10			<0.5	<0.5
Dieldrin	µg/L								<0.5	<0.5
4.4`-DDE	µg/L								<0.5	<0.5
Endrin	µg/L	0.01	0.004						<0.5	<0.5
beta-Endosulfan	µg/L	0.03 [3]	0.005 [3]						<0.5	<0.5
4.4`-DDD	µg/L								<0.5	<0.5
Endrin aldehyde	µg/L								<0.5	<0.5
Endosulfan sulfate	µg/L								<0.5	<0.5
4.4`-DDT	µg/L	0.006		0.06	30	0.1			<2	<2
Endrin ketone	µg/L								<0.5	<0.5
Methoxychlor	µg/L								<2	<2
Aldrin plus dieldrin	µg/L			0.010	0.3	3			<1	<0.5
Organophosphorus Pesticides (OP)										
Dichlorvos	µg/L								<0.5	<0.5
Demeton-S-methyl	µg/L								<0.5	<0.5
Monocrotophos	µg/L								<2	<2
Dimethoate	µg/L	0.15			50	50			<0.5	<0.5
Diazinon	µg/L	0.01		1	3	1			<0.5	<0.5
Chlorpyrifos-methyl	µg/L	0.01	0.009		10	100			<0.5	<0.5
Parathion-methyl	µg/L								<2	<2
Malathion	µg/L	0.05							<0.5	<0.5
Fenthion	µg/L								<0.5	<0.5
Chlorpyrifos	µg/L	0.01	0.009						<0.5	<0.5
Parathion	µg/L	0.004			10	10			<2	<2
Pirimphos-ethyl	µg/L								<0.5	<0.5
Chlorfenvinphos	µg/L								<0.5	<0.5
Bromophos-ethyl	µg/L								<0.5	<0.5
Fenamiphos	µg/L								<0.5	<0.5
Prothiofos	µg/L								<0.5	<0.5
Ethion	µg/L								<0.5	<0.5
Carbophenothion	µg/L								<0.5	<0.5
Azinphos Methyl	µg/L	0.02							<0.5	<0.5
Monocyclic Aromatic Hydrocarbons										
Benzene	µg/L	0.95	0.5	0.001		0.01			-	-
Toluene	µg/L			0.80	0.025	0.025			-	-
Ethylbenzene	µg/L			0.30	0.003	0.003			-	-
meta- & para-Xylene	µg/L	200							-	-
Styrene	µg/L			0.03	0.004	0.004			<5	<5
ortho-Xylene	µg/L	350							-	-
Isopropylbenzene	µg/L								<5	<5
n-Propylbenzene	µg/L								<5	<5
1.3.5-Trimethylbenzene	µg/L								<5	<5
sec-Butylbenzene	µg/L								<5	<5
1.2.4-Trimethylbenzene	µg/L								<5	<5
tert-Butylbenzene	µg/L								<5	<5
p-Isopropyltoluene	µg/L								<5	<5
n-Butylbenzene	µg/L								<5	<5

Oxygenated Compounds										
Vinyl Acetate	µg/L								<50	<50
2-Butanone (MEK)	µg/L								<50	<50
4-Methyl-2-pentanone (MIBK)	µg/L								<50	<50
2-Hexanone (MBK)	µg/L								<50	<50
Sulfonated Compounds										
Carbon disulfide	µg/L								<5	<5
Fumigants										
2.2-Dichloropropane	µg/L								<5	<5
1.2-Dichloropropane	µg/L								<5	<5
cis-1.3-Dichloropropylene	µg/L								<5	<5
trans-1.3-Dichloropropylene	µg/L								<5	<5
1.2-Dibromoethane (EDB)	µg/L								<5	<5
Halogenated Aliphatic Compounds										
Dichlorodifluoromethane	µg/L								<50	<50
Chloromethane	µg/L								<50	<50
Vinyl chloride	µg/L			0.0003		0.003			<50	<50
Bromomethane	µg/L								<50	<50
Chloroethane	µg/L								<50	<50
Trichlorofluoromethane	µg/L								<50	<50
1.1-Dichloroethene	µg/L			0.03		0.3			<5	<5
Iodomethane	µg/L								<5	<5
trans-1.2-Dichloroethene	µg/L								<5	<5
1.1-Dichloroethane	µg/L								<5	<5
cis-1.2-Dichloroethene	µg/L								<5	<5
1.1.1-Trichloroethane	µg/L								<5	<5
1.1-Dichloropropylene	µg/L								<5	<5
Carbon Tetrachloride	µg/L								<5	<5
1.2-Dichloroethane	µg/L			0.003		0.03			<5	<5
Trichloroethene	µg/L								<5	<5
Dibromomethane	µg/L								<5	<5
1.1.2-Trichloroethane	µg/L	6500	1900						<5	<5
1.3-Dichloropropane	µg/L								<5	<5
Tetrachloroethene	µg/L			0.05		0.5			<5	<5
1.1.1.2-Tetrachloroethane	µg/L								<5	<5
trans-1.4-Dichloro-2-butene	µg/L								<5	<5
cis-1.4-Dichloro-2-butene	µg/L								<5	<5
1.1.2.2-Tetrachloroethane	µg/L								<5	<5
1.2.3-Trichloropropane	µg/L								<5	<5
Pentachloroethane	µg/L								<5	<5
1.2-Dibromo-3-chloropropane	µg/L								<5	<5
Hexachlorobutadiene	µg/L								<5	<5
Halogenated Aromatic Compounds										
Chlorobenzene	µg/L			0.30	0.01	0.01			<5	<5
Bromobenzene	µg/L								<5	<5
2-Chlorotoluene	µg/L								<5	<5
4-Chlorotoluene	µg/L								<5	<5
1.3-Dichlorobenzene	µg/L	0.26			0.02	0.02			<5	<5
1.4-Dichlorobenzene	µg/L	0.06		0.04	0.003	0.003			<5	<5
1.2-Dichlorobenzene	µg/L	0.16		1.5	0.001	0.001			<5	<5
1.2.4-Trichlorobenzene	µg/L	0.085	80	0.03	0.005	0.005			<5	<5
1.2.3-Trichlorobenzene	µg/L	0.003		0.03	0.005	0.005			<5	<5
Trihalomethanes										
Chloroform	µg/L								<5	<5
Bromodichloromethane	µg/L								<5	<5
Dibromochloromethane	µg/L								<5	<5
Bromoform	µg/L								<5	<5
Phenolic Compounds										
Phenol	µg/L	320	400						<1.0	<1.0
2-Chlorophenol	µg/L	340		300	0.1	3000			<1.0	<1.0
2-Methylphenol	µg/L								<1.0	<1.0
3- & 4-Methylphenol	µg/L								<2.0	**3.3**
2-Nitrophenol	µg/L								<1.0	<1.0
2.4-Dimethylphenol	µg/L								<1.0	<1.0
2.4-Dichlorophenol	µg/L	120		200	0.3	2000			<1.0	<1.0
2.6-Dichlorophenol	µg/L								<1.0	<1.0
4-Chloro-3-Methylphenol	µg/L								<1.0	<1.0
2.4.6-Trichlorophenol	µg/L	3		20	2	200			<1.0	<1.0
2.4.5-Trichlorophenol	µg/L								<1.0	<1.0
Pentachlorophenol	µg/L	3.6	11						<2.0	<2.0
Polynuclear Aromatic Hydrocarbons										
Naphthalene	µg/L	16	50						<1.0	<1.0
Acenaphthylene	µg/L								<1.0	<1.0
Acenaphthene	µg/L								<1.0	<1.0
Fluorene	µg/L								<1.0	<1.0
Phenanthrene	µg/L								<1.0	<1.0
Anthracene	µg/L								<1.0	<1.0
Fluoranthene	µg/L								<1.0	<1.0
Pyrene	µg/L								<1.0	<1.0
Benz(a)anthracene	µg/L								<1.0	<1.0
Chrysene	µg/L								<1.0	<1.0
Benzo(b)fluoranthene	µg/L								<1.0	<1.0
Benzo(k)fluoranthene	µg/L								<1.0	<1.0
Benzo(a)pyrene	µg/L			0.01		0.1			<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L								<1.0	<1.0
Dibenz(a.h)anthracene	µg/L								<1.0	<1.0
Benzo(g.h.i)perylene	µg/L								<1.0	<1.0
Total Petroleum Hydrocarbons										
C6 - C9 Fraction	µg/L								<20	<20
C10 - C14 Fraction	µg/L								<50	<50
C15 - C28 Fraction	µg/L								<100	<100
C29 - C36 Fraction	µg/L								**270**	<50
C10 - C36 Fraction (sum)	µg/L	600 [4]							**270**	<50

NOTES:
1. SRT Healthy Rivers Action Plan Long Term / Short Term Targets
2. ANZECC 99% protection level for Chlordane
3. ANZECC 99% protection level for Endosulfan
4. Dutch intervention values (2000).
5. pH > 6 / pH < 6
6. ASS disturbance indicators
7. Effluent treatment triggers

Table 6 MW4 Groundwater Laboratory Analysis Results

Analyte grouping/Analyte	Units	ANZECC & ARMCANZ		ADWG		DoH	ANZECC & ARMCANZ		18/05/2012	30/08/2012
		Fresh Waters	Marine Waters	Drinking Water Health Value (HV)	Drinking Water Aesthetic Value (AV)	Domestic non-potable groundwater use	Short-term Irrigation Water	Long-term Irrigation Water	WRMW4	WRMW4
pH Value	pH Unit	6.5-8.5	8.0-8.4		6.5-8.5			6.0-8.5	6.04	5.96
Electrical Conductivity	µS/cm								354	144
Total Dissolved Solids	mg/L								226	83
Suspended Solids	mg/L								144	9
Turbidity	NTU								86.9	10.8
Total Alkalinity $CaCO_3$	mg/L								5	1
Acidity as $CaCO_3$	mg/L								8	21
Sulfate as SO_4^{2-}	mg/L			500	250	5000			17	2
Chloride	mg/L				250	2500			89	30
Total Metals										
Aluminium	mg/L	0.055			0.2	2	20	5	4.3	1.61
Arsenic	mg/L	0.013		0.01		0.07	2	0.1	0.001	<0.001
Cadmium	mg/L	0.0002	0.0007	0.002		0.02	0.05	0.01	<0.0001	<0.0001
Chromium	mg/L						1	0.1	0.004	0.001
Copper	mg/L	0.0014	0.0013	2	1	20	5	0.2	0.005	0.003
Lead	mg/L	0.0034	0.0044	0.01		0.1	5	2	0.011	0.005
Manganese	mg/L	1.9		0.5	0.1	5	10	0.2	0.016	0.006
Molybdenum	mg/L			0.05		0.5	0.05	0.01	<0.001	<0.001
Nickel	mg/L	0.011	0.02	0.02		0.2	2	0.2	0.001	0.003
Selenium	mg/L	0.005		0.01		0.1	0.05	0.02	<0.01	<0.01
Silver	mg/L	0.00005	0.0014	0.1		1			<0.001	<0.001
Zinc	mg/L	0.008	0.015		3	30	5	2	0.017	0.011
Iron	mg/L	0.3	1.0 / 0.35		0.33	3	10	0.2	0.88	0.4
Mercury	mg/L	0.00006	0.0001	0.001		0.01	0.002	0.002	<0.0001	<0.0001
Nutrients										
Ammonia as N	mg/L	0.9	0.91						0.11	0.05
Nitrite as N	mg/L			3.0		30			0.01	<0.01
Nitrate as N	mg/L			50		500			3.75	4.92
Kjeldhal Nitrogen	mg/L								0.5	1.1
Total Nitrogen	mg/L	1.0 / 2.0[1]							4.3	6
Total Phosphorus	mg/L	0.1 / 0.2[1]							0.04	0.12
Reactive Phosphorus	mg/L								<0.01	<0.01
Sulfide	mg/L	0.001							<0.1	<0.1
COD	mg/L								11	7
BOD	mg/L								4	<2
Organochlorine Pesticides (OC)										
alpha-BHC	µg/L								<0.5	<0.5
Hexachlorobenzene (HCB)	µg/L								<0.5	<0.5
beta-BHC	µg/L								<0.5	<0.5
gamma-BHC	µg/L								<0.5	<0.5
delta-BHC	µg/L								<0.5	<0.5
Heptachlor	µg/L	0.01							<0.5	<0.5
Aldrin	µg/L								<0.5	<0.5
Heptachlor epoxide	µg/L			0.05	0.3	3			<0.5	<0.5
trans-Chlordane	µg/L	0.03 [2]		0.01	1	10			<0.5	<0.5
alpha-Endosulfan	µg/L	0.03 [3]	0.005 [3]	0.05	30	30			<0.5	<0.5
cis-Chlordane	µg/L	0.03 [2]		0.01	1	10			<0.5	<0.5
Dieldrin	µg/L								<0.5	<0.5
4.4`-DDE	µg/L								<0.5	<0.5
Endrin	µg/L	0.01	0.004						<0.5	<0.5
beta-Endosulfan	µg/L	0.03 [3]	0.005 [3]						<0.5	<0.5
4.4`-DDD	µg/L								<0.5	<0.5
Endrin aldehyde	µg/L								<0.5	<0.5
Endosulfan sulfate	µg/L								<0.5	<0.5
4.4`-DDT	µg/L	0.006		0.06	30	0.1			<2	<2
Endrin ketone	µg/L								<0.5	<0.5
Methoxychlor	µg/L								<2	<2
Aldrin plus dieldrin	µg/L			0.010	0.3	3			<1	<0.5
Organophosphorus Pesticides (OP)										
Dichlorvos	µg/L								<0.5	<0.5
Demeton-S-methyl	µg/L								<0.5	<0.5
Monocrotophos	µg/L								<2	<2
Dimethoate	µg/L	0.15			50	50			<0.5	<0.5
Diazinon	µg/L	0.01		1	3	1			<0.5	<0.5
Chlorpyrifos-methyl	µg/L	0.01	0.009		10	100			<0.5	<0.5
Parathion-methyl	µg/L								<2	<2
Malathion	µg/L	0.05							<0.5	<0.5
Fenthion	µg/L								<0.5	<0.5
Chlorpyrifos	µg/L	0.01	0.009						<0.5	<0.5
Parathion	µg/L	0.004			10	10			<2	<2
Pirimphos-ethyl	µg/L								<0.5	<0.5
Chlorfenvinphos	µg/L								<0.5	<0.5
Bromophos-ethyl	µg/L								<0.5	<0.5
Fenamiphos	µg/L								<0.5	<0.5
Prothiofos	µg/L								<0.5	<0.5
Ethion	µg/L								<0.5	<0.5
Carbophenothion	µg/L								<0.5	<0.5
Azinphos Methyl	µg/L	0.02							<0.5	<0.5
Monocyclic Aromatic Hydrocarbons										
Benzene	µg/L	0.95	0.5	0.001		0.01			-	-
Toluene	µg/L			0.80	0.025	0.025			-	-
Ethylbenzene	µg/L			0.30	0.003	0.003			-	-
meta- & para-Xylene	µg/L	200							-	-
Styrene	µg/L			0.03	0.004	0.004			<5	<5
ortho-Xylene	µg/L	350							-	-
Isopropylbenzene	µg/L								<5	<5
n-Propylbenzene	µg/L								<5	<5
1.3.5-Trimethylbenzene	µg/L								<5	<5
sec-Butylbenzene	µg/L								<5	<5
1.2.4-Trimethylbenzene	µg/L								<5	<5
tert-Butylbenzene	µg/L								<5	<5
p-Isopropyltoluene	µg/L								<5	<5
n-Butylbenzene	µg/L								<5	<5

Oxygenated Compounds										
Vinyl Acetate	µg/L								<50	<50
2-Butanone (MEK)	µg/L								<50	<50
4-Methyl-2-pentanone (MIBK)	µg/L								<50	<50
2-Hexanone (MBK)	µg/L								<50	<50
Sulfonated Compounds										
Carbon disulfide	µg/L								<5	<5
Fumigants										
2.2-Dichloropropane	µg/L								<5	<5
1.2-Dichloropropane	µg/L								<5	<5
cis-1.3-Dichloropropylene	µg/L								<5	<5
trans-1.3-Dichloropropylene	µg/L								<5	<5
1.2-Dibromoethane (EDB)	µg/L								<5	<5
Halogenated Aliphatic Compounds										
Dichlorodifluoromethane	µg/L								<50	<50
Chloromethane	µg/L								<50	<50
Vinyl chloride	µg/L			0.0003		0.003			<50	<50
Bromomethane	µg/L								<50	<50
Chloroethane	µg/L								<50	<50
Trichlorofluoromethane	µg/L								<50	<50
1.1-Dichloroethene	µg/L			0.03		0.3			<5	<5
Iodomethane	µg/L								<5	<5
trans-1.2-Dichloroethene	µg/L								<5	<5
1.1-Dichloroethane	µg/L								<5	<5
cis-1.2-Dichloroethene	µg/L								<5	<5
1.1.1-Trichloroethane	µg/L								<5	<5
1.1-Dichloropropylene	µg/L								<5	<5
Carbon Tetrachloride	µg/L								<5	<5
1.2-Dichloroethane	µg/L			0.003		0.03			<5	<5
Trichloroethene	µg/L								<5	<5
Dibromomethane	µg/L								<5	<5
1.1.2-Trichloroethane	µg/L	6500	1900						<5	<5
1.3-Dichloropropane	µg/L								<5	<5
Tetrachloroethene	µg/L			0.05		0.5			<5	<5
1.1.1.2-Tetrachloroethane	µg/L								<5	<5
trans-1.4-Dichloro-2-butene	µg/L								<5	<5
cis-1.4-Dichloro-2-butene	µg/L								<5	<5
1.1.2.2-Tetrachloroethane	µg/L								<5	<5
1.2.3-Trichloropropane	µg/L								<5	<5
Pentachloroethane	µg/L								<5	<5
1.2-Dibromo-3-chloropropane	µg/L								<5	<5
Hexachlorobutadiene	µg/L								<5	<5
Halogenated Aromatic Compounds										
Chlorobenzene	µg/L			0.30	0.01	0.01			<5	<5
Bromobenzene	µg/L								<5	<5
2-Chlorotoluene	µg/L								<5	<5
4-Chlorotoluene	µg/L								<5	<5
1.3-Dichlorobenzene	µg/L	0.26			0.02	0.02			<5	<5
1.4-Dichlorobenzene	µg/L	0.06		0.04	0.003	0.003			<5	<5
1.2-Dichlorobenzene	µg/L	0.16		1.5	0.001	0.001			<5	<5
1.2.4-Trichlorobenzene	µg/L	0.085	80	0.03	0.005	0.005			<5	<5
1.2.3-Trichlorobenzene	µg/L	0.003		0.03	0.005	0.005			<5	<5
Trihalomethanes										
Chloroform	µg/L								<5	<5
Bromodichloromethane	µg/L								<5	<5
Dibromochloromethane	µg/L								**12**	<5
Bromoform	µg/L								**13**	<5
Phenolic Compounds										
Phenol	µg/L	320	400						<1.0	<1.0
2-Chlorophenol	µg/L	340		300	0.1	3000			<1.0	<1.0
2-Methylphenol	µg/L								<1.0	<1.0
3- & 4-Methylphenol	µg/L								<2.0	<2.0
2-Nitrophenol	µg/L								<1.0	<1.0
2.4-Dimethylphenol	µg/L								<1.0	<1.0
2.4-Dichlorophenol	µg/L	120		200	0.3	2000			<1.0	<1.0
2.6-Dichlorophenol	µg/L								<1.0	<1.0
4-Chloro-3-Methylphenol	µg/L								<1.0	<1.0
2.4.6-Trichlorophenol	µg/L	3		20	2	200			<1.0	<1.0
2.4.5-Trichlorophenol	µg/L								<1.0	<1.0
Pentachlorophenol	µg/L	3.6	11						<2.0	<2.0
Polynuclear Aromatic Hydrocarbons										
Naphthalene	µg/L	16	50						<1.0	<1.0
Acenaphthylene	µg/L								<1.0	<1.0
Acenaphthene	µg/L								<1.0	<1.0
Fluorene	µg/L								<1.0	<1.0
Phenanthrene	µg/L								<1.0	<1.0
Anthracene	µg/L								<1.0	<1.0
Fluoranthene	µg/L								<1.0	<1.0
Pyrene	µg/L								<1.0	<1.0
Benz(a)anthracene	µg/L								<1.0	<1.0
Chrysene	µg/L								<1.0	<1.0
Benzo(b)fluoranthene	µg/L								<1.0	<1.0
Benzo(k)fluoranthene	µg/L								<1.0	<1.0
Benzo(a)pyrene	µg/L			0.01		0.1			<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L								<1.0	<1.0
Dibenz(a.h)anthracene	µg/L								<1.0	<1.0
Benzo(g.h.i)perylene	µg/L								<1.0	<1.0
Total Petroleum Hydrocarbons										
C6 - C9 Fraction	µg/L								<20	<20
C10 - C14 Fraction	µg/L								<50	<50
C15 - C28 Fraction	µg/L								<100	<100
C29 - C36 Fraction	µg/L								<50	<50
C10 - C36 Fraction (sum)	µg/L	600 [4]							<50	<50

NOTES:
1. SRT Healthy Rivers Action Plan Long Term / Short Term Targets
2. ANZECC 99% protection level for Chlordane
3. ANZECC 99% protection level for Endosulfan
4. Dutch intervention values (2000).
5. pH > 6 / pH < 6
6. ASS disturbance indicators
7. Effluent treatment triggers

Table 7 MW5 Groundwater Laboratory Analysis Results

Analyte grouping/Analyte	Units	ANZECC & ARMCANZ		ADWG		DoH	ANZECC & ARMCANZ		18/05/2012	30/08/2012
		Fresh Waters	Marine Waters	Drinking Water Health Value (HV)	Drinking Water Aesthetic Value (AV)	Domestic non-potable groundwater use	Short-term Irrigation Water	Long-term Irrigation Water	WRMW5	WRMW5
pH Value	pH Unit	6.5-8.5	8.0-8.4		6.5-8.5			6.0-8.5	5.86	5.72
Electrical Conductivity	µS/cm								449	97
Total Dissolved Solids	mg/L								341	56
Suspended Solids	mg/L								59	660
Turbidity	NTU								137	854
Total Alkalinity $CaCO_3$	mg/L								5	<1
Acidity as $CaCO_3$	mg/L								13	11
Sulfate as SO_4^{2-}	mg/L			500	250	5000			19	7
Chloride	mg/L				250	2500			132	17
Total Metals										
Aluminium	mg/L	0.055			0.2	2	20	5	10	2.57
Arsenic	mg/L	0.013		0.01		0.07	2	0.1	0.001	<0.001
Cadmium	mg/L	0.0002	0.0007	0.002		0.02	0.05	0.01	<0.0001	<0.0001
Chromium	mg/L						1	0.1	0.005	0.001
Copper	mg/L	0.0014	0.0013	2	1	20	5	0.2	0.005	0.015
Lead	mg/L	0.0034	0.0044	0.01		0.1	5	2	0.015	0.002
Manganese	mg/L	1.9		0.5	0.1	5	10	0.2	0.01	0.002
Molybdenum	mg/L			0.05		0.5	0.05	0.01	<0.001	<0.001
Nickel	mg/L	0.011	0.02	0.02		0.2	2	0.2	0.003	0.002
Selenium	mg/L	0.005		0.01		0.1	0.05	0.02	<0.01	<0.01
Silver	mg/L	0.00005	0.0014	0.1		1			<0.001	<0.001
Zinc	mg/L	0.008	0.015		3	30	5	2	0.011	0.007
Iron	mg/L	0.3	1.0 / 0.35		0.33	3	10	0.2	0.49	0.13
Mercury	mg/L	0.00006	0.0001	0.001		0.01	0.002	0.002	<0.0001	<0.0001
Nutrients										
Ammonia as N	mg/L	0.9	0.91						0.01	0.06
Nitrite as N	mg/L			3.0		30			0.04	<0.01
Nitrate as N	mg/L			50		500			0.45	2.03
Kjeldhal Nitrogen	mg/L								0.1	1.5
Total Nitrogen	mg/L	1.0 / 2.0[1]							0.6	3.5
Total Phosphorus	mg/L	0.1 / 0.2[1]							0.02	0.23
Reactive Phosphorus	mg/L								<0.01	<0.01
Sulfide	mg/L	0.001							<0.1	<0.1
COD	mg/L								9	<5
BOD	mg/L								3	3
Organochlorine Pesticides (OC)										
alpha-BHC	µg/L								<0.5	<0.5
Hexachlorobenzene (HCB)	µg/L								<0.5	<0.5
beta-BHC	µg/L								<0.5	<0.5
gamma-BHC	µg/L								<0.5	<0.5
delta-BHC	µg/L								<0.5	<0.5
Heptachlor	µg/L	0.01							<0.5	<0.5
Aldrin	µg/L								<0.5	<0.5
Heptachlor epoxide	µg/L			0.05	0.3	3			<0.5	<0.5
trans-Chlordane	µg/L	0.03[2]		0.01	1	10			<0.5	<0.5
alpha-Endosulfan	µg/L	0.03[3]	0.005[3]	0.05	30	30			<0.5	<0.5
cis-Chlordane	µg/L	0.03[2]		0.01	1	10			<0.5	<0.5
Dieldrin	µg/L								<0.5	<0.5
4.4`-DDE	µg/L								<0.5	<0.5
Endrin	µg/L	0.01	0.004						<0.5	<0.5
beta-Endosulfan	µg/L	0.03[3]	0.005[3]						<0.5	<0.5
4.4`-DDD	µg/L								<0.5	<0.5
Endrin aldehyde	µg/L								<0.5	<0.5
Endosulfan sulfate	µg/L								<0.5	<0.5
4.4`-DDT	µg/L	0.006		0.06	30	0.1			<2	<2
Endrin ketone	µg/L								<0.5	<0.5
Methoxychlor	µg/L								<2	<2
Aldrin plus dieldrin	µg/L			0.010	0.3	3			<1	<0.5
Organophosphorus Pesticides (OP)										
Dichlorvos	µg/L								<0.5	<0.5
Demeton-S-methyl	µg/L								<0.5	<0.5
Monocrotophos	µg/L								<2	<2
Dimethoate	µg/L	0.15			50	50			<0.5	<0.5
Diazinon	µg/L	0.01		1	3	1			<0.5	<0.5
Chlorpyrifos-methyl	µg/L	0.01	0.009		10	100			<0.5	<0.5
Parathion-methyl	µg/L								<2	<2
Malathion	µg/L	0.05							<0.5	<0.5
Fenthion	µg/L								<0.5	<0.5
Chlorpyrifos	µg/L	0.01	0.009						<0.5	<0.5
Parathion	µg/L	0.004			10	10			<2	<2
Pirimphos-ethyl	µg/L								<0.5	<0.5
Chlorfenvinphos	µg/L								<0.5	<0.5
Bromophos-ethyl	µg/L								<0.5	<0.5
Fenamiphos	µg/L								<0.5	<0.5
Prothiofos	µg/L								<0.5	<0.5
Ethion	µg/L								<0.5	<0.5
Carbophenothion	µg/L								<0.5	<0.5
Azinphos Methyl	µg/L	0.02							<0.5	<0.5
Monocyclic Aromatic Hydrocarbons										
Benzene	µg/L	0.95	0.5	0.001		0.01			-	-
Toluene	µg/L			0.80	0.025	0.025			-	-
Ethylbenzene	µg/L			0.30	0.003	0.003			-	-
meta- & para-Xylene	µg/L	200							-	-
Styrene	µg/L			0.03	0.004	0.004			<5	<5
ortho-Xylene	µg/L	350							-	-
Isopropylbenzene	µg/L								<5	<5
n-Propylbenzene	µg/L								<5	<5
1.3.5-Trimethylbenzene	µg/L								<5	<5
sec-Butylbenzene	µg/L								<5	<5
1.2.4-Trimethylbenzene	µg/L								<5	<5
tert-Butylbenzene	µg/L								<5	<5
p-Isopropyltoluene	µg/L								<5	<5
n-Butylbenzene	µg/L								<5	<5

Oxygenated Compounds										
Vinyl Acetate	µg/L								<50	<50
2-Butanone (MEK)	µg/L								<50	<50
4-Methyl-2-pentanone (MIBK)	µg/L								<50	<50
2-Hexanone (MBK)	µg/L								<50	<50
Sulfonated Compounds										
Carbon disulfide	µg/L								<5	<5
Fumigants										
2.2-Dichloropropane	µg/L								<5	<5
1.2-Dichloropropane	µg/L								<5	<5
cis-1.3-Dichloropropylene	µg/L								<5	<5
trans-1.3-Dichloropropylene	µg/L								<5	<5
1.2-Dibromoethane (EDB)	µg/L								<5	<5
Halogenated Aliphatic Compounds										
Dichlorodifluoromethane	µg/L								<50	<50
Chloromethane	µg/L								<50	<50
Vinyl chloride	µg/L			0.0003		0.003			<50	<50
Bromomethane	µg/L								<50	<50
Chloroethane	µg/L								<50	<50
Trichlorofluoromethane	µg/L								<50	<50
1.1-Dichloroethene	µg/L			0.03		0.3			<5	<5
Iodomethane	µg/L								<5	<5
trans-1.2-Dichloroethene	µg/L								<5	<5
1.1-Dichloroethane	µg/L								<5	<5
cis-1.2-Dichloroethene	µg/L								<5	<5
1.1.1-Trichloroethane	µg/L								<5	<5
1.1-Dichloropropylene	µg/L								<5	<5
Carbon Tetrachloride	µg/L								<5	<5
1.2-Dichloroethane	µg/L			0.003		0.03			<5	<5
Trichloroethene	µg/L								<5	<5
Dibromomethane	µg/L								<5	<5
1.1.2-Trichloroethane	µg/L	6500	1900						<5	<5
1.3-Dichloropropane	µg/L								<5	<5
Tetrachloroethene	µg/L			0.05		0.5			<5	<5
1.1.1.2-Tetrachloroethane	µg/L								<5	<5
trans-1.4-Dichloro-2-butene	µg/L								<5	<5
cis-1.4-Dichloro-2-butene	µg/L								<5	<5
1.1.2.2-Tetrachloroethane	µg/L								<5	<5
1.2.3-Trichloropropane	µg/L								<5	<5
Pentachloroethane	µg/L								<5	<5
1.2-Dibromo-3-chloropropane	µg/L								<5	<5
Hexachlorobutadiene	µg/L								<5	<5
Halogenated Aromatic Compounds										
Chlorobenzene	µg/L			0.30	0.01	0.01			<5	<5
Bromobenzene	µg/L								<5	<5
2-Chlorotoluene	µg/L								<5	<5
4-Chlorotoluene	µg/L								<5	<5
1.3-Dichlorobenzene	µg/L	0.26			0.02	0.02			<5	<5
1.4-Dichlorobenzene	µg/L	0.06		0.04	0.003	0.003			<5	<5
1.2-Dichlorobenzene	µg/L	0.16		1.5	0.001	0.001			<5	<5
1.2.4-Trichlorobenzene	µg/L	0.085	80	0.03	0.005	0.005			<5	<5
1.2.3-Trichlorobenzene	µg/L	0.003		0.03	0.005	0.005			<5	<5
Trihalomethanes										
Chloroform	µg/L								<5	<5
Bromodichloromethane	µg/L								5	<5
Dibromochloromethane	µg/L								**20**	<5
Bromoform	µg/L								**22**	<5
Phenolic Compounds										
Phenol	µg/L	320	400						<1.0	<1.0
2-Chlorophenol	µg/L	340		300	0.1	3000			<1.0	<1.0
2-Methylphenol	µg/L								<1.0	<1.0
3- & 4-Methylphenol	µg/L								<2.0	<2.0
2-Nitrophenol	µg/L								<1.0	<1.0
2.4-Dimethylphenol	µg/L								<1.0	<1.0
2.4-Dichlorophenol	µg/L	120		200	0.3	2000			<1.0	<1.0
2.6-Dichlorophenol	µg/L								<1.0	<1.0
4-Chloro-3-Methylphenol	µg/L								<1.0	<1.0
2.4.6-Trichlorophenol	µg/L	3		20	2	200			<1.0	<1.0
2.4.5-Trichlorophenol	µg/L								<1.0	<1.0
Pentachlorophenol	µg/L	3.6	11						<2.0	<2.0
Polynuclear Aromatic Hydrocarbons										
Naphthalene	µg/L	16	50						<1.0	<1.0
Acenaphthylene	µg/L								<1.0	<1.0
Acenaphthene	µg/L								<1.0	<1.0
Fluorene	µg/L								<1.0	<1.0
Phenanthrene	µg/L								<1.0	<1.0
Anthracene	µg/L								<1.0	<1.0
Fluoranthene	µg/L								<1.0	<1.0
Pyrene	µg/L								<1.0	<1.0
Benz(a)anthracene	µg/L								<1.0	<1.0
Chrysene	µg/L								<1.0	<1.0
Benzo(b)fluoranthene	µg/L								<1.0	<1.0
Benzo(k)fluoranthene	µg/L								<1.0	<1.0
Benzo(a)pyrene	µg/L			0.01		0.1			<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L								<1.0	<1.0
Dibenz(a.h)anthracene	µg/L								<1.0	<1.0
Benzo(g.h.i)perylene	µg/L								<1.0	<1.0
Total Petroleum Hydrocarbons										
C6 - C9 Fraction	µg/L								<20	<20
C10 - C14 Fraction	µg/L								<50	<50
C15 - C28 Fraction	µg/L								<100	<100
C29 - C36 Fraction	µg/L								<50	<50
C10 - C36 Fraction (sum)	µg/L	600 [4]							<50	<50

NOTES: 1. SRT Healthy Rivers Action Plan Long Term / Short Term Targets
2. ANZECC 99% protection level for Chlordane
3. ANZECC 99% protection level for Endosulfan
4. Dutch intervention values (2000).
5. pH > 6 / pH < 6
6. ASS disturbance indicators
7. Effluent treatment triggers

Table 8 MW6 Groundwater Laboratory Analysis Results

Analyte grouping/Analyte	Units	ANZECC & ARMCANZ		ADWG		DoH	ANZECC & ARMCANZ		18/05/2012	30/08/2012
		Fresh Waters	Marine Waters	Drinking Water Health Value (HV)	Drinking Water Aesthetic Value (AV)	Domestic non-potable groundwater use	Short-term Irrigation Water	Long-term Irrigation Water	WRMW6	WRMW6
pH Value	pH Unit	6.5-8.5	8.0-8.4		6.5-8.5			6.0-8.5	5.83	5.87
Electrical Conductivity	µS/cm								808	914
Total Dissolved Solids	mg/L								492	578
Suspended Solids	mg/L								50	6
Turbidity	NTU								76.6	4
Total Alkalinity $CaCO_3$	mg/L								38	10
Acidity as $CaCO_3$	mg/L								22	39
Sulfate as SO_4^{2-}	mg/L			500	250	5000			173	203
Chloride	mg/L				250	2500			124	153
Total Metals										
Aluminium	mg/L	0.055			0.2	2	20	5	0.74	0.41
Arsenic	mg/L	0.013		0.01		0.07	2	0.1	<0.001	<0.001
Cadmium	mg/L	0.0002	0.0007	0.002		0.02	0.05	0.01	<0.0001	<0.0001
Chromium	mg/L						1	0.1	<0.001	<0.001
Copper	mg/L	0.0014	0.0013	2	1	20	5	0.2	0.002	0.003
Lead	mg/L	0.0034	0.0044	0.01		0.1	5	2	0.007	0.009
Manganese	mg/L	1.9		0.5	0.1	5	10	0.2	0.034	0.034
Molybdenum	mg/L			0.05		0.5	0.05	0.01	<0.001	<0.001
Nickel	mg/L	0.011	0.02	0.02		0.2	2	0.2	0.002	0.003
Selenium	mg/L	0.005		0.01		0.1	0.05	0.02	<0.01	<0.01
Silver	mg/L	0.00005	0.0014	0.1		1			<0.001	<0.001
Zinc	mg/L	0.008	0.015		3	30	5	2	0.012	0.011
Iron	mg/L	0.3	1.0 / 0.35		0.33	3	10	0.2	10.4	3.21
Mercury	mg/L	0.00006	0.0001	0.001		0.01	0.002	0.002	<0.0001	<0.0001
Nutrients										
Ammonia as N	mg/L	0.9	0.91						1.64	0.73
Nitrite as N	mg/L			3.0		30			0.05	0.02
Nitrate as N	mg/L			50		500			0.17	1.43
Kjeldahl Nitrogen	mg/L								1.6	1.1
Total Nitrogen	mg/L	1.0 / 2.0[1]							1.8	2.6
Total Phosphorus	mg/L	0.1 / 0.2[1]							0.03	0.02
Reactive Phosphorus	mg/L								<0.01	<0.01
Sulfide	mg/L	0.001							<0.1	<0.1
COD	mg/L								25	30
BOD	mg/L								26	2
Organochlorine Pesticides (OC)										
alpha-BHC	µg/L								<0.5	<0.5
Hexachlorobenzene (HCB)	µg/L								<0.5	<0.5
beta-BHC	µg/L								<0.5	<0.5
gamma-BHC	µg/L								<0.5	<0.5
delta-BHC	µg/L								<0.5	<0.5
Heptachlor	µg/L	0.01							<0.5	<0.5
Aldrin	µg/L								<0.5	<0.5
Heptachlor epoxide	µg/L			0.05	0.3	3			<0.5	<0.5
trans-Chlordane	µg/L	0.03[2]		0.01	1	10			<0.5	<0.5
alpha-Endosulfan	µg/L	0.03[3]	0.005[3]	0.05	30	30			<0.5	<0.5
cis-Chlordane	µg/L	0.03[2]		0.01	1	10			<0.5	<0.5
Dieldrin	µg/L								<0.5	<0.5
4.4`-DDE	µg/L								<0.5	<0.5
Endrin	µg/L	0.01	0.004						<0.5	<0.5
beta-Endosulfan	µg/L	0.03[3]	0.005[3]						<0.5	<0.5
4.4`-DDD	µg/L								<0.5	<0.5
Endrin aldehyde	µg/L								<0.5	<0.5
Endosulfan sulfate	µg/L								<0.5	<0.5
4.4`-DDT	µg/L	0.006		0.06	30	0.1			<2	<2
Endrin ketone	µg/L								<0.5	<0.5
Methoxychlor	µg/L								<2	<2
Aldrin plus dieldrin	µg/L			0.010	0.3	3			<1	<0.5
Organophosphorus Pesticides (OP)										
Dichlorvos	µg/L								<0.5	<0.5
Demeton-S-methyl	µg/L								<0.5	<0.5
Monocrotophos	µg/L								<2	<2
Dimethoate	µg/L	0.15			50	50			<0.5	<0.5
Diazinon	µg/L	0.01		1	3	1			<0.5	<0.5
Chlorpyrifos-methyl	µg/L	0.01	0.009		10	100			<0.5	<0.5
Parathion-methyl	µg/L								<2	<2
Malathion	µg/L	0.05							<0.5	<0.5
Fenthion	µg/L								<0.5	<0.5
Chlorpyrifos	µg/L	0.01	0.009						<0.5	<0.5
Parathion	µg/L	0.004			10	10			<2	<2
Pirimphos-ethyl	µg/L								<0.5	<0.5
Chlorfenvinphos	µg/L								<0.5	<0.5
Bromophos-ethyl	µg/L								<0.5	<0.5
Fenamiphos	µg/L								<0.5	<0.5
Prothiofos	µg/L								<0.5	<0.5
Ethion	µg/L								<0.5	<0.5
Carbophenothion	µg/L								<0.5	<0.5
Azinphos Methyl	µg/L	0.02							<0.5	<0.5
Monocyclic Aromatic Hydrocarbons										
Benzene	µg/L	0.95	0.5	0.001		0.01			-	-
Toluene	µg/L			0.80	0.025	0.025			-	-
Ethylbenzene	µg/L			0.30	0.003	0.003			-	-
meta- & para-Xylene	µg/L	200							-	-
Styrene	µg/L			0.03	0.004	0.004			<5	<5
ortho-Xylene	µg/L	350							-	-
Isopropylbenzene	µg/L								<5	<5
n-Propylbenzene	µg/L								<5	<5
1.3.5-Trimethylbenzene	µg/L								<5	<5
sec-Butylbenzene	µg/L								<5	<5
1.2.4-Trimethylbenzene	µg/L								<5	<5
tert-Butylbenzene	µg/L								<5	<5
p-Isopropyltoluene	µg/L								<5	<5
n-Butylbenzene	µg/L								<5	<5

Oxygenated Compounds										
Vinyl Acetate	µg/L								<50	<50
2-Butanone (MEK)	µg/L								<50	<50
4-Methyl-2-pentanone (MIBK)	µg/L								<50	<50
2-Hexanone (MBK)	µg/L								<50	<50
Sulfonated Compounds										
Carbon disulfide	µg/L								<5	<5
Fumigants										
2.2-Dichloropropane	µg/L								<5	<5
1.2-Dichloropropane	µg/L								<5	<5
cis-1.3-Dichloropropylene	µg/L								<5	<5
trans-1.3-Dichloropropylene	µg/L								<5	<5
1.2-Dibromoethane (EDB)	µg/L								<5	<5
Halogenated Aliphatic Compounds										
Dichlorodifluoromethane	µg/L								<50	<50
Chloromethane	µg/L								<50	<50
Vinyl chloride	µg/L			0.0003		0.003			<50	<50
Bromomethane	µg/L								<50	<50
Chloroethane	µg/L								<50	<50
Trichlorofluoromethane	µg/L								<50	<50
1.1-Dichloroethene	µg/L			0.03		0.3			<5	<5
Iodomethane	µg/L								<5	<5
trans-1.2-Dichloroethene	µg/L								<5	<5
1.1-Dichloroethane	µg/L								<5	<5
cis-1.2-Dichloroethene	µg/L								<5	<5
1.1.1-Trichloroethane	µg/L								<5	<5
1.1-Dichloropropylene	µg/L								<5	<5
Carbon Tetrachloride	µg/L								<5	<5
1.2-Dichloroethane	µg/L			0.003		0.03			<5	<5
Trichloroethene	µg/L								<5	<5
Dibromomethane	µg/L								<5	<5
1.1.2-Trichloroethane	µg/L	6500	1900						<5	<5
1.3-Dichloropropane	µg/L								<5	<5
Tetrachloroethene	µg/L			0.05		0.5			<5	<5
1.1.1.2-Tetrachloroethane	µg/L								<5	<5
trans-1.4-Dichloro-2-butene	µg/L								<5	<5
cis-1.4-Dichloro-2-butene	µg/L								<5	<5
1.1.2.2-Tetrachloroethane	µg/L								<5	<5
1.2.3-Trichloropropane	µg/L								<5	<5
Pentachloroethane	µg/L								<5	<5
1.2-Dibromo-3-chloropropane	µg/L								<5	<5
Hexachlorobutadiene	µg/L								<5	<5
Halogenated Aromatic Compounds										
Chlorobenzene	µg/L			0.30	0.01	0.01			<5	<5
Bromobenzene	µg/L								<5	<5
2-Chlorotoluene	µg/L								<5	<5
4-Chlorotoluene	µg/L								<5	<5
1.3-Dichlorobenzene	µg/L	0.26			0.02	0.02			<5	<5
1.4-Dichlorobenzene	µg/L	0.06		0.04	0.003	0.003			<5	<5
1.2-Dichlorobenzene	µg/L	0.16		1.5	0.001	0.001			<5	<5
1.2.4-Trichlorobenzene	µg/L	0.085	80	0.03	0.005	0.005			<5	<5
1.2.3-Trichlorobenzene	µg/L	0.003		0.03	0.005	0.005			<5	<5
Trihalomethanes										
Chloroform	µg/L								<5	<5
Bromodichloromethane	µg/L								<5	<5
Dibromochloromethane	µg/L								<5	<5
Bromoform	µg/L								<5	<5
Phenolic Compounds										
Phenol	µg/L	320	400						<1.0	<1.0
2-Chlorophenol	µg/L	340		300	0.1	3000			<1.0	<1.0
2-Methylphenol	µg/L								<1.0	<1.0
3- & 4-Methylphenol	µg/L								<2.0	<2.0
2-Nitrophenol	µg/L								<1.0	<1.0
2.4-Dimethylphenol	µg/L								<1.0	<1.0
2.4-Dichlorophenol	µg/L	120		200	0.3	2000			<1.0	<1.0
2.6-Dichlorophenol	µg/L								<1.0	<1.0
4-Chloro-3-Methylphenol	µg/L								<1.0	<1.0
2.4.6-Trichlorophenol	µg/L	3		20	2	200			<1.0	<1.0
2.4.5-Trichlorophenol	µg/L								<1.0	<1.0
Pentachlorophenol	µg/L	3.6	11						<2.0	<2.0
Polynuclear Aromatic Hydrocarbons										
Naphthalene	µg/L	16	50						<1.0	<1.0
Acenaphthylene	µg/L								<1.0	<1.0
Acenaphthene	µg/L								<1.0	<1.0
Fluorene	µg/L								<1.0	<1.0
Phenanthrene	µg/L								<1.0	<1.0
Anthracene	µg/L								<1.0	<1.0
Fluoranthene	µg/L								<1.0	<1.0
Pyrene	µg/L								<1.0	<1.0
Benz(a)anthracene	µg/L								<1.0	<1.0
Chrysene	µg/L								<1.0	<1.0
Benzo(b)fluoranthene	µg/L								<1.0	<1.0
Benzo(k)fluoranthene	µg/L								<1.0	<1.0
Benzo(a)pyrene	µg/L			0.01		0.1			<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L								<1.0	<1.0
Dibenz(a.h)anthracene	µg/L								<1.0	<1.0
Benzo(g.h.i)perylene	µg/L								<1.0	<1.0
Total Petroleum Hydrocarbons										
C6 - C9 Fraction	µg/L								<20	<20
C10 - C14 Fraction	µg/L								<50	<50
C15 - C28 Fraction	µg/L								**260**	**380**
C29 - C36 Fraction	µg/L								**60**	<50
C10 - C36 Fraction (sum)	µg/L	600 [4]							**320**	**380**

NOTES:
1. SRT Healthy Rivers Action Plan Long Term / Short Term Targets
2. ANZECC 99% protection level for Chlordane
3. ANZECC 99% protection level for Endosulfan
4. Dutch intervention values (2000).
5. pH > 6 / pH < 6
6. ASS disturbance indicators
7. Effluent treatment triggers

8.3 Groundwater Levels

The depth to groundwater was measured on 30th September 2012 and tabulated with historical data (Table 4). An interface meter was used to verify the presence / absence of free phase hydrocarbon products over the groundwater: no free phase products were detected. Groundwater is intercepted between 20 RL mAHD (Relative level metres Australian Height Datum) and 24 RL mAHD.

Plotting the water table values enable determination of groundwater direction. Figure 3 identifies a groundwater flux towards the northwest.

Table 9 Groundwater Measurements

Groundwater Well I.D.	Date	Top of Casing	Water Level		
		RL mAHD	mBGL	RL mAHD	Change mm
WRMW1	18/05/2012	27.281	3.700	23.581	N/A
	30/08/2012		3.455	23.826	-245
	11/10/2012		3.130	24.151	-325
WRMW2	18/05/2012	30.607	7.666	22.941	N/A
	30/08/2012		7.26	23.347	-406
	11/10/2012		7.316	23.291	56
WRMW3	18/05/2012	34.622	11.846	22.776	N/A
	30/08/2012		11.725	22.897	-121
	11/10/2012		11.794	22.828	69
WRMW4	18/05/2012	27.751	8.509	19.242	N/A
	30/08/2012		7.79	19.961	-719
	11/10/2012		7.753	19.998	-37
WRMW5	18/05/2012	29.034	8.836	20.198	N/A
	30/08/2012		8.28	20.754	-556
	11/10/2012		8.170	20.864	-110
WRMW6	18/05/2012	31.611	8.759	22.852	N/A
	30/08/2012		9.215	22.396	456
	11/10/2012		8.998	22.613	-217

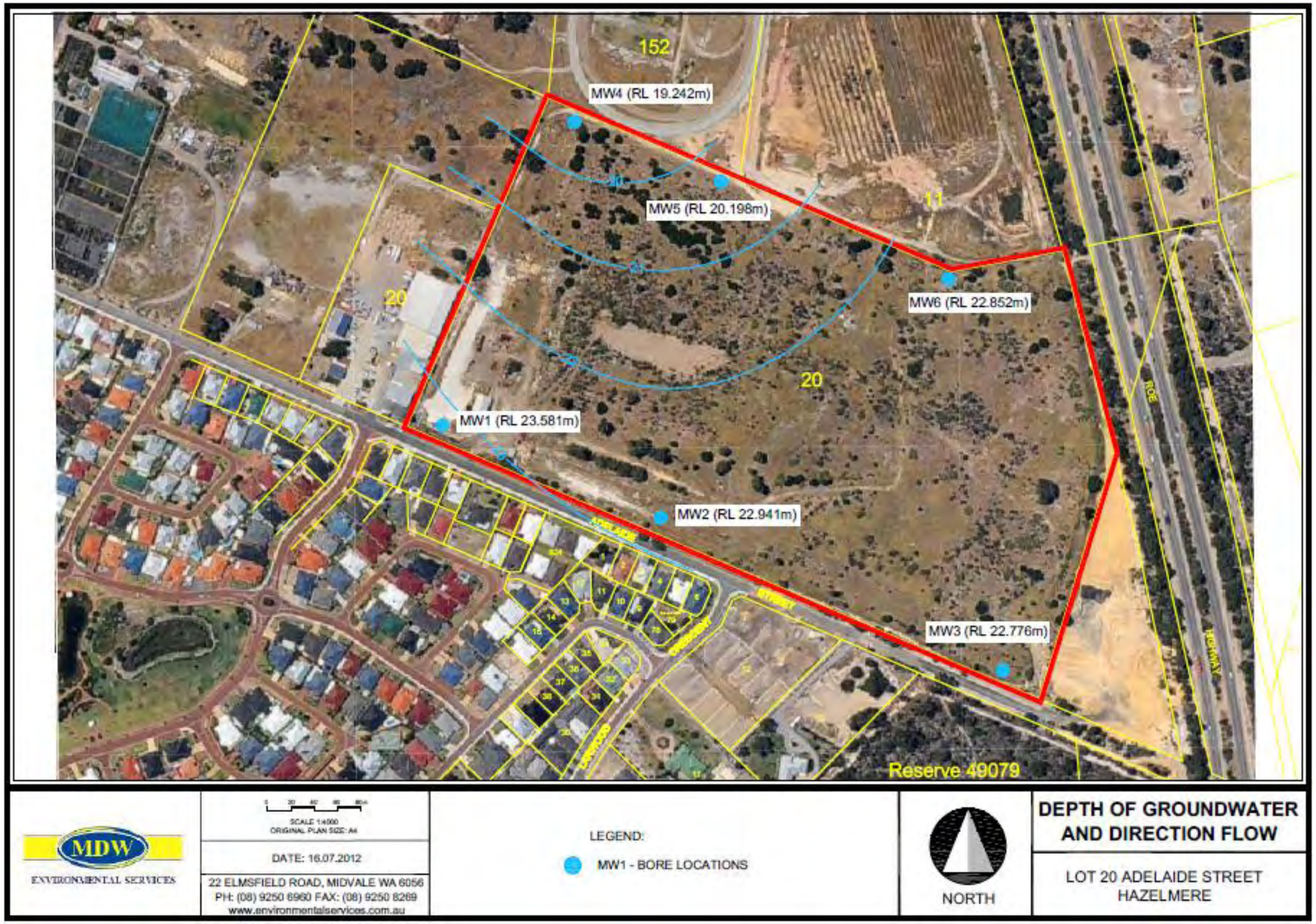

Figure 3 Groundwater Contours

9 DISCUSSION

Standing water level measurements recorded by MDWES during the GME sampling indicate that groundwater is encountered between RL 20.0 mAHD and 24.1 mAHD beneath the Site. Based upon current redevelopment plans, groundwater will not be intercepted during the proposed remediation work.

Field results indicate that the groundwater beneath the site is fresh and mildly acidic with pH ranging from 5.72 to 7.83. This is an acceptable range of pH for groundwater within this locality.

Contamination of the groundwater from material previously deposited on the Site appears to be minimal. With the exception of metalloids, nutrients and low levels of TPH in WRMW6, all other PCOC were below laboratory detection limits.

Metalloid results could be considered higher than expected for background waters within this locality, however, elevated levels of suspended solids within majority of the samples could have contributed to artificially increasing the results. It is further suspected that if dissolved metal concentrations were requested, these would be significantly lower than the total metal results and more indicative of the quality of water that would be abstracted for use for dust suppression and compaction.

Although nutrient levels were slightly elevated above ANZECC criteria, surface waters are not located in the immediate vicinity of the site and downstream receptors are likely to be more significantly impacted upon by land uses to the north of the site including rendering facilities. Comparison of historical data indicates that concentrations of contaminants of high concern (TPH and 3-&4- Methylphenol) are decreasing however further data is needed to accurately determine fluctuations in groundwater quality.

MDWES are of the opinion that the contamination of the groundwater from material previously deposited on the Site is minimal and the site does not appear to be a source site for contamination external to the site boundaries. Groundwater flux appears to be in a northwest direction and if the properties to the north of the site are to be included in the redevelopment proposal for this site, it is recommended that additional groundwater investigations are completed on these properties.

It has been recommended that groundwater gauging be completed on a monthly basis and laboratory analysis be completed on a quarterly basis until the remediation commence to gather additional groundwater data prior to the inert wastes being disturbed during remediation earthmoving activities.

10 REFERENCES

ANZECC (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.* Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ).

DEC (2010) *Contaminated Site Management Series - Assessment Levels for Soil, Sediment and Water*. Contaminated Sites Branch, Department of Environment and Conservation.

DEC 2009. Department of Environment and Conservation, Contaminated Sites Management Series - Site classification scheme.

DEC 2006a. Department of Environment and Conservation: Contaminated Sites Management Series – The Use of Risk Assessment in Contaminated Site Assessment Management.

DEC 2006b. Department of Environment and Conservation: Contaminated Sites Management Series – Community Consultation Guideline

DEC 2010. Department of Environment and Conservation: Assessment Levels for Soil, Sediment, and Water, Feb 2010

DEP 2004. Department of Environmental Protection, Contaminated Sites Management Series - Potentially contaminating activities, Industries and land uses
DoH 2006. Department of Health Domestic non-potable groundwater use.

DEP 2001. Department of Environmental Protection, Contaminated Sites Management Series - Reporting of site assessments.

Standards Australia/Standards New Zealand. 1998. AS/NZS 5667.1:1998. Water Quality – Sampling. Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of sample. Standards Australia and Standards New Zealand, Homebush NSW and Wellington NZ.

MDW
ENVIRONMENTAL SERVICES

Monitoring Well Field Record

Job #: E2012-031 Client: WASTEROCK Location: ADELAIDE ST

Well ID: MW1 Date: 30.8.12 Sampler: DA/NF

Monitoring Well Information			
Depth to Water:	3455 (mm TOC)	Depth to Bottom:	6.51 6.65 (m)
Standpipe:	0.445 (m)	Monument Cover	☑
Lock: ☐ None	☑ Padlock (YL)	☐ Enviro Cap	☐ Gatic

Equipment IDs			
Water Quality Meter:	YSI	TTA Kit:	
Pump:	LOW-FLOW	TALK Kit:	
Dipper:	CON-SITES		

Sampling

Sample ID: WRMW1-002 COC No: E2012-031-003

Time	pH	EC	DO	Temp	Redox	TTA	TALK
12:57 0	8.71	608	5.44	22.7	85.5		
5	5.81	652	2.4	21.3	192.5		
10	5.56	672	0.5	21.8	195.9		
15	5.60	687	—	21.2	192.1	35	54

Bottles	ASSESSMENT SUITE 2	
1 x 1000mL plastic GREEN ☑	2 x 40mL vials MAROON ☑	1 x 500mL plastic GREEN** ☑
1 x 125mL plastic YELLOW ☑	1 x 500mL glass ORANGE ☑	**BRING BACK &FILTER INTO:
1 x 125mL plastic PURPLE ☑	2 x 500mL glass ORANGE per sample set (Lab Dups) ☒	1 x 60mL plastic MAROON ☑
1 x 60mL plastic BLUE ☑		1 x 60mL plastic RED/GREEN ☑
1 x 60mL plastic RED/GREEN ☑	1 x 500mL plastic GREEN ☑	

Comments

ENVIRONMENTAL SERVICES

Monitoring Well Field Record

Job #: E2012-031 Client: WASEROCK Location: ADELAIDE ST

Well ID: MW2 Date: 30.8.12 Sampler: DA/NF

Monitoring Well Information

Depth to Water: 7260 (mm TOC) Depth to Bottom: 10.443 → 10.95 (m)

Standpipe: 0.615 (m) Monument Cover ☑

Lock: ☐ None ☑ Padlock (YL) ☐ Enviro Cap ☐ Gatic

Equipment IDs

Water Quality Meter: YSI TTA Kit:

Pump: LOW-FLOW TALK Kit:

Dipper: ~~BB~~ CON/SIRS.

Sampling

Sample ID: EWRMW2-002 COC No: E2012-031-003

Time	pH	EC	DO	Temp	Redox	TTA	TALK
11:59 0	6.42	314	6.3	21.5	86.3		
5	4.87	283	1.6	21.3	176.5		
10	4.61	282	1.4	21.3	191.1		
15	4.60	288	1.4	21.4	191.8		
20	4.62	292	1.4	21.4	190.8	36	18

Bottles

ASSESSMENT SUITE 2

1 x 1000mL plastic GREEN ☑	2 x 40mL vials MAROON ☑	1 x 500mL plastic GREEN** ☑
1 x 125mL plastic YELLOW ☑	1 x 500mL glass ORANGE ☑	**BRING BACK &FILTER INTO:
1 x 125mL plastic PURPLE ☑	2 x 500mL glass ORANGE per sample set (Lab Dups) ☑	1 x 60mL plastic MAROON ☑
1 x 60mL plastic BLUE ☑		1 x 60mL plastic RED/GREEN ☐
1 x 60mL plastic RED/GREEN ☑	1 x 500mL plastic GREEN ☑	

Comments

MDW ENVIRONMENTAL SERVICES

Monitoring Well Field Record

Job #: E2012-031 Client: WASTEROCK Location: ADELAIDE ST

Well ID: ~~WA~~ MW3 Date: 30.8.12 Sampler: DA/NF

Monitoring Well Information

Depth to Water: 11725 (mm TOC) Depth to Bottom: 14.58 (m)

Standpipe: 0.510 (m) Monument Cover ☑

Lock: ☐ None ☑ Padlock (YL) ☐ Enviro Cap ☐ Gatic

Equipment IDs

Water Quality Meter: YSI TTA Kit:

Pump: LOWFLOW TALK Kit:

Dipper: CON-SITES

Sampling

Sample ID: WRMW3-002 COC No: E2012-031-003

Time	pH	EC µS	DO	Temp	Redox	TTA	TALK
0 (11:05)	7.09	979	4.6	22.8	9.2		
5	7.17	960	3.9	22.7	-61.7		
10	7.15	943	3.2	22.6	-36.8		
15	7.13	930	3.1	22.6	-40.6	20	150

Bottles

ASSESSMENT SUITE 2

1 x 1000mL plastic GREEN ☑	2 x 40mL vials MAROON ☑	1 x 500mL plastic GREEN** ☑
1 x 125mL plastic YELLOW ☑	1 x 500mL glass ORANGE ☑	**BRING BACK &FILTER INTO:
1 x 125mL plastic PURPLE ☑	~~2 x 500mL glass ORANGE per sample set (Lab Dups)~~ ☐	1 x 60mL plastic MAROON ☑
1 x 60mL plastic BLUE ☑		1 x 60mL plastic RED/GREEN ☑
1 x 60mL plastic RED/GREEN ☑	1 x 500mL plastic GREEN ☑	

Comments

MDW
ENVIRONMENTAL SERVICES

Monitoring Well Field Record

Job #: E2012-031 Client: WASTEROCK Location: ADELAIDE ST

Well ID: MW4 Date: 30.8.12 Sampler: DA/NF

Monitoring Well Information

Depth to Water: 7.790 (mm TOC) Depth to Bottom: 11.~~75~~50 (m)

Standpipe: 0.625 (m) Monument Cover ☑

Lock: ☐ None ☑ Padlock (YL) ☐ Enviro Cap ☐ Gatic

Equipment IDs

Water Quality Meter: TSI TTA Kit: ____

Pump: LOW FLOW TALK Kit: ____

Dipper: CON-SITES

Sampling

Sample ID: WRMW4-002 COC No: E2012-031-003

Time	pH	EC	DO	Temp	Redox	TTA	TALK
13:40 0	5.05	165.7	4.5	22.0	229.6		
5	5.01	165.5	4.3	21.9	235.6		
10	4.50	163.6	2.6	21.8			
15	4.49	163.0	1.9	21.9	25.4	17	120

Bottles

ASSESSMENT SUITE 2

1 x 1000mL plastic GREEN ☑	2 x 40mL vials MAROON ☑	1 x 500mL plastic GREEN** ☑
1 x 125mL plastic YELLOW ☑	1 x 500mL glass ORANGE ☑	**BRING BACK &FILTER INTO:
1 x 125mL plastic PURPLE ☑	2 x 500mL glass ORANGE per sample set (Lab Dups) ☑	1 x 60mL plastic MAROON ☑
1 x 60mL plastic BLUE ☑		1 x 60mL plastic RED/GREEN ☑
1 x 60mL plastic RED/GREEN ☑	1 x 500mL plastic GREEN ☑	

Comments

DUP & TRIP

MDW
ENVIRONMENTAL SERVICES

Monitoring Well Field Record

Job #: E2012-031 Client: WASTEROCK Location: ADELAIDE ST

Well ID: MW5 Date: 30.8.12 Sampler: DA/NF

Monitoring Well Information

Depth to Water: 8280 (mm TOC) Depth to Bottom: 12.162 (m)

Standpipe: 0.56 (m) Monument Cover ☑

Lock: ☐ None ☑ Padlock (YL) ☐ Enviro Cap ☐ Gatic

Equipment IDs

Water Quality Meter: YSI TTA Kit:

Pump: LOW FLOW TALK Kit:

Dipper: CON_SITES

Sampling

Sample ID: WRMW5-002 COC No: E2012-031-003

Time	pH	EC	DO	Temp	Redox	TTA	TALK
14:55 – 0	5.79	111.7	–	23.6	228.7		
5	5.70	107.2	–	23.2	233.5		
10	5.17	101.8	–	22.4	268.0	12	12
15							

Bottles

ASSESSMENT SUITE 2

1 x 1000mL plastic GREEN ☑	2 x 40mL vials MAROON ☑	1 x 500mL plastic GREEN** ☑
1 x 125mL plastic YELLOW ☑	1 x 500mL glass ORANGE ☑	**BRING BACK &FILTER INTO:
1 x 125mL plastic PURPLE ☑	2 x 500mL glass ORANGE per sample set (Lab Dups) ☒	1 x 60mL plastic MAROON ☑
1 x 60mL plastic BLUE ☑		1 x 60mL plastic RED/GREEN ☑
1 x 60mL plastic RED/GREEN ☐	1 x 500mL plastic GREEN ☑	

Comments

MDW
ENVIRONMENTAL SERVICES

Monitoring Well Field Record

Job #: E2012-031 Client: WASTEROCK Location: ADELAIDE ST

Well ID: MW6 Date: 30.8.12 Sampler: DA/NF

Monitoring Well Information

9-810

Depth to Water: 9.215 (mm TOC) Depth to Bottom: 9.895 (m)

Standpipe: 0.640 (m) Monument Cover ☑

Lock: ☐ None ☑ Padlock (YL) ☐ Enviro Cap ☐ Gatic

Equipment IDs

Water Quality Meter: YSI TTA Kit:

Pump: Low-Flow TALK Kit:

Dipper: CON-SITES -

Sampling

Sample ID: MWRMW6-002 COC No: E2012-031-003

Time	pH	EC	DO	Temp	Redox	TTA	TALK
15:45	4.96	865	—	23.1	269.2		
:50	4.71	889	—	23.1	267.9		
:55	4.67	894	—	23.0	268.5		
16:00	4.67	896	—	23.0	267.9	31	30

Bottles

ASSESSMENT SUITE 2

1 x 1000mL plastic GREEN ☑	2 x 40mL vials MAROON ☑	1 x 500mL plastic GREEN** ☑
1 x 125mL plastic YELLOW ☑	1 x 500mL glass ORANGE ☑	**BRING BACK &FILTER INTO:
1 x 125mL plastic PURPLE ☑	2 x 500mL glass ORANGE per sample set (Lab Dups) ☑	1 x 60mL plastic MAROON ☑
1 x 60mL plastic BLUE ☑		1 x 60mL plastic RED/GREEN ☑
1 x 60mL plastic RED/GREEN ☑	1 x 500mL plastic GREEN ☑	

Comments

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **EP1207278**	Page	: 1 of 18
Client	: **MOBILE DEWATERING**	Laboratory	: Environmental Division Perth
Contact	: INFO	Contact	: Lauren Ockwell
Address	: PO BOX 239 MIDLAND WA, AUSTRALIA 6939	Address	: 10 Hod Way Malaga WA Australia 6090
E-mail	: info@environmentalservices.com.au	E-mail	: lauren.ockwell@alsenviro.com
Telephone	: +61 08 9250 4995	Telephone	: 08 9209 7606
Facsimile	: ----	Facsimile	: 08 9209 7600
Project	: E2012-031	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: E2012-031-003	Date Samples Received	: 31-AUG-2012
Sampler	: Dale A./ Nathan F.	Issue Date	: 07-SEP-2012
Site	: WASTEROCK		
		No. of samples received	: 9
Quote number	: EP/324/12	No. of samples analysed	: 9

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

NATA
WORLD RECOGNISED ACCREDITATION

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Metals Instrument Chemist	Perth Inorganics
Chas Tucker	Inorganic Chemist	Perth Inorganics
Cicelia Bartels	Metals Instrument Chemist	Perth Inorganics
Edwandy Fadjar	Organic Coordinator	Sydney Organics
Hoa Nguyen	Inorganic Chemist	Sydney Inorganics
Pabi Subba	Senior Organic Chemist	Sydney Organics
Phalak Inthaksone	Laboratory Manager - Organics	Sydney Organics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **EK057G: Poor spike recovery due to sample matrix interference. Confirmed by re-analysis.**

Analytical Results

Sub-Matrix: WATER			Client sample ID	WRMW1-002	WRMW2-002	WRMW3-002	WRMW4-002	WRMW5-002
			Client sampling date / time	30-AUG-2012 11:00	30-AUG-2012 11:00	30-AUG-2012 11:00	30-AUG-2012 11:00	30-AUG-2012 11:00
Compound	CAS Number	LOR	Unit	EP1207278-001	EP1207278-002	EP1207278-003	EP1207278-004	EP1207278-005
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	6.77	5.72	7.83	5.96	5.72
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	716	292	901	144	97
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	GIS-210-010	10	mg/L	474	169	567	83	56
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	950	106	1610	9	660
EA045: Turbidity								
Turbidity	----	0.1	NTU	202	32.0	1120	10.8	854
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	36	3	157	1	<1
Total Alkalinity as CaCO3	----	1	mg/L	36	3	157	1	<1
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	35	42	18	21	11
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	123	11	18	2	7
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	138	82	219	30	17
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.09	0.03	0.02	0.06	1.48
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.002	<0.001	0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	0.004	0.003	0.108	0.005	0.005
Nickel	7440-02-0	0.001	mg/L	0.002	0.006	0.003	0.003	0.004
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	0.013	0.025	0.006	0.010	0.021
Iron	7439-89-6	0.05	mg/L	0.52	0.75	<0.05	<0.05	0.54
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	7.69	3.15	24.9	1.61	2.57
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.007	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0002	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	0.005	0.003	0.044	0.001	0.001
Copper	7440-50-8	0.001	mg/L	0.002	0.005	0.036	0.003	0.015

Analytical Results

Sub-Matrix: **WATER**			Client sample ID	**WRMW1-002**	**WRMW2-002**	**WRMW3-002**	**WRMW4-002**	**WRMW5-002**
			Client sampling date / time	30-AUG-2012 11:00	30-AUG-2012 11:00	30-AUG-2012 11:00	30-AUG-2012 11:00	30-AUG-2012 11:00
Compound	*CAS Number*	*LOR*	*Unit*	**EP1207278-001**	**EP1207278-002**	**EP1207278-003**	**EP1207278-004**	**EP1207278-005**
EG020T: Total Metals by ICP-MS - Continued								
Lead	7439-92-1	0.001	mg/L	**0.015**	**0.003**	**0.079**	**0.005**	**0.002**
Manganese	7439-96-5	0.001	mg/L	**0.004**	**0.004**	**0.129**	**0.006**	**0.002**
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	**0.001**	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	**0.003**	**0.006**	**0.019**	**0.003**	**0.002**
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	**0.007**	**0.079**	**0.079**	**0.011**	**0.007**
Iron	7439-89-6	0.05	mg/L	**0.21**	**2.12**	**12.4**	**0.40**	**0.13**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	**0.0001**	<0.0001	<0.0001	<0.0001	<0.0001
EG050F: Dissolved Hexavalent Chromium								
Hexavalent Chromium	18540-29-9	0.010	mg/L	<0.010	<0.010	<0.010	----	<0.010
Hexavalent Chromium	18540-29-9	0.01	mg/L	----	----	----	<0.01	----
EG051G: Ferrous Iron by Discrete Analyser								
Ferrous Iron	----	0.05	mg/L	**0.34**	**0.76**	<0.05	<0.05	**0.12**
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.03**	**0.03**	**0.45**	**0.05**	**0.06**
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	----	0.01	mg/L	**0.02**	**0.01**	**0.02**	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**4.91**	**1.09**	**0.31**	**4.92**	**2.03**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**4.93**	**1.10**	**0.33**	**4.92**	**2.03**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**1.4**	**0.3**	**1.4**	**1.1**	**1.5**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**6.3**	**1.4**	**1.7**	**6.0**	**3.5**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.19**	**0.03**	**0.51**	**0.12**	**0.23**
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	----	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EK085M: Sulfide as S2-								
Sulfide as S2-	18496-25-8	0.1	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
EP026ST: Chemical Oxygen Demand (Sealed Tube)								
Chemical Oxygen Demand	----	5	mg/L	**14**	<5	**21**	**7**	<5
EP030: Biochemical Oxygen Demand (BOD)								

Analytical Results

Sub-Matrix: WATER			Client sample ID	WRMW1-002	WRMW2-002	WRMW3-002	WRMW4-002	WRMW5-002
			Client sampling date / time	30-AUG-2012 11:00	30-AUG-2012 11:00	30-AUG-2012 11:00	30-AUG-2012 11:00	30-AUG-2012 11:00
Compound	CAS Number	LOR	Unit	EP1207278-001	EP1207278-002	EP1207278-003	EP1207278-004	EP1207278-005
EP030: Biochemical Oxygen Demand (BOD) - Continued								
Biochemical Oxygen Demand	----	2	mg/L	<2	<2	**5**	<2	**3**
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
beta-BHC	319-85-7	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
gamma-BHC	58-89-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
delta-BHC	319-86-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Heptachlor	76-44-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Aldrin	309-00-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Dieldrin	60-57-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDE	72-55-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Endrin	72-20-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDD	72-54-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDT	50-29-3	2	µg/L	<2	<2	<2	<2	<2
Endrin ketone	53494-70-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Methoxychlor	72-43-5	2	µg/L	<2	<2	<2	<2	<2
^ Total Chlordane (sum)	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of DDD + DDE + DDT	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Monocrotophos	6923-22-4	2	µg/L	<2	<2	<2	<2	<2
Dimethoate	60-51-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Diazinon	333-41-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Parathion-methyl	298-00-0	2	µg/L	<2	<2	<2	<2	<2
Malathion	121-75-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Fenthion	55-38-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Parathion	56-38-2	2	µg/L	<2	<2	<2	<2	<2

Analytical Results

Sub-Matrix: WATER			Client sample ID	WRMW1-002	WRMW2-002	WRMW3-002	WRMW4-002	WRMW5-002
			Client sampling date / time	30-AUG-2012 11:00	30-AUG-2012 11:00	30-AUG-2012 11:00	30-AUG-2012 11:00	30-AUG-2012 11:00
Compound	CAS Number	LOR	Unit	EP1207278-001	EP1207278-002	EP1207278-003	EP1207278-004	EP1207278-005
EP068B: Organophosphorus Pesticides (OP) - Continued								
Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Fenamiphos	22224-92-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Prothiofos	34643-46-4	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Ethion	563-12-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Carbophenothion	786-19-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
EP074A: Monocyclic Aromatic Hydrocarbons								
Styrene	100-42-5	5	µg/L	<5	<5	<5	<5	<5
Isopropylbenzene	98-82-8	5	µg/L	<5	<5	<5	<5	<5
n-Propylbenzene	103-65-1	5	µg/L	<5	<5	<5	<5	<5
1.3.5-Trimethylbenzene	108-67-8	5	µg/L	<5	<5	<5	<5	<5
sec-Butylbenzene	135-98-8	5	µg/L	<5	<5	<5	<5	<5
1.2.4-Trimethylbenzene	95-63-6	5	µg/L	<5	<5	<5	<5	<5
tert-Butylbenzene	98-06-6	5	µg/L	<5	<5	<5	<5	<5
p-Isopropyltoluene	99-87-6	5	µg/L	<5	<5	<5	<5	<5
n-Butylbenzene	104-51-8	5	µg/L	<5	<5	<5	<5	<5
EP074B: Oxygenated Compounds								
Vinyl Acetate	108-05-4	50	µg/L	<50	<50	<50	<50	<50
2-Butanone (MEK)	78-93-3	50	µg/L	<50	<50	<50	<50	<50
4-Methyl-2-pentanone (MIBK)	108-10-1	50	µg/L	<50	<50	<50	<50	<50
2-Hexanone (MBK)	591-78-6	50	µg/L	<50	<50	<50	<50	<50
EP074C: Sulfonated Compounds								
Carbon disulfide	75-15-0	5	µg/L	<5	<5	<5	<5	<5
EP074D: Fumigants								
2.2-Dichloropropane	594-20-7	5	µg/L	<5	<5	<5	<5	<5
1.2-Dichloropropane	78-87-5	5	µg/L	<5	<5	<5	<5	<5
cis-1.3-Dichloropropylene	10061-01-5	5	µg/L	<5	<5	<5	<5	<5
trans-1.3-Dichloropropylene	10061-02-6	5	µg/L	<5	<5	<5	<5	<5
1.2-Dibromoethane (EDB)	106-93-4	5	µg/L	<5	<5	<5	<5	<5
EP074E: Halogenated Aliphatic Compounds								
Dichlorodifluoromethane	75-71-8	50	µg/L	<50	<50	<50	<50	<50
Chloromethane	74-87-3	50	µg/L	<50	<50	<50	<50	<50
Vinyl chloride	75-01-4	50	µg/L	<50	<50	<50	<50	<50
Bromomethane	74-83-9	50	µg/L	<50	<50	<50	<50	<50
Chloroethane	75-00-3	50	µg/L	<50	<50	<50	<50	<50

Analytical Results

Sub-Matrix: WATER			Client sample ID	WRMW1-002	WRMW2-002	WRMW3-002	WRMW4-002	WRMW5-002
			Client sampling date / time	30-AUG-2012 11:00	30-AUG-2012 11:00	30-AUG-2012 11:00	30-AUG-2012 11:00	30-AUG-2012 11:00
Compound	CAS Number	LOR	Unit	EP1207278-001	EP1207278-002	EP1207278-003	EP1207278-004	EP1207278-005
EP074E: Halogenated Aliphatic Compounds - Continued								
Trichlorofluoromethane	75-69-4	50	µg/L	<50	<50	<50	<50	<50
1.1-Dichloroethene	75-35-4	5	µg/L	<5	<5	<5	<5	<5
Iodomethane	74-88-4	5	µg/L	<5	<5	<5	<5	<5
trans-1.2-Dichloroethene	156-60-5	5	µg/L	<5	<5	<5	<5	<5
1.1-Dichloroethane	75-34-3	5	µg/L	<5	<5	<5	<5	<5
cis-1.2-Dichloroethene	156-59-2	5	µg/L	<5	<5	<5	<5	<5
1.1.1-Trichloroethane	71-55-6	5	µg/L	<5	<5	<5	<5	<5
1.1-Dichloropropylene	563-58-6	5	µg/L	<5	<5	<5	<5	<5
Carbon Tetrachloride	56-23-5	5	µg/L	<5	<5	<5	<5	<5
1.2-Dichloroethane	107-06-2	5	µg/L	<5	<5	<5	<5	<5
Trichloroethene	79-01-6	5	µg/L	<5	<5	<5	<5	<5
Dibromomethane	74-95-3	5	µg/L	<5	<5	<5	<5	<5
1.1.2-Trichloroethane	79-00-5	5	µg/L	<5	<5	<5	<5	<5
1.3-Dichloropropane	142-28-9	5	µg/L	<5	<5	<5	<5	<5
Tetrachloroethene	127-18-4	5	µg/L	<5	<5	<5	<5	<5
1.1.1.2-Tetrachloroethane	630-20-6	5	µg/L	<5	<5	<5	<5	<5
trans-1.4-Dichloro-2-butene	110-57-6	5	µg/L	<5	<5	<5	<5	<5
cis-1.4-Dichloro-2-butene	1476-11-5	5	µg/L	<5	<5	<5	<5	<5
1.1.2.2-Tetrachloroethane	79-34-5	5	µg/L	<5	<5	<5	<5	<5
1.2.3-Trichloropropane	96-18-4	5	µg/L	<5	<5	<5	<5	<5
Pentachloroethane	76-01-7	5	µg/L	<5	<5	<5	<5	<5
1.2-Dibromo-3-chloropropane	96-12-8	5	µg/L	<5	<5	<5	<5	<5
Hexachlorobutadiene	87-68-3	5	µg/L	<5	<5	<5	<5	<5
EP074F: Halogenated Aromatic Compounds								
Chlorobenzene	108-90-7	5	µg/L	<5	<5	<5	<5	<5
Bromobenzene	108-86-1	5	µg/L	<5	<5	<5	<5	<5
2-Chlorotoluene	95-49-8	5	µg/L	<5	<5	<5	<5	<5
4-Chlorotoluene	106-43-4	5	µg/L	<5	<5	<5	<5	<5
1.3-Dichlorobenzene	541-73-1	5	µg/L	<5	<5	<5	<5	<5
1.4-Dichlorobenzene	106-46-7	5	µg/L	<5	<5	<5	<5	<5
1.2-Dichlorobenzene	95-50-1	5	µg/L	<5	<5	<5	<5	<5
1.2.4-Trichlorobenzene	120-82-1	5	µg/L	<5	<5	<5	<5	<5
1.2.3-Trichlorobenzene	87-61-6	5	µg/L	<5	<5	<5	<5	<5
EP074G: Trihalomethanes								
Chloroform	67-66-3	5	µg/L	<5	<5	<5	<5	<5
Bromodichloromethane	75-27-4	5	µg/L	<5	<5	<5	<5	<5
Dibromochloromethane	124-48-1	5	µg/L	<5	<5	<5	<5	<5
Bromoform	75-25-2	5	µg/L	<5	<5	<5	<5	<5

Analytical Results

Sub-Matrix: **WATER**			Client sample ID	WRMW1-002	WRMW2-002	WRMW3-002	WRMW4-002	WRMW5-002
			Client sampling date / time	30-AUG-2012 11:00	30-AUG-2012 11:00	30-AUG-2012 11:00	30-AUG-2012 11:00	30-AUG-2012 11:00
Compound	*CAS Number*	*LOR*	*Unit*	EP1207278-001	EP1207278-002	EP1207278-003	EP1207278-004	EP1207278-005
EP075(SIM)A: Phenolic Compounds								
Phenol	108-95-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chlorophenol	95-57-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2-Methylphenol	95-48-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
3- & 4-Methylphenol	1319-77-3	2.0	µg/L	<2.0	<2.0	**3.3**	<2.0	<2.0
2-Nitrophenol	88-75-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.4-Dimethylphenol	105-67-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.4-Dichlorophenol	120-83-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.6-Dichlorophenol	87-65-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
4-Chloro-3-Methylphenol	59-50-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.4.6-Trichlorophenol	88-06-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.4.5-Trichlorophenol	95-95-4	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Pentachlorophenol	87-86-5	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(b)fluoranthene	205-99-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (WHO)	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft								

Analytical Results

Sub-Matrix: WATER			Client sample ID	WRMW1-002	WRMW2-002	WRMW3-002	WRMW4-002	WRMW5-002
			Client sampling date / time	30-AUG-2012 11:00	30-AUG-2012 11:00	30-AUG-2012 11:00	30-AUG-2012 11:00	30-AUG-2012 11:00
Compound	CAS Number	LOR	Unit	EP1207278-001	EP1207278-002	EP1207278-003	EP1207278-004	EP1207278-005
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft - Continued								
C6 - C10 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	----	20	µg/L	<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	<100	<100
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ Total Xylenes	1330-20-7	2	µg/L	<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.1	%	87.3	85.4	80.3	91.1	63.2
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.1	%	76.3	77.8	74.3	81.7	70.4
EP074S: VOC Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	111	111	116	116	115
Toluene-D8	2037-26-5	0.1	%	117	116	124	120	123
4-Bromofluorobenzene	460-00-4	0.1	%	113	112	116	118	118
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	33.6	32.4	36.7	37.1	22.6
2-Chlorophenol-D4	93951-73-6	0.1	%	85.1	78.6	86.1	83.9	53.3
2.4.6-Tribromophenol	118-79-6	0.1	%	88.4	95.6	90.8	100	57.0
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	92.1	94.3	85.7	90.7	63.0
Anthracene-d10	1719-06-8	0.1	%	95.5	99.0	97.4	101	80.6
4-Terphenyl-d14	1718-51-0	0.1	%	89.8	89.4	90.8	101	65.9
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	108	107	112	112	111
Toluene-D8	2037-26-5	0.1	%	112	112	119	123	118
4-Bromofluorobenzene	460-00-4	0.1	%	111	110	112	115	115

Analytical Results

Sub-Matrix: WATER			Client sample ID	WRMW6-002	DUP-002	RINSATE-002	BLANK-002	----
			Client sampling date / time	30-AUG-2012 11:00	30-AUG-2012 11:00	30-AUG-2012 11:00	30-AUG-2012 11:00	----
Compound	CAS Number	LOR	Unit	EP1207278-006	EP1207278-007	EP1207278-008	EP1207278-009	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**5.87**	**5.49**	**5.63**	**5.91**	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**914**	**151**	<1	<1	----
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	GIS-210-010	10	mg/L	**578**	**85**	<10	<10	----
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	**6**	**16**	<5	<5	----
EA045: Turbidity								
Turbidity	----	0.1	NTU	**4.0**	**9.6**	**0.3**	<0.1	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**10**	<1	<1	<1	----
Total Alkalinity as CaCO3	----	1	mg/L	**10**	<1	<1	<1	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**39**	**8**	**4**	**2**	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**203**	**3**	<1	<1	----
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	**153**	**31**	<1	<1	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.15**	**0.06**	<0.01	<0.01	----
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Manganese	7439-96-5	0.001	mg/L	**0.032**	**0.004**	<0.001	<0.001	----
Nickel	7440-02-0	0.001	mg/L	**0.004**	**0.002**	<0.001	<0.001	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Zinc	7440-66-6	0.005	mg/L	**0.016**	**0.008**	<0.005	<0.005	----
Iron	7439-89-6	0.05	mg/L	**0.11**	**0.06**	<0.05	<0.05	----
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.41**	**1.43**	<0.01	<0.01	----
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	**0.003**	<0.001	----
Copper	7440-50-8	0.001	mg/L	**0.003**	**0.003**	**0.001**	**0.001**	----

Analytical Results

Sub-Matrix: **WATER**			Client sample ID	**WRMW6-002**	**DUP-002**	**RINSATE-002**	**BLANK-002**	----
			Client sampling date / time	30-AUG-2012 11:00	30-AUG-2012 11:00	30-AUG-2012 11:00	30-AUG-2012 11:00	----
Compound	*CAS Number*	*LOR*	*Unit*	**EP1207278-006**	**EP1207278-007**	**EP1207278-008**	**EP1207278-009**	**----**
EG020T: Total Metals by ICP-MS - Continued								
Lead	7439-92-1	0.001	mg/L	**0.009**	**0.004**	<0.001	<0.001	----
Manganese	7439-96-5	0.001	mg/L	**0.034**	**0.006**	<0.001	<0.001	----
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Nickel	7440-02-0	0.001	mg/L	**0.003**	**0.003**	**0.002**	<0.001	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Zinc	7440-66-6	0.005	mg/L	**0.011**	**0.011**	<0.005	<0.005	----
Iron	7439-89-6	0.05	mg/L	**3.21**	**0.32**	**0.08**	<0.05	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
EG050F: Dissolved Hexavalent Chromium								
Hexavalent Chromium	18540-29-9	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	----
EG051G: Ferrous Iron by Discrete Analyser								
Ferrous Iron	----	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.73**	**0.04**	**0.03**	**0.04**	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	----	0.01	mg/L	**0.02**	**0.01**	<0.01	<0.01	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**1.43**	**4.89**	<0.01	<0.01	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**1.45**	**4.90**	<0.01	<0.01	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**1.1**	**1.5**	<0.1	<0.1	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ **Total Nitrogen as N**	----	0.1	mg/L	**2.6**	**6.4**	<0.1	<0.1	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.02**	**0.09**	<0.01	<0.01	----
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	----	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
EK085M: Sulfide as S2-								
Sulfide as S2-	18496-25-8	0.1	mg/L	<0.1	<0.1	<0.1	<0.1	----
EP026ST: Chemical Oxygen Demand (Sealed Tube)								
Chemical Oxygen Demand	----	5	mg/L	**30**	**7**	<5	<5	----
EP030: Biochemical Oxygen Demand (BOD)								
Biochemical Oxygen Demand	----	2	mg/L	**2**	<2	**3**	<2	----

Analytical Results

Sub-Matrix: WATER		Client sample ID		WRMW6-002	DUP-002	RINSATE-002	BLANK-002	----
		Client sampling date / time		30-AUG-2012 11:00	30-AUG-2012 11:00	30-AUG-2012 11:00	30-AUG-2012 11:00	----
Compound	CAS Number	LOR	Unit	EP1207278-006	EP1207278-007	EP1207278-008	EP1207278-009	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
beta-BHC	319-85-7	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
gamma-BHC	58-89-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
delta-BHC	319-86-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Heptachlor	76-44-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Aldrin	309-00-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Dieldrin	60-57-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
4.4`-DDE	72-55-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Endrin	72-20-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
4.4`-DDD	72-54-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
4.4`-DDT	50-29-3	2	µg/L	<2	<2	<2	<2	----
Endrin ketone	53494-70-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Methoxychlor	72-43-5	2	µg/L	<2	<2	<2	<2	----
^ Total Chlordane (sum)	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
^ Sum of DDD + DDE + DDT	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Monocrotophos	6923-22-4	2	µg/L	<2	<2	<2	<2	----
Dimethoate	60-51-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Diazinon	333-41-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Parathion-methyl	298-00-0	2	µg/L	<2	<2	<2	<2	----
Malathion	121-75-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Fenthion	55-38-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Parathion	56-38-2	2	µg/L	<2	<2	<2	<2	----
Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----

Analytical Results

Sub-Matrix: WATER			Client sample ID	WRMW6-002	DUP-002	RINSATE-002	BLANK-002	----
			Client sampling date / time	30-AUG-2012 11:00	30-AUG-2012 11:00	30-AUG-2012 11:00	30-AUG-2012 11:00	----
Compound	CAS Number	LOR	Unit	EP1207278-006	EP1207278-007	EP1207278-008	EP1207278-009	----
EP068B: Organophosphorus Pesticides (OP) - Continued								
Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Fenamiphos	22224-92-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Prothiofos	34643-46-4	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Ethion	563-12-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Carbophenothion	786-19-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
EP074A: Monocyclic Aromatic Hydrocarbons								
Styrene	100-42-5	5	µg/L	<5	<5	<5	<5	----
Isopropylbenzene	98-82-8	5	µg/L	<5	<5	<5	<5	----
n-Propylbenzene	103-65-1	5	µg/L	<5	<5	<5	<5	----
1.3.5-Trimethylbenzene	108-67-8	5	µg/L	<5	<5	<5	<5	----
sec-Butylbenzene	135-98-8	5	µg/L	<5	<5	<5	<5	----
1.2.4-Trimethylbenzene	95-63-6	5	µg/L	<5	<5	<5	<5	----
tert-Butylbenzene	98-06-6	5	µg/L	<5	<5	<5	<5	----
p-Isopropyltoluene	99-87-6	5	µg/L	<5	<5	<5	<5	----
n-Butylbenzene	104-51-8	5	µg/L	<5	<5	<5	<5	----
EP074B: Oxygenated Compounds								
Vinyl Acetate	108-05-4	50	µg/L	<50	<50	<50	<50	----
2-Butanone (MEK)	78-93-3	50	µg/L	<50	<50	<50	<50	----
4-Methyl-2-pentanone (MIBK)	108-10-1	50	µg/L	<50	<50	<50	<50	----
2-Hexanone (MBK)	591-78-6	50	µg/L	<50	<50	<50	<50	----
EP074C: Sulfonated Compounds								
Carbon disulfide	75-15-0	5	µg/L	<5	<5	<5	<5	----
EP074D: Fumigants								
2.2-Dichloropropane	594-20-7	5	µg/L	<5	<5	<5	<5	----
1.2-Dichloropropane	78-87-5	5	µg/L	<5	<5	<5	<5	----
cis-1.3-Dichloropropylene	10061-01-5	5	µg/L	<5	<5	<5	<5	----
trans-1.3-Dichloropropylene	10061-02-6	5	µg/L	<5	<5	<5	<5	----
1.2-Dibromoethane (EDB)	106-93-4	5	µg/L	<5	<5	<5	<5	----
EP074E: Halogenated Aliphatic Compounds								
Dichlorodifluoromethane	75-71-8	50	µg/L	<50	<50	<50	<50	----
Chloromethane	74-87-3	50	µg/L	<50	<50	<50	<50	----
Vinyl chloride	75-01-4	50	µg/L	<50	<50	<50	<50	----
Bromomethane	74-83-9	50	µg/L	<50	<50	<50	<50	----
Chloroethane	75-00-3	50	µg/L	<50	<50	<50	<50	----
Trichlorofluoromethane	75-69-4	50	µg/L	<50	<50	<50	<50	----
1.1-Dichloroethene	75-35-4	5	µg/L	<5	<5	<5	<5	----

Analytical Results

Sub-Matrix: **WATER**			Client sample ID	WRMW6-002	DUP-002	RINSATE-002	BLANK-002	----
			Client sampling date / time	30-AUG-2012 11:00	30-AUG-2012 11:00	30-AUG-2012 11:00	30-AUG-2012 11:00	----
Compound	*CAS Number*	*LOR*	*Unit*	EP1207278-006	EP1207278-007	EP1207278-008	EP1207278-009	----
EP074E: Halogenated Aliphatic Compounds - Continued								
Iodomethane	74-88-4	5	µg/L	<5	<5	<5	<5	----
trans-1.2-Dichloroethene	156-60-5	5	µg/L	<5	<5	<5	<5	----
1.1-Dichloroethane	75-34-3	5	µg/L	<5	<5	<5	<5	----
cis-1.2-Dichloroethene	156-59-2	5	µg/L	<5	<5	<5	<5	----
1.1.1-Trichloroethane	71-55-6	5	µg/L	<5	<5	<5	<5	----
1.1-Dichloropropylene	563-58-6	5	µg/L	<5	<5	<5	<5	----
Carbon Tetrachloride	56-23-5	5	µg/L	<5	<5	<5	<5	----
1.2-Dichloroethane	107-06-2	5	µg/L	<5	<5	<5	<5	----
Trichloroethene	79-01-6	5	µg/L	<5	<5	<5	<5	----
Dibromomethane	74-95-3	5	µg/L	<5	<5	<5	<5	----
1.1.2-Trichloroethane	79-00-5	5	µg/L	<5	<5	<5	<5	----
1.3-Dichloropropane	142-28-9	5	µg/L	<5	<5	<5	<5	----
Tetrachloroethene	127-18-4	5	µg/L	<5	<5	<5	<5	----
1.1.1.2-Tetrachloroethane	630-20-6	5	µg/L	<5	<5	<5	<5	----
trans-1.4-Dichloro-2-butene	110-57-6	5	µg/L	<5	<5	<5	<5	----
cis-1.4-Dichloro-2-butene	1476-11-5	5	µg/L	<5	<5	<5	<5	----
1.1.2.2-Tetrachloroethane	79-34-5	5	µg/L	<5	<5	<5	<5	----
1.2.3-Trichloropropane	96-18-4	5	µg/L	<5	<5	<5	<5	----
Pentachloroethane	76-01-7	5	µg/L	<5	<5	<5	<5	----
1.2-Dibromo-3-chloropropane	96-12-8	5	µg/L	<5	<5	<5	<5	----
Hexachlorobutadiene	87-68-3	5	µg/L	<5	<5	<5	<5	----
EP074F: Halogenated Aromatic Compounds								
Chlorobenzene	108-90-7	5	µg/L	<5	<5	<5	<5	----
Bromobenzene	108-86-1	5	µg/L	<5	<5	<5	<5	----
2-Chlorotoluene	95-49-8	5	µg/L	<5	<5	<5	<5	----
4-Chlorotoluene	106-43-4	5	µg/L	<5	<5	<5	<5	----
1.3-Dichlorobenzene	541-73-1	5	µg/L	<5	<5	<5	<5	----
1.4-Dichlorobenzene	106-46-7	5	µg/L	<5	<5	<5	<5	----
1.2-Dichlorobenzene	95-50-1	5	µg/L	<5	<5	<5	<5	----
1.2.4-Trichlorobenzene	120-82-1	5	µg/L	<5	<5	<5	<5	----
1.2.3-Trichlorobenzene	87-61-6	5	µg/L	<5	<5	<5	<5	----
EP074G: Trihalomethanes								
Chloroform	67-66-3	5	µg/L	<5	<5	<5	<5	----
Bromodichloromethane	75-27-4	5	µg/L	<5	<5	<5	<5	----
Dibromochloromethane	124-48-1	5	µg/L	<5	<5	<5	<5	----
Bromoform	75-25-2	5	µg/L	<5	<5	<5	<5	----
EP075(SIM)A: Phenolic Compounds								
Phenol	108-95-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----

Analytical Results

Sub-Matrix: **WATER**			Client sample ID	WRMW6-002	DUP-002	RINSATE-002	BLANK-002	----
			Client sampling date / time	30-AUG-2012 11:00	30-AUG-2012 11:00	30-AUG-2012 11:00	30-AUG-2012 11:00	----
Compound	CAS Number	LOR	Unit	EP1207278-006	EP1207278-007	EP1207278-008	EP1207278-009	----
EP075(SIM)A: Phenolic Compounds - Continued								
2-Chlorophenol	95-57-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
2-Methylphenol	95-48-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
3- & 4-Methylphenol	1319-77-3	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	----
2-Nitrophenol	88-75-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
2.4-Dimethylphenol	105-67-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
2.4-Dichlorophenol	120-83-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
2.6-Dichlorophenol	87-65-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
4-Chloro-3-Methylphenol	59-50-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
2.4.6-Trichlorophenol	88-06-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
2.4.5-Trichlorophenol	95-95-4	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Pentachlorophenol	87-86-5	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Benzo(b)fluoranthene	205-99-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
^ Benzo(a)pyrene TEQ (WHO)	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	----
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	----
C15 - C28 Fraction	----	100	µg/L	**380**	<100	<100	<100	----
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	**380**	<50	<50	<50	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft								
C6 - C10 Fraction	----	20	µg/L	<20	<20	<20	<20	----

Analytical Results

Sub-Matrix: WATER			Client sample ID	WRMW6-002	DUP-002	RINSATE-002	BLANK-002	----
			Client sampling date / time	30-AUG-2012 11:00	30-AUG-2012 11:00	30-AUG-2012 11:00	30-AUG-2012 11:00	----
Compound	CAS Number	LOR	Unit	EP1207278-006	EP1207278-007	EP1207278-008	EP1207278-009	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft - Continued								
^ C6 - C10 Fraction minus BTEX (F1)	----	20	µg/L	<20	<20	<20	<20	----
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	----
>C16 - C34 Fraction	----	100	µg/L	**410**	<100	<100	<100	----
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	**410**	<100	<100	<100	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	----
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	----
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	----
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	----
^ Total Xylenes	1330-20-7	2	µg/L	<2	<2	<2	<2	----
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	----
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.1	%	**78.2**	**70.0**	**83.8**	**83.1**	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.1	%	**76.5**	**60.3**	**80.2**	**75.8**	----
EP074S: VOC Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	**118**	**113**	**114**	**112**	----
Toluene-D8	2037-26-5	0.1	%	**119**	**117**	**118**	**116**	----
4-Bromofluorobenzene	460-00-4	0.1	%	**122**	**112**	**112**	**111**	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	**37.0**	**27.5**	**37.0**	**37.3**	----
2-Chlorophenol-D4	93951-73-6	0.1	%	**81.9**	**73.6**	**87.1**	**91.2**	----
2.4.6-Tribromophenol	118-79-6	0.1	%	**108**	**76.6**	**88.1**	**95.3**	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	**103**	**78.3**	**83.8**	**92.2**	----
Anthracene-d10	1719-06-8	0.1	%	**104**	**85.2**	**96.1**	**102**	----
4-Terphenyl-d14	1718-51-0	0.1	%	**95.7**	**75.8**	**90.7**	**97.0**	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	**114**	**109**	**110**	**108**	----
Toluene-D8	2037-26-5	0.1	%	**112**	**112**	**113**	**111**	----
4-Bromofluorobenzene	460-00-4	0.1	%	**118**	**109**	**110**	**108**	----

Surrogate Control Limits

Sub-Matrix: **WATER**

Compound	CAS Number	Recovery Limits (%) Low	High
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	33.6	142.5
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	28.1	147.7
EP074S: VOC Surrogates			
1.2-Dichloroethane-D4	17060-07-0	78.3	133.2
Toluene-D8	2037-26-5	79.1	128.9
4-Bromofluorobenzene	460-00-4	80.8	123.7
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10.0	64.1
2-Chlorophenol-D4	93951-73-6	11.3	122.9
2.4.6-Tribromophenol	118-79-6	11.7	144.0
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	19.9	122.8
Anthracene-d10	1719-06-8	23.3	125.8
4-Terphenyl-d14	1718-51-0	20.3	134.5
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128

QUALITY CONTROL REPORT

Work Order	: **EP1207278**	Page	: 1 of 22
Client	: **MOBILE DEWATERING**	Laboratory	: Environmental Division Perth
Contact	: INFO	Contact	: Lauren Ockwell
Address	: PO BOX 239 MIDLAND WA, AUSTRALIA 6939	Address	: 10 Hod Way Malaga WA Australia 6090
E-mail	: info@environmentalservices.com.au	E-mail	: lauren.ockwell@alsenviro.com
Telephone	: +61 08 9250 4995	Telephone	: 08 9209 7606
Facsimile	: ----	Facsimile	: 08 9209 7600
Project	: E2012-031	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: WASTEROCK		
C-O-C number	: E2012-031-003	Date Samples Received	: 31-AUG-2012
Sampler	: Dale A./ Nathan F.	Issue Date	: 07-SEP-2012
Order number	: ----		
		No. of samples received	: 9
Quote number	: EP/324/12	No. of samples analysed	: 9

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

WORLD RECOGNISED ACCREDITATION

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Metals Instrument Chemist	Perth Inorganics
Chas Tucker	Inorganic Chemist	Perth Inorganics
Cicelia Bartels	Metals Instrument Chemist	Perth Inorganics
Edwandy Fadjar	Organic Coordinator	Sydney Organics
Hoa Nguyen	Inorganic Chemist	Sydney Inorganics
Pabi Subba	Senior Organic Chemist	Sydney Organics
Phalak Inthakesone	Laboratory Manager - Organics	Sydney Organics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key :
Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA005P: pH by PC Titrator (QC Lot: 2477807)									
EP1207259-003	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	6.60	6.51	1.4	0% - 20%
EP1207264-003	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	5.01	5.05	0.8	0% - 20%
EA005P: pH by PC Titrator (QC Lot: 2477810)									
EP1207278-006	WRMW6-002	EA005-P: pH Value	----	0.01	pH Unit	5.87	5.91	0.7	0% - 20%
EA010P: Conductivity by PC Titrator (QC Lot: 2477805)									
EP1207248-008	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	25600	25000	2.3	0% - 20%
EP1207259-003	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	584	575	1.6	0% - 20%
EA010P: Conductivity by PC Titrator (QC Lot: 2477808)									
EP1207278-006	WRMW6-002	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	914	892	2.4	0% - 20%
EA015: Total Dissolved Solids (QC Lot: 2482069)									
EP1207278-001	WRMW1-002	EA015H: Total Dissolved Solids @180°C	GIS-210-010	10	mg/L	474	482	1.7	0% - 20%
EP1207278-009	BLANK-002	EA015H: Total Dissolved Solids @180°C	GIS-210-010	10	mg/L	<10	<10	0.0	No Limit
EA025: Suspended Solids (QC Lot: 2482340)									
EP1207260-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	131	136	3.7	0% - 20%
EP1207278-009	BLANK-002	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
EA045: Turbidity (QC Lot: 2477904)									
EP1207278-001	WRMW1-002	EA045: Turbidity	----	0.1	NTU	202	208	3.2	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 2477806)									
EP1207248-008	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	323	325	0.8	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	323	325	0.8	0% - 20%
EP1207259-003	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	21	21	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	21	21	0.0	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 2477809)									
EP1207278-006	WRMW6-002	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	10	10	0.0	0% - 50%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	10	10	0.0	0% - 50%
ED038A: Acidity (QC Lot: 2485063)									
EP1207259-001	Anonymous	ED038: Acidity as CaCO3	----	1	mg/L	35	36	0.0	0% - 20%
EP1207278-001	WRMW1-002	ED038: Acidity as CaCO3	----	1	mg/L	35	38	7.8	0% - 20%

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 2477925)									
EP1207264-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<10	<10	0.0	No Limit
EP1207278-006	WRMW6-002	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	203	205	0.7	0% - 20%
ED045G: Chloride Discrete analyser (QC Lot: 2477924)									
EP1207264-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	119	120	1.1	0% - 20%
EP1207278-006	WRMW6-002	ED045G: Chloride	16887-00-6	1	mg/L	153	157	2.6	0% - 20%
EG020F: Dissolved Metals by ICP-MS (QC Lot: 2483241)									
EP1207259-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.003	0.002	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.026	0.027	0.0	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.005	0.005	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.025	0.025	0.0	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	1.62	1.64	0.8	0% - 20%
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	10.8	11.0	1.9	0% - 20%
EP1207278-003	WRMW3-002	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.108	0.107	0.0	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.003	0.003	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.006	<0.005	0.0	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	0.02	0.02	0.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 2483220)									
EP1207257-002	Anonymous	EG020B-T: Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	0.0	No Limit
EP1207278-008	RINSATE-002	EG020B-T: Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	0.0	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 2483221)									
EP1207257-002	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	0.002	<0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.432	0.437	1.1	0% - 20%
		EG020A-T: Lead	7439-92-1	0.001	mg/L	0.007	0.007	0.0	No Limit
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.005	0.003	37.8	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.154	0.152	1.2	0% - 20%
		EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EG020T: Total Metals by ICP-MS (QC Lot: 2483221) - continued									
EP1207257-002	Anonymous	EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EP1207278-008	RINSATE-002	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	0.003	<0.001	99.3	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.001	0.001	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.002	<0.001	84.1	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Iron	7439-89-6	0.05	mg/L	0.08	<0.05	38.6	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 2485210)									
EP1207257-001	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EP1207278-007	DUP-002	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG050F: Dissolved Hexavalent Chromium (QC Lot: 2482429)									
EP1207219-001	Anonymous	EG050G-F: Hexavalent Chromium	18540-29-9	0.01	mg/L	<0.010	0.02	0.0	No Limit
EP1207259-003	Anonymous	EG050G-F: Hexavalent Chromium	18540-29-9	0.01	mg/L	<0.010	<0.01	0.0	No Limit
EG051G: Ferrous Iron by Discrete Analyser (QC Lot: 2484335)									
EP1207182-002	Anonymous	EG051G: Ferrous Iron	----	0.05	mg/L	0.22	0.21	0.0	No Limit
EP1207278-005	WRMW5-002	EG051G: Ferrous Iron	----	0.05	mg/L	0.12	0.12	0.0	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 2478533)									
EP1207260-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.10	0.10	0.0	0% - 50%
EP1207278-001	WRMW1-002	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.03	0.03	0.0	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 2477922)									
EP1207264-001	Anonymous	EK057G: Nitrite as N	----	0.01	mg/L	0.04	0.03	0.0	No Limit
EP1207265-001	Anonymous	EK057G: Nitrite as N	----	0.01	mg/L	0.01	0.01	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 2478532)									
EP1207260-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	2.01	2.01	0.0	0% - 20%
EP1207278-001	WRMW1-002	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	4.93	4.93	0.0	0% - 20%
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 2481449)									
EP1207041-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	1.6	1.4	8.0	0% - 50%
EP1207278-007	DUP-002	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	1.5	1.1	35.2	0% - 50%
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 2481450)									
EP1207041-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.49	0.47	4.4	0% - 20%
EP1207278-007	DUP-002	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.09	0.05	56.1	No Limit
EK071G: Reactive Phosphorus as P by discrete analyser (QC Lot: 2477923)									

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EK071G: Reactive Phosphorus as P by discrete analyser (QC Lot: 2477923) - continued									
EP1207264-001	Anonymous	EK071G: Reactive Phosphorus as P	----	0.01	mg/L	0.81	0.79	3.4	0% - 20%
EP1207278-006	WRMW6-002	EK071G: Reactive Phosphorus as P	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK085M: Sulfide as S2- (QC Lot: 2483210)									
EP1207265-001	Anonymous	EK085: Sulfide as S2-	18496-25-8	0.1	mg/L	<0.1	0.1	0.0	No Limit
EP1207278-009	BLANK-002	EK085: Sulfide as S2-	18496-25-8	0.1	mg/L	<0.1	<0.1	0.0	No Limit
EP026ST: Chemical Oxygen Demand (Sealed Tube) (QC Lot: 2484044)									
EP1207184-001	Anonymous	EP026ST: Chemical Oxygen Demand	----	5	mg/L	<5	<5	0.0	No Limit
EP1207184-001	Anonymous	EP026ST: Chemical Oxygen Demand	----	5	mg/L	<5	<5	0.0	No Limit
EP030: Biochemical Oxygen Demand (BOD) (QC Lot: 2477990)									
EP1207235-002	Anonymous	EP030: Biochemical Oxygen Demand	----	2	mg/L	<2	<2	0.0	No Limit
EP1207278-008	RINSATE-002	EP030: Biochemical Oxygen Demand	----	2	mg/L	3	<2	49.0	No Limit
EP074A: Monocyclic Aromatic Hydrocarbons (QC Lot: 2486254)									
EP1207278-001	WRMW1-002	EP074: Styrene	100-42-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: Isopropylbenzene	98-82-8	5	µg/L	<5	<5	0.0	No Limit
		EP074: n-Propylbenzene	103-65-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.3.5-Trimethylbenzene	108-67-8	5	µg/L	<5	<5	0.0	No Limit
		EP074: sec-Butylbenzene	135-98-8	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2.4-Trimethylbenzene	95-63-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: tert-Butylbenzene	98-06-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: p-Isopropyltoluene	99-87-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: n-Butylbenzene	104-51-8	5	µg/L	<5	<5	0.0	No Limit
EP1207278-008	RINSATE-002	EP074: Styrene	100-42-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: Isopropylbenzene	98-82-8	5	µg/L	<5	<5	0.0	No Limit
		EP074: n-Propylbenzene	103-65-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.3.5-Trimethylbenzene	108-67-8	5	µg/L	<5	<5	0.0	No Limit
		EP074: sec-Butylbenzene	135-98-8	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2.4-Trimethylbenzene	95-63-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: tert-Butylbenzene	98-06-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: p-Isopropyltoluene	99-87-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: n-Butylbenzene	104-51-8	5	µg/L	<5	<5	0.0	No Limit
EP074B: Oxygenated Compounds (QC Lot: 2486254)									
EP1207278-001	WRMW1-002	EP074: Vinyl Acetate	108-05-4	50	µg/L	<50	<50	0.0	No Limit
		EP074: 2-Butanone (MEK)	78-93-3	50	µg/L	<50	<50	0.0	No Limit
		EP074: 4-Methyl-2-pentanone (MIBK)	108-10-1	50	µg/L	<50	<50	0.0	No Limit
		EP074: 2-Hexanone (MBK)	591-78-6	50	µg/L	<50	<50	0.0	No Limit
EP1207278-008	RINSATE-002	EP074: Vinyl Acetate	108-05-4	50	µg/L	<50	<50	0.0	No Limit
		EP074: 2-Butanone (MEK)	78-93-3	50	µg/L	<50	<50	0.0	No Limit
		EP074: 4-Methyl-2-pentanone (MIBK)	108-10-1	50	µg/L	<50	<50	0.0	No Limit
		EP074: 2-Hexanone (MBK)	591-78-6	50	µg/L	<50	<50	0.0	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP074C: Sulfonated Compounds (QC Lot: 2486254)									
EP1207278-001	WRMW1-002	EP074: Carbon disulfide	75-15-0	5	µg/L	<5	<5	0.0	No Limit
EP1207278-008	RINSATE-002	EP074: Carbon disulfide	75-15-0	5	µg/L	<5	<5	0.0	No Limit
EP074D: Fumigants (QC Lot: 2486254)									
EP1207278-001	WRMW1-002	EP074: 2.2-Dichloropropane	594-20-7	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dichloropropane	78-87-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: cis-1.3-Dichloropropylene	10061-01-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: trans-1.3-Dichloropropylene	10061-02-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dibromoethane (EDB)	106-93-4	5	µg/L	<5	<5	0.0	No Limit
EP1207278-008	RINSATE-002	EP074: 2.2-Dichloropropane	594-20-7	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dichloropropane	78-87-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: cis-1.3-Dichloropropylene	10061-01-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: trans-1.3-Dichloropropylene	10061-02-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dibromoethane (EDB)	106-93-4	5	µg/L	<5	<5	0.0	No Limit
EP074E: Halogenated Aliphatic Compounds (QC Lot: 2486254)									
EP1207278-001	WRMW1-002	EP074: 1.1-Dichloroethene	75-35-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: Iodomethane	74-88-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: trans-1.2-Dichloroethene	156-60-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1-Dichloroethane	75-34-3	5	µg/L	<5	<5	0.0	No Limit
		EP074: cis-1.2-Dichloroethene	156-59-2	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1.1-Trichloroethane	71-55-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1-Dichloropropylene	563-58-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: Carbon Tetrachloride	56-23-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dichloroethane	107-06-2	5	µg/L	<5	<5	0.0	No Limit
		EP074: Trichloroethene	79-01-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: Dibromomethane	74-95-3	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1.2-Trichloroethane	79-00-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.3-Dichloropropane	142-28-9	5	µg/L	<5	<5	0.0	No Limit
		EP074: Tetrachloroethene	127-18-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1.1.2-Tetrachloroethane	630-20-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: trans-1.4-Dichloro-2-butene	110-57-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: cis-1.4-Dichloro-2-butene	1476-11-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1.2.2-Tetrachloroethane	79-34-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2.3-Trichloropropane	96-18-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: Pentachloroethane	76-01-7	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dibromo-3-chloropropane	96-12-8	5	µg/L	<5	<5	0.0	No Limit
		EP074: Hexachlorobutadiene	87-68-3	5	µg/L	<5	<5	0.0	No Limit
		EP074: Dichlorodifluoromethane	75-71-8	50	µg/L	<50	<50	0.0	No Limit
		EP074: Chloromethane	74-87-3	50	µg/L	<50	<50	0.0	No Limit
		EP074: Vinyl chloride	75-01-4	50	µg/L	<50	<50	0.0	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP074E: Halogenated Aliphatic Compounds (QC Lot: 2486254) - continued									
EP1207278-001	WRMW1-002	EP074: Bromomethane	74-83-9	50	µg/L	<50	<50	0.0	No Limit
		EP074: Chloroethane	75-00-3	50	µg/L	<50	<50	0.0	No Limit
		EP074: Trichlorofluoromethane	75-69-4	50	µg/L	<50	<50	0.0	No Limit
EP1207278-008	RINSATE-002	EP074: 1.1-Dichloroethene	75-35-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: Iodomethane	74-88-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: trans-1.2-Dichloroethene	156-60-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1-Dichloroethane	75-34-3	5	µg/L	<5	<5	0.0	No Limit
		EP074: cis-1.2-Dichloroethene	156-59-2	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1.1-Trichloroethane	71-55-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1-Dichloropropylene	563-58-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: Carbon Tetrachloride	56-23-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dichloroethane	107-06-2	5	µg/L	<5	<5	0.0	No Limit
		EP074: Trichloroethene	79-01-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: Dibromomethane	74-95-3	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1.2-Trichloroethane	79-00-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.3-Dichloropropane	142-28-9	5	µg/L	<5	<5	0.0	No Limit
		EP074: Tetrachloroethene	127-18-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1.1.2-Tetrachloroethane	630-20-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: trans-1.4-Dichloro-2-butene	110-57-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: cis-1.4-Dichloro-2-butene	1476-11-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1.2.2-Tetrachloroethane	79-34-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2.3-Trichloropropane	96-18-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: Pentachloroethane	76-01-7	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dibromo-3-chloropropane	96-12-8	5	µg/L	<5	<5	0.0	No Limit
		EP074: Hexachlorobutadiene	87-68-3	5	µg/L	<5	<5	0.0	No Limit
		EP074: Dichlorodifluoromethane	75-71-8	50	µg/L	<50	<50	0.0	No Limit
		EP074: Chloromethane	74-87-3	50	µg/L	<50	<50	0.0	No Limit
		EP074: Vinyl chloride	75-01-4	50	µg/L	<50	<50	0.0	No Limit
		EP074: Bromomethane	74-83-9	50	µg/L	<50	<50	0.0	No Limit
		EP074: Chloroethane	75-00-3	50	µg/L	<50	<50	0.0	No Limit
		EP074: Trichlorofluoromethane	75-69-4	50	µg/L	<50	<50	0.0	No Limit
EP074F: Halogenated Aromatic Compounds (QC Lot: 2486254)									
EP1207278-001	WRMW1-002	EP074: Chlorobenzene	108-90-7	5	µg/L	<5	<5	0.0	No Limit
		EP074: Bromobenzene	108-86-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 2-Chlorotoluene	95-49-8	5	µg/L	<5	<5	0.0	No Limit
		EP074: 4-Chlorotoluene	106-43-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.3-Dichlorobenzene	541-73-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.4-Dichlorobenzene	106-46-7	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dichlorobenzene	95-50-1	5	µg/L	<5	<5	0.0	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP074F: Halogenated Aromatic Compounds (QC Lot: 2486254) - continued									
EP1207278-001	WRMW1-002	EP074: 1.2.4-Trichlorobenzene	120-82-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2.3-Trichlorobenzene	87-61-6	5	µg/L	<5	<5	0.0	No Limit
EP1207278-008	RINSATE-002	EP074: Chlorobenzene	108-90-7	5	µg/L	<5	<5	0.0	No Limit
		EP074: Bromobenzene	108-86-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 2-Chlorotoluene	95-49-8	5	µg/L	<5	<5	0.0	No Limit
		EP074: 4-Chlorotoluene	106-43-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.3-Dichlorobenzene	541-73-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.4-Dichlorobenzene	106-46-7	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dichlorobenzene	95-50-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2.4-Trichlorobenzene	120-82-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2.3-Trichlorobenzene	87-61-6	5	µg/L	<5	<5	0.0	No Limit
EP074G: Trihalomethanes (QC Lot: 2486254)									
EP1207278-001	WRMW1-002	EP074: Chloroform	67-66-3	5	µg/L	<5	<5	0.0	No Limit
		EP074: Bromodichloromethane	75-27-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: Dibromochloromethane	124-48-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: Bromoform	75-25-2	5	µg/L	<5	<5	0.0	No Limit
EP1207278-008	RINSATE-002	EP074: Chloroform	67-66-3	5	µg/L	<5	<5	0.0	No Limit
		EP074: Bromodichloromethane	75-27-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: Dibromochloromethane	124-48-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: Bromoform	75-25-2	5	µg/L	<5	<5	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 2480669)									
ES1221161-001	Anonymous	EP071: C15 - C28 Fraction	----	100	µg/L	13300	13000	2.9	0% - 20%
		EP071: C10 - C14 Fraction	----	50	µg/L	190	200	0.0	No Limit
		EP071: C29 - C36 Fraction	----	50	µg/L	5100	5000	2.1	0% - 20%
EP1207278-005	WRMW5-002	EP071: C15 - C28 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	µg/L	<50	<50	0.0	No Limit
		EP071: C29 - C36 Fraction	----	50	µg/L	<50	<50	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 2486255)									
EP1207278-001	WRMW1-002	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QC Lot: 2480669)									
ES1221161-001	Anonymous	EP071: >C10 - C16 Fraction	----	100	µg/L	2040	2140	4.9	0% - 20%
		EP071: >C16 - C34 Fraction	----	100	µg/L	13600	13600	0.3	0% - 20%
		EP071: >C34 - C40 Fraction	----	100	µg/L	660	590	11.0	No Limit
EP1207278-005	WRMW5-002	EP071: >C10 - C16 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
		EP071: >C16 - C34 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QC Lot: 2486255)									
EP1207278-001	WRMW1-002	EP080: C6 - C10 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080: BTEXN (QC Lot: 2486255)									

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP080: BTEXN (QC Lot: 2486255) - continued									
EP1207278-001	WRMW1-002	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 2477807)								
EA005-P: pH Value	----	0.01	pH Unit	----	7.00 pH Unit	100	70	130
EA005P: pH by PC Titrator (QCLot: 2477810)								
EA005-P: pH Value	----	0.01	pH Unit	----	7.00 pH Unit	100	70	130
EA010P: Conductivity by PC Titrator (QCLot: 2477805)								
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	24800 µS/cm	99.5	98	102
EA010P: Conductivity by PC Titrator (QCLot: 2477808)								
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	24800 µS/cm	99.7	98	102
EA015: Total Dissolved Solids (QCLot: 2482069)								
EA015H: Total Dissolved Solids @180°C	GIS-210-010	10	mg/L	<10	2000 mg/L	92.0	79.8	116
EA025: Suspended Solids (QCLot: 2482340)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	111	82	122
EA045: Turbidity (QCLot: 2477904)								
EA045: Turbidity	----	0.1	NTU	<0.1	40 NTU	96.5	90.1	107
ED037P: Alkalinity by PC Titrator (QCLot: 2477806)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	200 mg/L	108	87	125
ED037P: Alkalinity by PC Titrator (QCLot: 2477809)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	200 mg/L	122	87	125
ED038A: Acidity (QCLot: 2485063)								
ED038: Acidity as CaCO3	----	1	mg/L	----	20 mg/L	113	85	119
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 2477925)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	106	85	130
ED045G: Chloride Discrete analyser (QCLot: 2477924)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	1000 mg/L	98.1	78	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 2483241)								
EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.50 mg/L	96.2	77	113

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 2483241) - continued								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.100 mg/L	93.9	79	111
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1000 mg/L	97.7	81	109
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.100 mg/L	93.9	81	109
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.100 mg/L	95.3	79	109
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.100 mg/L	95.2	79	109
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.10 mg/L	95.6	80	112
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.100 mg/L	95.9	79	113
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.50 mg/L	90.0	76	112
EG020T: Total Metals by ICP-MS (QCLot: 2483220)								
EG020B-T: Silver	7440-22-4	0.001	mg/L	<0.001	0.01 mg/L	118	70	130
EG020T: Total Metals by ICP-MS (QCLot: 2483221)								
EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	104	78	116
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	98.5	77	109
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	101	78	108
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	98.4	80	112
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	98.0	79	111
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	95.8	81	109
EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	100	80	112
EG020A-T: Molybdenum	7439-98-7	0.001	mg/L	<0.001	0.1 mg/L	102	86	118
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	97.3	80	112
EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	102	75	107
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	96.6	74	108
EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	98.6	75	115
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2485210)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.0100 mg/L	104	82.3	118
EG050F: Dissolved Hexavalent Chromium (QCLot: 2482429)								
EG050G-F: Hexavalent Chromium	18540-29-9	0.01	mg/L	<0.01	0.5 mg/L	103	90	114
EG051G: Ferrous Iron by Discrete Analyser (QCLot: 2484335)								
EG051G: Ferrous Iron	----	0.05	mg/L	<0.05	2.00 mg/L	101	87	111
EK055G: Ammonia as N by Discrete Analyser (QCLot: 2478533)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1 mg/L	104	87.5	124
EK057G: Nitrite as N by Discrete Analyser (QCLot: 2477922)								
EK057G: Nitrite as N	----	0.01	mg/L	<0.01	0.5 mg/L	101	86	124
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 2478532)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	105	75.6	124
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 2481449)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	10 mg/L	91.5	70	130

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 2481450)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	91.2	70	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 2477923)								
EK071G: Reactive Phosphorus as P	----	0.01	mg/L	<0.01	0.5 mg/L	100	82	128
EK085M: Sulfide as S2- (QCLot: 2483210)								
EK085: Sulfide as S2-	18496-25-8	0.10	mg/L	<0.1	0.50 mg/L	96.6	82	116
EP026ST: Chemical Oxygen Demand (Sealed Tube) (QCLot: 2484044)								
EP026ST: Chemical Oxygen Demand	----	5	mg/L	<5	500 mg/L	98.0	88	114
EP030: Biochemical Oxygen Demand (BOD) (QCLot: 2477990)								
EP030: Biochemical Oxygen Demand	----	2	mg/L	<2	198 mg/L	85.2	84	114
EP068A: Organochlorine Pesticides (OC) (QCLot: 2480671)								
EP068: alpha-BHC	319-84-6	0.5	µg/L	<0.5	5 µg/L	84.6	61	117
EP068: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	5 µg/L	74.7	56	116
EP068: beta-BHC	319-85-7	0.5	µg/L	<0.5	5 µg/L	97.1	60	118
EP068: gamma-BHC	58-89-9	0.5	µg/L	<0.5	5 µg/L	90.4	62	118
EP068: delta-BHC	319-86-8	0.5	µg/L	<0.5	5 µg/L	86.3	64	116
EP068: Heptachlor	76-44-8	0.5	µg/L	<0.5	5 µg/L	80.6	63	117
EP068: Aldrin	309-00-2	0.5	µg/L	<0.5	5 µg/L	89.8	65	121
EP068: Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	5 µg/L	83.5	63	117
EP068: trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	5 µg/L	94.5	64	120
EP068: alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	5 µg/L	95.4	67	119
EP068: cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	5 µg/L	92.2	63	123
EP068: Dieldrin	60-57-1	0.5	µg/L	<0.5	5 µg/L	87.3	64	122
EP068: 4.4`-DDE	72-55-9	0.5	µg/L	<0.5	5 µg/L	92.2	64	118
EP068: Endrin	72-20-8	0.5	µg/L	<0.5	5 µg/L	90.6	64	126
EP068: beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	5 µg/L	100	68	122
EP068: 4.4`-DDD	72-54-8	0.5	µg/L	<0.5	5 µg/L	95.1	66	122
EP068: Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	5 µg/L	86.5	62	112
EP068: Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	5 µg/L	103	60	124
EP068: 4.4`-DDT	50-29-3	2.0	µg/L	<2	5 µg/L	92.0	54	126
EP068: Endrin ketone	53494-70-5	0.5	µg/L	<0.5	5 µg/L	91.0	55	119
EP068: Methoxychlor	72-43-5	2.0	µg/L	<2	5 µg/L	96.7	53	127
EP068A: Organochlorine Pesticides (OC) (QCLot: 2481317)								
EP068: alpha-BHC	319-84-6	0.5	µg/L	<0.5	5 µg/L	90.3	61	117
EP068: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	5 µg/L	90.4	56	116
EP068: beta-BHC	319-85-7	0.5	µg/L	<0.5	5 µg/L	90.7	60	118
EP068: gamma-BHC	58-89-9	0.5	µg/L	<0.5	5 µg/L	90.0	62	118
EP068: delta-BHC	319-86-8	0.5	µg/L	<0.5	5 µg/L	83.3	64	116
EP068: Heptachlor	76-44-8	0.5	µg/L	<0.5	5 µg/L	78.9	63	117

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP068A: Organochlorine Pesticides (OC) (QCLot: 2481317) - continued								
EP068: Aldrin	309-00-2	0.5	µg/L	<0.5	5 µg/L	86.3	65	121
EP068: Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	5 µg/L	77.5	63	117
EP068: trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	5 µg/L	88.4	64	120
EP068: alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	5 µg/L	91.3	67	119
EP068: cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	5 µg/L	87.1	63	123
EP068: Dieldrin	60-57-1	0.5	µg/L	<0.5	5 µg/L	77.5	64	122
EP068: 4.4`-DDE	72-55-9	0.5	µg/L	<0.5	5 µg/L	85.1	64	118
EP068: Endrin	72-20-8	0.5	µg/L	<0.5	5 µg/L	82.4	64	126
EP068: beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	5 µg/L	93.7	68	122
EP068: 4.4`-DDD	72-54-8	0.5	µg/L	<0.5	5 µg/L	89.7	66	122
EP068: Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	5 µg/L	82.4	62	112
EP068: Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	5 µg/L	91.8	60	124
EP068: 4.4`-DDT	50-29-3	2.0	µg/L	<2	5 µg/L	85.4	54	126
EP068: Endrin ketone	53494-70-5	0.5	µg/L	<0.5	5 µg/L	80.4	55	119
EP068: Methoxychlor	72-43-5	2.0	µg/L	<2	5 µg/L	86.9	53	127
EP068B: Organophosphorus Pesticides (OP) (QCLot: 2480671)								
EP068: Dichlorvos	62-73-7	0.5	µg/L	<0.5	5 µg/L	106	52	128
EP068: Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	5 µg/L	105	28.4	150
EP068: Monocrotophos	6923-22-4	0.5	µg/L	----	5 µg/L	22.2	10	89.1
		2.0	µg/L	<2	----	----	----	----
EP068: Dimethoate	60-51-5	0.5	µg/L	<0.5	5 µg/L	108	61	117
EP068: Diazinon	333-41-5	0.5	µg/L	<0.5	5 µg/L	97.7	64	122
EP068: Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	5 µg/L	97.2	67	121
EP068: Parathion-methyl	298-00-0	2.0	µg/L	<2	5 µg/L	87.8	59	123
EP068: Malathion	121-75-5	0.5	µg/L	<0.5	5 µg/L	95.4	57	123
EP068: Fenthion	55-38-9	0.5	µg/L	<0.5	5 µg/L	87.9	67	119
EP068: Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	5 µg/L	87.4	67	121
EP068: Parathion	56-38-2	2.0	µg/L	<2	5 µg/L	91.0	64	118
EP068: Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	5 µg/L	81.4	64	118
EP068: Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	5 µg/L	94.7	59	123
EP068: Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	5 µg/L	87.7	62	122
EP068: Fenamiphos	22224-92-6	0.5	µg/L	<0.5	5 µg/L	93.9	59	131
EP068: Prothiofos	34643-46-4	0.5	µg/L	<0.5	5 µg/L	85.2	64	116
EP068: Ethion	563-12-2	0.5	µg/L	<0.5	5 µg/L	102	68	120
EP068: Carbophenothion	786-19-6	0.5	µg/L	<0.5	5 µg/L	103	62	120
EP068: Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	5 µg/L	98.2	39	131
EP068B: Organophosphorus Pesticides (OP) (QCLot: 2481317)								
EP068: Dichlorvos	62-73-7	0.5	µg/L	<0.5	5 µg/L	74.6	52	128
EP068: Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	5 µg/L	90.4	28.4	150

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP068B: Organophosphorus Pesticides (OP) (QCLot: 2481317) - continued								
EP068: Monocrotophos	6923-22-4	0.5	µg/L	----	5 µg/L	24.3	10	89.1
		2.0	µg/L	<2	----	----	----	----
EP068: Dimethoate	60-51-5	0.5	µg/L	<0.5	5 µg/L	90.5	61	117
EP068: Diazinon	333-41-5	0.5	µg/L	<0.5	5 µg/L	93.1	64	122
EP068: Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	5 µg/L	79.1	67	121
EP068: Parathion-methyl	298-00-0	2.0	µg/L	<2	5 µg/L	80.4	59	123
EP068: Malathion	121-75-5	0.5	µg/L	<0.5	5 µg/L	83.7	57	123
EP068: Fenthion	55-38-9	0.5	µg/L	<0.5	5 µg/L	82.2	67	119
EP068: Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	5 µg/L	76.9	67	121
EP068: Parathion	56-38-2	2.0	µg/L	<2	5 µg/L	74.9	64	118
EP068: Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	5 µg/L	74.7	64	118
EP068: Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	5 µg/L	81.6	59	123
EP068: Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	5 µg/L	77.0	62	122
EP068: Fenamiphos	22224-92-6	0.5	µg/L	<0.5	5 µg/L	78.8	59	131
EP068: Prothiofos	34643-46-4	0.5	µg/L	<0.5	5 µg/L	77.3	64	116
EP068: Ethion	563-12-2	0.5	µg/L	<0.5	5 µg/L	90.3	68	120
EP068: Carbophenothion	786-19-6	0.5	µg/L	<0.5	5 µg/L	89.7	62	120
EP068: Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	5 µg/L	96.5	39	131
EP074A: Monocyclic Aromatic Hydrocarbons (QCLot: 2486254)								
EP074: Styrene	100-42-5	5	µg/L	<5	10 µg/L	98.9	71	121
EP074: Isopropylbenzene	98-82-8	5	µg/L	<5	10 µg/L	99.2	74	122
EP074: n-Propylbenzene	103-65-1	5	µg/L	<5	10 µg/L	101	67	123
EP074: 1.3.5-Trimethylbenzene	108-67-8	5	µg/L	<5	10 µg/L	101	69	123
EP074: sec-Butylbenzene	135-98-8	5	µg/L	<5	10 µg/L	100	70	124
EP074: 1.2.4-Trimethylbenzene	95-63-6	5	µg/L	<5	10 µg/L	100	70	122
EP074: tert-Butylbenzene	98-06-6	5	µg/L	<5	10 µg/L	102	71	123
EP074: p-Isopropyltoluene	99-87-6	5	µg/L	<5	10 µg/L	101	66	124
EP074: n-Butylbenzene	104-51-8	5	µg/L	<5	10 µg/L	102	61	127
EP074B: Oxygenated Compounds (QCLot: 2486254)								
EP074: Vinyl Acetate	108-05-4	50	µg/L	<50	100 µg/L	103	61.4	134
EP074: 2-Butanone (MEK)	78-93-3	50	µg/L	<50	100 µg/L	108	73.6	130
EP074: 4-Methyl-2-pentanone (MIBK)	108-10-1	50	µg/L	<50	100 µg/L	95.9	61	139
EP074: 2-Hexanone (MBK)	591-78-6	50	µg/L	<50	100 µg/L	103	61	139
EP074C: Sulfonated Compounds (QCLot: 2486254)								
EP074: Carbon disulfide	75-15-0	5	µg/L	<5	10 µg/L	99.0	72.8	127
EP074D: Fumigants (QCLot: 2486254)								
EP074: 2.2-Dichloropropane	594-20-7	5	µg/L	<5	10 µg/L	97.6	62	128
EP074: 1.2-Dichloropropane	78-87-5	5	µg/L	<5	10 µg/L	101	75	123
EP074: cis-1.3-Dichloropropylene	10061-01-5	10	µg/L	<10	10 µg/L	96.4	62	120

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP074D: Fumigants (QCLot: 2486254) - continued								
EP074: trans-1.3-Dichloropropylene	10061-02-6	10	µg/L	<10	10 µg/L	96.6	61	119
EP074: 1.2-Dibromoethane (EDB)	106-93-4	5	µg/L	<5	10 µg/L	99.4	70	124
EP074E: Halogenated Aliphatic Compounds (QCLot: 2486254)								
EP074: Dichlorodifluoromethane	75-71-8	50	µg/L	<50	100 µg/L	96.4	60.6	138
EP074: Chloromethane	74-87-3	50	µg/L	<50	100 µg/L	105	67.4	130
EP074: Vinyl chloride	75-01-4	50	µg/L	<50	100 µg/L	98.4	69.4	129
EP074: Bromomethane	74-83-9	50	µg/L	<50	100 µg/L	90.4	56	140
EP074: Chloroethane	75-00-3	50	µg/L	<50	100 µg/L	98.9	63	135
EP074: Trichlorofluoromethane	75-69-4	50	µg/L	<50	100 µg/L	101	61	135
EP074: 1.1-Dichloroethene	75-35-4	5	µg/L	<5	10 µg/L	103	66	128
EP074: Iodomethane	74-88-4	5	µg/L	<5	10 µg/L	104	70.2	128
EP074: trans-1.2-Dichloroethene	156-60-5	5	µg/L	<5	10 µg/L	103	70	124
EP074: 1.1-Dichloroethane	75-34-3	5	µg/L	<5	10 µg/L	102	72	126
EP074: cis-1.2-Dichloroethene	156-59-2	5	µg/L	<5	10 µg/L	102	74	126
EP074: 1.1.1-Trichloroethane	71-55-6	5	µg/L	<5	10 µg/L	97.8	65	121
EP074: 1.1-Dichloropropylene	563-58-6	5	µg/L	<5	10 µg/L	101	70	122
EP074: Carbon Tetrachloride	56-23-5	5	µg/L	<5	10 µg/L	95.6	63	121
EP074: 1.2-Dichloroethane	107-06-2	5	µg/L	<5	10 µg/L	99.6	74	130
EP074: Trichloroethene	79-01-6	5	µg/L	<5	10 µg/L	100	72	124
EP074: Dibromomethane	74-95-3	5	µg/L	<5	10 µg/L	98.9	70	124
EP074: 1.1.2-Trichloroethane	79-00-5	5	µg/L	<5	10 µg/L	96.9	75	127
EP074: 1.3-Dichloropropane	142-28-9	5	µg/L	<5	10 µg/L	102	79	125
EP074: Tetrachloroethene	127-18-4	5	µg/L	<5	10 µg/L	99.1	73	125
EP074: 1.1.1.2-Tetrachloroethane	630-20-6	5	µg/L	<5	10 µg/L	96.3	66	114
EP074: trans-1.4-Dichloro-2-butene	110-57-6	5	µg/L	<5	10 µg/L	102	54	128
EP074: cis-1.4-Dichloro-2-butene	1476-11-5	5	µg/L	<5	10 µg/L	103	70.6	128
EP074: 1.1.2.2-Tetrachloroethane	79-34-5	5	µg/L	<5	10 µg/L	97.8	67	131
EP074: 1.2.3-Trichloropropane	96-18-4	5	µg/L	<5	10 µg/L	99.2	70	134
EP074: Pentachloroethane	76-01-7	5	µg/L	<5	10 µg/L	97.6	71.8	126
EP074: 1.2-Dibromo-3-chloropropane	96-12-8	5	µg/L	<5	10 µg/L	87.9	66.4	136
EP074: Hexachlorobutadiene	87-68-3	5	µg/L	<5	10 µg/L	98.2	58	132
EP074F: Halogenated Aromatic Compounds (QCLot: 2486254)								
EP074: Chlorobenzene	108-90-7	5	µg/L	<5	10 µg/L	99.8	79	121
EP074: Bromobenzene	108-86-1	5	µg/L	<5	10 µg/L	99.9	79	119
EP074: 2-Chlorotoluene	95-49-8	5	µg/L	<5	10 µg/L	101	75	121
EP074: 4-Chlorotoluene	106-43-4	5	µg/L	<5	10 µg/L	101	73	121
EP074: 1.3-Dichlorobenzene	541-73-1	5	µg/L	<5	10 µg/L	102	76	120
EP074: 1.4-Dichlorobenzene	106-46-7	5	µg/L	<5	10 µg/L	101	75	121
EP074: 1.2-Dichlorobenzene	95-50-1	5	µg/L	<5	10 µg/L	101	79	119

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High
EP074F: Halogenated Aromatic Compounds (QCLot: 2486254) - continued								
EP074: 1.2.4-Trichlorobenzene	120-82-1	5	µg/L	<5	10 µg/L	99.6	60	128
EP074: 1.2.3-Trichlorobenzene	87-61-6	5	µg/L	<5	10 µg/L	98.4	67	129
EP074G: Trihalomethanes (QCLot: 2486254)								
EP074: Chloroform	67-66-3	5	µg/L	<5	10 µg/L	101	71	127
EP074: Bromodichloromethane	75-27-4	5	µg/L	<5	10 µg/L	98.4	64	118
EP074: Dibromochloromethane	124-48-1	5	µg/L	<5	10 µg/L	94.4	65	115
EP074: Bromoform	75-25-2	5	µg/L	<5	10 µg/L	97.5	73.5	126
EP075(SIM)A: Phenolic Compounds (QCLot: 2480670)								
EP075(SIM): Phenol	108-95-2	0.2	µg/L	----	5 µg/L	33.0	24.5	61.9
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): 2-Chlorophenol	95-57-8	0.2	µg/L	----	5 µg/L	65.8	63.8	110
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): 2-Methylphenol	95-48-7	0.2	µg/L	----	5 µg/L	67.2	55.9	112
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): 3- & 4-Methylphenol	1319-77-3	0.4	µg/L	----	10 µg/L	87.8	42.5	114
		2	µg/L	<2.0	----	----	----	----
EP075(SIM): 2-Nitrophenol	88-75-5	0.2	µg/L	----	5 µg/L	68.3	62.7	117
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): 2.4-Dimethylphenol	105-67-9	0.2	µg/L	----	5 µg/L	67.0	59.9	112
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): 2.4-Dichlorophenol	120-83-2	0.2	µg/L	----	5 µg/L	68.8	59.3	122
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): 2.6-Dichlorophenol	87-65-0	0.2	µg/L	----	5 µg/L	68.5	64.3	118
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): 4-Chloro-3-Methylphenol	59-50-7	0.2	µg/L	----	5 µg/L	66.9	63	119
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	0.2	µg/L	----	5 µg/L	70.3	58.7	118
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	0.2	µg/L	----	5 µg/L	69.0	51.2	118
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Pentachlorophenol	87-86-5	0.4	µg/L	----	10 µg/L	50.8	6.85	95.6
		2	µg/L	<2.0	----	----	----	----
EP075(SIM)A: Phenolic Compounds (QCLot: 2481319)								
EP075(SIM): Phenol	108-95-2	0.2	µg/L	----	20 µg/L	42.7	24.5	61.9
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): 2-Chlorophenol	95-57-8	0.2	µg/L	----	20 µg/L	88.8	63.8	110
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): 2-Methylphenol	95-48-7	0.2	µg/L	----	20 µg/L	90.2	55.9	112
		1	µg/L	<1.0	----	----	----	----

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High
EP075(SIM)A: Phenolic Compounds (QCLot: 2481319) - continued								
EP075(SIM): 3- & 4-Methylphenol	1319-77-3	0.4	µg/L	----	40 µg/L	80.7	42.5	114
		2	µg/L	<2.0	----	----	----	----
EP075(SIM): 2-Nitrophenol	88-75-5	0.2	µg/L	----	20 µg/L	88.1	62.7	117
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): 2.4-Dimethylphenol	105-67-9	0.2	µg/L	----	20 µg/L	90.1	59.9	112
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): 2.4-Dichlorophenol	120-83-2	0.2	µg/L	----	20 µg/L	88.2	59.3	122
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): 2.6-Dichlorophenol	87-65-0	0.2	µg/L	----	20 µg/L	89.3	64.3	118
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): 4-Chloro-3-Methylphenol	59-50-7	0.2	µg/L	----	20 µg/L	85.0	63	119
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	0.2	µg/L	----	20 µg/L	84.3	58.7	118
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	0.2	µg/L	----	20 µg/L	82.3	51.2	118
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Pentachlorophenol	87-86-5	0.4	µg/L	----	40 µg/L	54.3	6.85	95.6
		2	µg/L	<2.0	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2480670)								
EP075(SIM): Naphthalene	91-20-3	0.2	µg/L	----	5 µg/L	69.1	58.6	119
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Acenaphthylene	208-96-8	0.2	µg/L	----	5 µg/L	66.7	63.6	114
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Acenaphthene	83-32-9	0.2	µg/L	----	5 µg/L	70.0	62.2	113
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Fluorene	86-73-7	0.2	µg/L	----	5 µg/L	73.3	63.9	115
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Phenanthrene	85-01-8	0.2	µg/L	----	5 µg/L	83.6	62.6	116
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Anthracene	120-12-7	0.2	µg/L	----	5 µg/L	82.2	64.3	116
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Fluoranthene	206-44-0	0.2	µg/L	----	5 µg/L	83.9	63.6	118
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Pyrene	129-00-0	0.2	µg/L	----	5 µg/L	84.5	63.1	118
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Benz(a)anthracene	56-55-3	0.2	µg/L	----	5 µg/L	68.0	64.1	117
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Chrysene	218-01-9	0.2	µg/L	----	5 µg/L	76.9	62.5	116
		1	µg/L	<1.0	----	----	----	----

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2480670) - continued								
EP075(SIM): Benzo(b)fluoranthene	205-99-2	0.2	µg/L	----	5 µg/L	69.1	61.7	119
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.2	µg/L	----	5 µg/L	77.8	61.7	117
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Benzo(a)pyrene	50-32-8	0.2	µg/L	----	5 µg/L	71.5	63.3	117
		0.5	µg/L	<0.5	----	----	----	----
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.2	µg/L	----	5 µg/L	70.0	59.9	118
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.2	µg/L	----	5 µg/L	68.8	61.2	117
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.2	µg/L	----	5 µg/L	69.4	59.1	118
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	1	µg/L	<1.0	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2481319)								
EP075(SIM): Naphthalene	91-20-3	0.2	µg/L	----	20 µg/L	101	58.6	119
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Acenaphthylene	208-96-8	0.2	µg/L	----	20 µg/L	101	63.6	114
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Acenaphthene	83-32-9	0.2	µg/L	----	20 µg/L	101	62.2	113
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Fluorene	86-73-7	0.2	µg/L	----	20 µg/L	96.5	63.9	115
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Phenanthrene	85-01-8	0.2	µg/L	----	20 µg/L	95.0	62.6	116
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Anthracene	120-12-7	0.2	µg/L	----	20 µg/L	94.1	64.3	116
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Fluoranthene	206-44-0	0.2	µg/L	----	20 µg/L	95.4	63.6	118
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Pyrene	129-00-0	0.2	µg/L	----	20 µg/L	97.3	63.1	118
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Benz(a)anthracene	56-55-3	0.2	µg/L	----	20 µg/L	100	64.1	117
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Chrysene	218-01-9	0.2	µg/L	----	20 µg/L	100	62.5	116
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Benzo(b)fluoranthene	205-99-2	0.2	µg/L	----	20 µg/L	95.6	61.7	119
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.2	µg/L	----	20 µg/L	98.5	61.7	117
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Benzo(a)pyrene	50-32-8	0.2	µg/L	----	20 µg/L	104	63.3	117
		0.5	µg/L	<0.5	----	----	----	----

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2481319) - continued								
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.2	µg/L	----	20 µg/L	90.7	59.9	118
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.2	µg/L	----	20 µg/L	91.3	61.2	117
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.2	µg/L	----	20 µg/L	90.1	59.1	118
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	1	µg/L	<1.0	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2480669)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	200 µg/L	61.5	58.9	131
EP071: C15 - C28 Fraction	----	100	µg/L	<100	250 µg/L	101	73.9	138
EP071: C29 - C36 Fraction	----	50	µg/L	<50	200 µg/L	90.0	62.7	131
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2481318)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	200 µg/L	105	58.9	131
EP071: C15 - C28 Fraction	----	100	µg/L	<100	300 µg/L	113	73.9	138
EP071: C29 - C36 Fraction	----	50	µg/L	<50	200 µg/L	108	62.7	131
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2486255)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	118	75	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QCLot: 2480669)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	250 µg/L	67.6	58.9	131
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	350 µg/L	79.1	73.9	138
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	----	----	----	----
		50	µg/L	----	150 µg/L	96.7	62.7	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QCLot: 2481318)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	250 µg/L	113	58.9	131
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	350 µg/L	100	73.9	138
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	----	----	----	----
		50	µg/L	----	150 µg/L	109	62.7	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QCLot: 2486255)								
EP080: C6 - C10 Fraction	----	20	µg/L	<20	310 µg/L	118	75	127
EP080: BTEXN (QCLot: 2486255)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	111	70	124
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	113	66	132
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	108	70	120
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	106	69	121
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	109	72	122
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	72.8	70	124

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 2477925)							
EP1207264-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70	130
ED045G: Chloride Discrete analyser (QCLot: 2477924)							
EP1207264-001	Anonymous	ED045G: Chloride	16887-00-6	250 mg/L	111	70	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 2483241)							
EP1207259-002	Anonymous	EG020A-F: Arsenic	7440-38-2	0.200 mg/L	99.5	70	130
		EG020A-F: Cadmium	7440-43-9	0.0500 mg/L	98.5	70	130
		EG020A-F: Chromium	7440-47-3	0.200 mg/L	88.5	70	130
		EG020A-F: Manganese	7439-96-5	0.200 mg/L	92.8	70	130
		EG020A-F: Nickel	7440-02-0	0.200 mg/L	97.6	70	130
		EG020A-F: Zinc	7440-66-6	0.200 mg/L	98.0	70	130
EG020T: Total Metals by ICP-MS (QCLot: 2483221)							
EP1207257-003	Anonymous	EG020A-T: Arsenic	7440-38-2	1.00 mg/L	107	70	130
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	107	70	130
		EG020A-T: Chromium	7440-47-3	1.00 mg/L	97.2	70	130
		EG020A-T: Copper	7440-50-8	1.00 mg/L	101	70	130
		EG020A-T: Lead	7439-92-1	1.00 mg/L	81.9	70	130
		EG020A-T: Manganese	7439-96-5	1.00 mg/L	93.0	70	130
		EG020A-T: Nickel	7440-02-0	1.00 mg/L	103	70	130
		EG020A-T: Zinc	7440-66-6	1.00 mg/L	103	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2485210)							
EP1207257-002	Anonymous	EG035T: Mercury	7439-97-6	0.0100 mg/L	85.2	70	130
EG050F: Dissolved Hexavalent Chromium (QCLot: 2482429)							
EP1207219-001	Anonymous	EG050G-F: Hexavalent Chromium	18540-29-9	0.5 mg/L	89.0	70	130
EG051G: Ferrous Iron by Discrete Analyser (QCLot: 2484335)							
EP1207182-002	Anonymous	EG051G: Ferrous Iron	----	2.5 mg/L	102	70	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 2478533)							
EP1207260-001	Anonymous	EK055G: Ammonia as N	7664-41-7	1.00 mg/L	119	70	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 2477922)							
EP1207260-001	Anonymous	EK057G: Nitrite as N	----	0.6 mg/L	# 43.0	70	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 2478532)							
EP1207260-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.6 mg/L	101	70	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 2481449)							
EP1207264-002	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	25 mg/L	98.4	70	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 2481450)							
EP1207264-002	Anonymous	EK067G: Total Phosphorus as P	----	5 mg/L	91.3	70	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 2477923)							
EP1207264-001	Anonymous	EK071G: Reactive Phosphorus as P	----	0.5 mg/L	94.1	70	130
EP026ST: Chemical Oxygen Demand (Sealed Tube) (QCLot: 2484044)							
EP1207184-001	Anonymous	EP026ST: Chemical Oxygen Demand	----	143 mg/L	122	70	130
EP074E: Halogenated Aliphatic Compounds (QCLot: 2486254)							
EP1207278-001	WRMW1-002	EP074: 1.1-Dichloroethene	75-35-4	25 µg/L	77.5	70	130
		EP074: Trichloroethene	79-01-6	25 µg/L	86.9	70	130
EP074F: Halogenated Aromatic Compounds (QCLot: 2486254)							
EP1207278-001	WRMW1-002	EP074: Chlorobenzene	108-90-7	25 µg/L	90.2	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2480669)							
ES1221161-001	Anonymous	EP071: C10 - C14 Fraction	----	200 µg/L	110	74	150
		EP071: C15 - C28 Fraction	----	250 µg/L	# Not Determined	77	153
		EP071: C29 - C36 Fraction	----	200 µg/L	# Not Determined	67	153
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2486255)							
EP1207278-001	WRMW1-002	EP080: C6 - C9 Fraction	----	325 µg/L	118	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QCLot: 2480669)							
ES1221161-001	Anonymous	EP071: >C10 - C16 Fraction	----	250 µg/L	# Not Determined	74	150
		EP071: >C16 - C34 Fraction	----	350 µg/L	# Not Determined	77	153
		EP071: >C34 - C40 Fraction	----	150 µg/L	# Not Determined	67	153
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QCLot: 2486255)							
EP1207278-001	WRMW1-002	EP080: C6 - C10 Fraction	----	375 µg/L	120	70	130
EP080: BTEXN (QCLot: 2486255)							
EP1207278-001	WRMW1-002	EP080: Benzene	71-43-2	25 µg/L	113	70	130
		EP080: Toluene	108-88-3	25 µg/L	91.5	70	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	88.2	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	25 µg/L	85.9	70	130
		EP080: ortho-Xylene	95-47-6	25 µg/L	86.8	70	130
		EP080: Naphthalene	91-20-3	25 µg/L	107	70	130

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **EP1207278**	Page	: 1 of 16
Client	: MOBILE DEWATERING	Laboratory	: Environmental Division Perth
Contact	: INFO	Contact	: Lauren Ockwell
Address	: PO BOX 239 MIDLAND WA, AUSTRALIA 6939	Address	: 10 Hod Way Malaga WA Australia 6090
E-mail	: info@environmentalservices.com.au	E-mail	: lauren.ockwell@alsenviro.com
Telephone	: +61 08 9250 4995	Telephone	: 08 9209 7606
Facsimile	: ----	Facsimile	: 08 9209 7600
Project	: E2012-031	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: WASTEROCK		
C-O-C number	: E2012-031-003	Date Samples Received	: 31-AUG-2012
Sampler	: Dale A./ Nathan F.	Issue Date	: 07-SEP-2012
Order number	: ----		
		No. of samples received	: 9
Quote number	: EP/324/12	No. of samples analysed	: 9

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non -volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

Matrix: **WATER**

Evaluation: ✘ = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
***Container** / Client Sample ID(s)*			**Date extracted**	Due for extraction	Evaluation	**Date analysed**	Due for analysis	Evaluation
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural								
WRMW1-002, WRMW3-002, WRMW5-002, DUP-002, BLANK-002	WRMW2-002, WRMW4-002, WRMW6-002, RINSATE-002,	**30-AUG-2012**	---	30-AUG-2012	----	**31-AUG-2012**	30-AUG-2012	✘
EA010P: Conductivity by PC Titrator								
Clear Plastic Bottle - Natural								
WRMW1-002, WRMW3-002, WRMW5-002, DUP-002, BLANK-002	WRMW2-002, WRMW4-002, WRMW6-002, RINSATE-002,	**30-AUG-2012**	---	27-SEP-2012	----	**31-AUG-2012**	27-SEP-2012	✓
EA015: Total Dissolved Solids								
Clear Plastic Bottle - Natural								
WRMW1-002, WRMW3-002, WRMW5-002, DUP-002, BLANK-002	WRMW2-002, WRMW4-002, WRMW6-002, RINSATE-002,	**30-AUG-2012**	----	----	----	**04-SEP-2012**	06-SEP-2012	✓
EA025: Suspended Solids								
Clear Plastic Bottle - Natural								
WRMW1-002, WRMW3-002, WRMW5-002, DUP-002, BLANK-002	WRMW2-002, WRMW4-002, WRMW6-002, RINSATE-002,	**30-AUG-2012**	----	----	----	**04-SEP-2012**	06-SEP-2012	✓
EA045: Turbidity								
Clear Plastic Bottle - Natural								
WRMW1-002, WRMW3-002, WRMW5-002, DUP-002, BLANK-002	WRMW2-002, WRMW4-002, WRMW6-002, RINSATE-002,	**30-AUG-2012**	----	----	----	**31-AUG-2012**	01-SEP-2012	✓

Work Order : EP1207278

Client : MOBILE DEWATERING

Project : E2012-031

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / *Container / Client Sample ID(s)*	*Sample Date*	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural WRMW1-002, WRMW2-002, WRMW3-002, WRMW4-002, WRMW5-002, WRMW6-002, DUP-002, RINSATE-002, BLANK-002	**30-AUG-2012**	**---**	13-SEP-2012	----	**31-AUG-2012**	13-SEP-2012	✓
ED038A: Acidity							
Clear Plastic Bottle - Natural WRMW1-002, WRMW2-002, WRMW3-002, WRMW4-002, WRMW5-002, WRMW6-002, DUP-002, RINSATE-002, BLANK-002	**30-AUG-2012**	**----**	----	----	**06-SEP-2012**	13-SEP-2012	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural WRMW1-002, WRMW2-002, WRMW3-002, WRMW4-002, WRMW5-002, WRMW6-002, DUP-002, RINSATE-002, BLANK-002	**30-AUG-2012**	**---**	27-SEP-2012	----	**31-AUG-2012**	27-SEP-2012	✓
ED045G: Chloride Discrete analyser							
Clear Plastic Bottle - Natural WRMW1-002, WRMW2-002, WRMW3-002, WRMW4-002, WRMW5-002, WRMW6-002, DUP-002, RINSATE-002, BLANK-002	**30-AUG-2012**	**---**	27-SEP-2012	----	**31-AUG-2012**	27-SEP-2012	✓
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Filtered; Lab-acidified WRMW1-002, WRMW2-002, WRMW3-002, WRMW4-002, WRMW5-002, WRMW6-002, DUP-002, RINSATE-002, BLANK-002	**30-AUG-2012**	**---**	26-FEB-2013	----	**05-SEP-2012**	26-FEB-2013	✓
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Unfiltered; Lab-acidified WRMW1-002, WRMW2-002, WRMW3-002, WRMW4-002, WRMW5-002, WRMW6-002, DUP-002, RINSATE-002, BLANK-002	**30-AUG-2012**	**05-SEP-2012**	26-FEB-2013	✓	**05-SEP-2012**	26-FEB-2013	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method *Container / Client Sample ID(s)*	*Sample Date*	*Extraction / Preparation* *Date extracted*	 *Due for extraction*	 *Evaluation*	*Analysis* *Date analysed*	 *Due for analysis*	 *Evaluation*
EG035T: Total Recoverable Mercury by FIMS							
Clear Plastic Bottle - Unfiltered; Lab-acidified WRMW1-002, WRMW2-002, WRMW3-002, WRMW4-002, WRMW5-002, WRMW6-002, DUP-002, RINSATE-002, BLANK-002	**30-AUG-2012**	**----**	----	----	**06-SEP-2012**	27-SEP-2012	✓
EG050F: Dissolved Hexavalent Chromium							
Clear Plastic Bottle - NaOH WRMW1-002, WRMW2-002, WRMW3-002, WRMW4-002, WRMW5-002, WRMW6-002, DUP-002, RINSATE-002, BLANK-002	**30-AUG-2012**	**----**	----	----	**05-SEP-2012**	27-SEP-2012	✓
EG051G: Ferrous Iron by Discrete Analyser							
Clear Plastic Bottle - HCl - Filtered WRMW1-002, WRMW2-002, WRMW3-002, WRMW4-002, WRMW5-002, WRMW6-002, DUP-002, RINSATE-002, BLANK-002	**30-AUG-2012**	**----**	----	----	**06-SEP-2012**	06-SEP-2012	✓
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid WRMW1-002, WRMW2-002, WRMW3-002, WRMW4-002, WRMW5-002, WRMW6-002, DUP-002, RINSATE-002, BLANK-002	**30-AUG-2012**	**---**	27-SEP-2012	----	**31-AUG-2012**	27-SEP-2012	✓
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural WRMW1-002, WRMW2-002, WRMW3-002, WRMW4-002, WRMW5-002, WRMW6-002, DUP-002, RINSATE-002, BLANK-002	**30-AUG-2012**	**---**	01-SEP-2012	----	**31-AUG-2012**	01-SEP-2012	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid WRMW1-002, WRMW2-002, WRMW3-002, WRMW4-002, WRMW5-002, WRMW6-002, DUP-002, RINSATE-002, BLANK-002	**30-AUG-2012**	**---**	27-SEP-2012	----	**31-AUG-2012**	27-SEP-2012	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid WRMW1-002, WRMW2-002, WRMW3-002, WRMW4-002, WRMW5-002, WRMW6-002, DUP-002, RINSATE-002, BLANK-002	**30-AUG-2012**	**05-SEP-2012**	27-SEP-2012	✓	**05-SEP-2012**	27-SEP-2012	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid WRMW1-002, WRMW2-002, WRMW3-002, WRMW4-002, WRMW5-002, WRMW6-002, DUP-002, RINSATE-002, BLANK-002	**30-AUG-2012**	**05-SEP-2012**	27-SEP-2012	✓	**05-SEP-2012**	27-SEP-2012	✓
EK071G: Reactive Phosphorus as P by discrete analyser							
Clear Plastic Bottle - Natural WRMW1-002, WRMW2-002, WRMW3-002, WRMW4-002, WRMW5-002, WRMW6-002, DUP-002, RINSATE-002, BLANK-002	**30-AUG-2012**	---	01-SEP-2012	----	**31-AUG-2012**	01-SEP-2012	✓
EK085M: Sulfide as S2-							
Clear Plastic Bottle - Zinc Acetate/NaOH WRMW1-002, WRMW2-002, WRMW3-002, WRMW4-002, WRMW5-002, WRMW6-002, DUP-002, RINSATE-002, BLANK-002	**30-AUG-2012**	----	----	----	**05-SEP-2012**	06-SEP-2012	✓
EP026ST: Chemical Oxygen Demand (Sealed Tube)							
Clear Plastic Bottle - Sulfuric Acid WRMW1-002, WRMW2-002, WRMW3-002, WRMW4-002, WRMW5-002, WRMW6-002, DUP-002, RINSATE-002, BLANK-002	**30-AUG-2012**	----	----	----	**05-SEP-2012**	27-SEP-2012	✓
EP030: Biochemical Oxygen Demand (BOD)							
Clear Plastic Bottle - Natural WRMW1-002, WRMW2-002, WRMW3-002, WRMW4-002, WRMW5-002, WRMW6-002, DUP-002, RINSATE-002, BLANK-002	**30-AUG-2012**	----	----	----	**31-AUG-2012**	01-SEP-2012	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)		Sample Date	Extraction / Preparation Date extracted	Due for extraction	Evaluation	Analysis Date analysed	Due for analysis	Evaluation
EP068A: Organochlorine Pesticides (OC)								
Amber Glass Bottle - Unpreserved								
WRMW1-002,	WRMW2-002,	**30-AUG-2012**	**04-SEP-2012**	06-SEP-2012	✓	**05-SEP-2012**	14-OCT-2012	✓
WRMW3-002,	WRMW4-002,							
WRMW5-002,	WRMW6-002,							
DUP-002,	RINSATE-002,							
BLANK-002								
EP068B: Organophosphorus Pesticides (OP)								
Amber Glass Bottle - Unpreserved								
WRMW1-002,	WRMW2-002,	**30-AUG-2012**	**04-SEP-2012**	06-SEP-2012	✓	**05-SEP-2012**	14-OCT-2012	✓
WRMW3-002,	WRMW4-002,							
WRMW5-002,	WRMW6-002,							
DUP-002,	RINSATE-002,							
BLANK-002								
EP074A: Monocyclic Aromatic Hydrocarbons								
Amber VOC Vial - Sulfuric Acid								
WRMW1-002,	WRMW2-002,	**30-AUG-2012**	**06-SEP-2012**	13-SEP-2012	✓	**06-SEP-2012**	13-SEP-2012	✓
WRMW3-002,	WRMW4-002,							
WRMW5-002,	WRMW6-002,							
DUP-002,	RINSATE-002,							
BLANK-002								
EP074B: Oxygenated Compounds								
Amber VOC Vial - Sulfuric Acid								
WRMW1-002,	WRMW2-002,	**30-AUG-2012**	**06-SEP-2012**	13-SEP-2012	✓	**06-SEP-2012**	13-SEP-2012	✓
WRMW3-002,	WRMW4-002,							
WRMW5-002,	WRMW6-002,							
DUP-002,	RINSATE-002,							
BLANK-002								
EP074C: Sulfonated Compounds								
Amber VOC Vial - Sulfuric Acid								
WRMW1-002,	WRMW2-002,	**30-AUG-2012**	**06-SEP-2012**	13-SEP-2012	✓	**06-SEP-2012**	13-SEP-2012	✓
WRMW3-002,	WRMW4-002,							
WRMW5-002,	WRMW6-002,							
DUP-002,	RINSATE-002,							
BLANK-002								
EP074D: Fumigants								
Amber VOC Vial - Sulfuric Acid								
WRMW1-002,	WRMW2-002,	**30-AUG-2012**	**06-SEP-2012**	13-SEP-2012	✓	**06-SEP-2012**	13-SEP-2012	✓
WRMW3-002,	WRMW4-002,							
WRMW5-002,	WRMW6-002,							
DUP-002,	RINSATE-002,							
BLANK-002								

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation
EP074E: Halogenated Aliphatic Compounds								
Amber VOC Vial - Sulfuric Acid								
WRMW1-002,	WRMW2-002,	**30-AUG-2012**	**06-SEP-2012**	13-SEP-2012	✓	**06-SEP-2012**	13-SEP-2012	✓
WRMW3-002,	WRMW4-002,							
WRMW5-002,	WRMW6-002,							
DUP-002,	RINSATE-002,							
BLANK-002								
EP074F: Halogenated Aromatic Compounds								
Amber VOC Vial - Sulfuric Acid								
WRMW1-002,	WRMW2-002,	**30-AUG-2012**	**06-SEP-2012**	13-SEP-2012	✓	**06-SEP-2012**	13-SEP-2012	✓
WRMW3-002,	WRMW4-002,							
WRMW5-002,	WRMW6-002,							
DUP-002,	RINSATE-002,							
BLANK-002								
EP074G: Trihalomethanes								
Amber VOC Vial - Sulfuric Acid								
WRMW1-002,	WRMW2-002,	**30-AUG-2012**	**06-SEP-2012**	13-SEP-2012	✓	**06-SEP-2012**	13-SEP-2012	✓
WRMW3-002,	WRMW4-002,							
WRMW5-002,	WRMW6-002,							
DUP-002,	RINSATE-002,							
BLANK-002								
EP075(SIM)A: Phenolic Compounds								
Amber Glass Bottle - Unpreserved								
WRMW1-002,	WRMW2-002,	**30-AUG-2012**	**04-SEP-2012**	06-SEP-2012	✓	**04-SEP-2012**	14-OCT-2012	✓
WRMW3-002,	WRMW4-002,							
WRMW5-002,	WRMW6-002,							
DUP-002,	RINSATE-002,							
BLANK-002								
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Amber Glass Bottle - Unpreserved								
WRMW1-002,	WRMW2-002,	**30-AUG-2012**	**04-SEP-2012**	06-SEP-2012	✓	**04-SEP-2012**	14-OCT-2012	✓
WRMW3-002,	WRMW4-002,							
WRMW5-002,	WRMW6-002,							
DUP-002,	RINSATE-002,							
BLANK-002								

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Petroleum Hydrocarbons								
Amber Glass Bottle - Unpreserved								
WRMW1-002,	WRMW2-002,	**30-AUG-2012**	**04-SEP-2012**	06-SEP-2012	✓	**05-SEP-2012**	14-OCT-2012	✓
WRMW3-002,	WRMW4-002,							
WRMW5-002,	WRMW6-002,							
DUP-002,	RINSATE-002,							
BLANK-002								
Amber VOC Vial - Sulfuric Acid								
WRMW1-002,	WRMW2-002,	**30-AUG-2012**	**06-SEP-2012**	13-SEP-2012	✓	**06-SEP-2012**	13-SEP-2012	✓
WRMW3-002,	WRMW4-002,							
WRMW5-002,	WRMW6-002,							
DUP-002,	RINSATE-002,							
BLANK-002								
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft								
Amber Glass Bottle - Unpreserved								
WRMW1-002,	WRMW2-002,	**30-AUG-2012**	**04-SEP-2012**	06-SEP-2012	✓	**05-SEP-2012**	14-OCT-2012	✓
WRMW3-002,	WRMW4-002,							
WRMW5-002,	WRMW6-002,							
DUP-002,	RINSATE-002,							
BLANK-002								
Amber VOC Vial - Sulfuric Acid								
WRMW1-002,	WRMW2-002,	**30-AUG-2012**	**06-SEP-2012**	13-SEP-2012	✓	**06-SEP-2012**	13-SEP-2012	✓
WRMW3-002,	WRMW4-002,							
WRMW5-002,	WRMW6-002,							
DUP-002,	RINSATE-002,							
BLANK-002								
EP080: BTEXN								
Amber VOC Vial - Sulfuric Acid								
WRMW1-002,	WRMW2-002,	**30-AUG-2012**	**06-SEP-2012**	13-SEP-2012	✓	**06-SEP-2012**	13-SEP-2012	✓
WRMW3-002,	WRMW4-002,							
WRMW5-002,	WRMW6-002,							
DUP-002,	RINSATE-002,							
BLANK-002								

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Acidity as Calcium Carbonate	ED038	2	19	**10.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Alkalinity by PC Titrator	ED037-P	3	24	**12.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ammonia as N by Discrete analyser	EK055G	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Biochemical Oxygen Demand (BOD)	EP030	2	19	**10.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chemical Oxygen Demand (Sealed Tube)	EP026ST	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	2	14	**14.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	3	26	**11.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	18	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ferrous Iron by Discrete Analyser	EG051G	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Hexavalent Chromium by Discrete Analyser - Dissolved	EG050G-F	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
pH by PC Titrator	EA005-P	3	23	**13.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P-By Discrete Analyser	EK071G	2	14	**14.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	14	**14.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Sulfide as S2-	EK085	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	2	16	**12.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids (High Level)	EA015H	2	9	**22.2**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	14	**14.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	2	13	**15.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	2	14	**14.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite B	EG020B-T	2	13	**15.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	2	13	**15.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	2	12	**16.7**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	10	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Turbidity	EA045	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Volatile Organic Compounds	EP074	2	16	**12.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Acidity as Calcium Carbonate	ED038	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Alkalinity by PC Titrator	ED037-P	4	24	**16.7**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ammonia as N by Discrete analyser	EK055G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Biochemical Oxygen Demand (BOD)	EP030	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chemical Oxygen Demand (Sealed Tube)	EP026ST	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	2	14	**14.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	6	26	**23.1**	**15.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ferrous Iron by Discrete Analyser	EG051G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Hexavalent Chromium by Discrete Analyser - Dissolved	EG050G-F	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Control Samples (LCS) - Continued							
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	2	18	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	2	9	**22.2**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
pH by PC Titrator	EA005-P	4	23	**17.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	14	**14.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Sulfide as S2-	EK085	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	1	16	**6.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids (High Level)	EA015H	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	14	**14.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite B	EG020B-T	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	2	13	**15.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	2	21	**9.5**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	10	**10.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Turbidity	EA045	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Volatile Organic Compounds	EP074	1	16	**6.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	2	24	**8.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ammonia as N by Discrete analyser	EK055G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Biochemical Oxygen Demand (BOD)	EP030	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chemical Oxygen Demand (Sealed Tube)	EP026ST	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	2	26	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ferrous Iron by Discrete Analyser	EG051G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Hexavalent Chromium by Discrete Analyser - Dissolved	EG050G-F	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	2	18	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	2	9	**22.2**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Sulfide as S2-	EK085	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	1	16	**6.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids (High Level)	EA015H	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite B	EG020B-T	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	2	21	**9.5**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
TPH Volatiles/BTEX	EP080	1	10	**10.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Turbidity	EA045	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Volatile Organic Compounds	EP074	1	16	**6.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Chemical Oxygen Demand (Sealed Tube)	EP026ST	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	1	14	**7.1**	**5.0**	✓	ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	18	**5.6**	**5.0**	✓	ALS QCS3 requirement
Ferrous Iron by Discrete Analyser	EG051G	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Hexavalent Chromium by Discrete Analyser - Dissolved	EG050G-F	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	14	**7.1**	**5.0**	✓	ALS QCS3 requirement
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	14	**7.1**	**5.0**	✓	ALS QCS3 requirement
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	14	**7.1**	**5.0**	✓	ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	13	**7.7**	**5.0**	✓	ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	1	14	**7.1**	**5.0**	✓	ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	1	13	**7.7**	**5.0**	✓	ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	12	**8.3**	**5.0**	✓	ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	10	**10.0**	**5.0**	✓	ALS QCS3 requirement
Volatile Organic Compounds	EP074	1	16	**6.3**	**5.0**	✓	ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	APHA 21st ed. 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Conductivity by PC Titrator	EA010-P	WATER	APHA 21st ed., 2510 B This procedure determines conductivity by automated ISE. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Dissolved Solids (High Level)	EA015H	WATER	In-House, APHA 21st ed., 2540C A gravimetric procedure that determines the amount of \`filterable\` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Suspended Solids (High Level)	EA025H	WATER	In-House, APHA 21st ed., 2540D A gravimetric procedure employed to determine the amount of \`non-filterable\` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Turbidity	EA045	WATER	APHA 21st ed., 2130 B. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Alkalinity by PC Titrator	ED037-P	WATER	APHA 21st ed., 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Acidity as Calcium Carbonate	ED038	WATER	APHA 21st ed., 2310 B Acidity is determined by titration with a standardised alkali to an end-point pH of 8.3. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	APHA 21st ed., 4500-SO4 Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Chloride by Discrete Analyser	ED045G	WATER	APHA 21st ed., 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA 21st edition seal method 2 017-1-L april 2003
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): Samples are 0.45 um filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite B	EG020B-T	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.

Analytical Methods	Method	Matrix	Method Descriptions
Total Mercury by FIMS	EG035T	WATER	AS 3550, APHA 21st ed. 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the unfiltered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Hexavalent Chromium by Discrete Analyser - Dissolved	EG050G-F	WATER	APHA 21st ed., 3500 Cr-A & B. Samples are 0.45 um filtered prior to analysis. Hexavalent chromium is determined directly on water sample by Descrete Analyser as received by pH adjustment and colour development using dephenylcarbazide. Each run of samples is measured against a five-point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ferrous Iron by Discrete Analyser	EG051G	WATER	APHA 21st ed., 3500 Fe-B. A colorimetric determination based on the reaction between phenanthroline and ferrous iron at pH 3.2-3.3 to form an orange-red complex that is measured against a five-point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ammonia as N by Discrete analyser	EK055G	WATER	APHA 21st ed., 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrite as N by Discrete Analyser	EK057G	WATER	APHA 21st ed., 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrate as N by Discrete Analyser	EK058G	WATER	APHA 21st ed., 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	APHA 21st ed., 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	APHA 21st ed., 4500-Norg D. 25mL water samples are digested using a traditional Kjeldahl digestion followed by determination by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	APHA 21st ed., 4500-Norg / 4500-NO3-. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	APHA 21st ed., 4500-P B&F This procedure involves sulphuric acid digestion of a 100mL sample to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Reactive Phosphorus as P-By Discrete Analyser	EK071G	WATER	APHA 21st ed., 4500-P F Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Sulfide as S2-	EK085	WATER	APHA 21st ed., 4500-S2- D Sulfide species present in water samples are immediately precipitated when collected in pretreated caustic/zinc acetate preserved sample containers. After the supernatant is discarded, the resultant precipitate is then coloured using methylene blue indicator and measured using UV-VIS detection at 664nm. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Chemical Oxygen Demand (Sealed Tube)	EP026ST	WATER	(APHA 21st ed., 5220C, ALS QWI-EN/EP026) Samples are digested with a known excess of an acidic potassium dichromate solution using silver sulfate as a catalyst. The chromium is reduced from the Cr (VI) oxidation state to the Cr (III) state by the oxygen present in the organic material. The unreacted Cr (VI) can then be titrated with ferrous ammonium sulfate to determine the amount of Cr (VI) consumed. The oxidisable organic matter can be calculated in terms of oxygen equivalents.

Analytical Methods	Method	Matrix	Method Descriptions
Biochemical Oxygen Demand (BOD)	EP030	WATER	APHA 21st ed., 5210 B The 5-Day BOD test provides an empirical measure of the oxygen consumption capacity of a given water. A portion of the sample is diluted into oxygenated, nutrient rich water, and a seed added to begin biological decay. The initial dissolved oxygen content is measured, then the bottle is sealed and incubated for five days. The remaining dissolved oxygen is measured, and from the difference, the demand for oxygen, by biological decay, is determined. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Pesticides by GCMS	EP068	WATER	USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
TPH - Semivolatile Fraction	EP071	WATER	USEPA SW 846 - 8015A The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Volatile Organic Compounds	EP074	WATER	USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
TPH Volatiles/BTEX	EP080	WATER	USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Preparation Methods	Method	Matrix	Method Descriptions
Digestion for Total Recoverable Metals	EN25	WATER	USEPA SW846-3005 Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Separatory Funnel Extraction of Liquids	ORG14	WATER	USEPA SW 846 - 3510B 500 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2). ALS default excludes sediment which may be resident in the container.

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	EP1207264-001	Anonymous	**Sulfate as SO4 - Turbidimetric**	14808-79-8	Not Determined	----	**Background level of analyte not determined in original.**
EK057G: Nitrite as N by Discrete Analyser	EP1207260-001	Anonymous	**Nitrite as N**	----	43.0 %	70-130%	**Recovery less than lower data quality objective**
EP080/071: Total Petroleum Hydrocarbons	ES1221161-001	Anonymous	**C15 - C28 Fraction**	----	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP080/071: Total Petroleum Hydrocarbons	ES1221161-001	Anonymous	**C29 - C36 Fraction**	----	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP080/071: Total Recoverable Hydrocarbons - NEPM 2	ES1221161-001	Anonymous	**>C10 - C16 Fraction**	----	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP080/071: Total Recoverable Hydrocarbons - NEPM 2	ES1221161-001	Anonymous	**>C16 - C34 Fraction**	----	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP080/071: Total Recoverable Hydrocarbons - NEPM 2	ES1221161-001	Anonymous	**>C34 - C40 Fraction**	----	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**
- **For all matrices, no Laboratory Control outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

Matrix: **WATER**

Method	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)	*Date extracted*	*Due for extraction*	***Days overdue***	*Date analysed*	*Due for analysis*	***Days overdue***
EA005P: pH by PC Titrator						

Matrix: **WATER**

Method	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator - Analysis Holding Time Compliance						
Clear Plastic Bottle - Natural						
WRMW1-002, WRMW2-002, WRMW3-002, WRMW4-002, WRMW5-002, WRMW6-002, DUP-002, RINSATE-002, BLANK-002	----	----	----	31-AUG-2012	30-AUG-2012	**1**

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

- **No Quality Control Sample Frequency Outliers exist.**

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order	: **EP1207278**		
Client	: **MOBILE DEWATERING**	Laboratory	: Environmental Division Perth
Contact	: INFO	Contact	: Lauren Ockwell
Address	: PO BOX 239 MIDLAND WA, AUSTRALIA 6939	Address	: 10 Hod Way Malaga WA Australia 6090
E-mail	: info@environmentalservices.com.au	E-mail	: lauren.ockwell@alsenviro.com
Telephone	: +61 08 9250 4995	Telephone	: 08 9209 7606
Facsimile	: ----	Facsimile	: 08 9209 7600
Project	: E2012-031	Page	: 1 of 3
Order number	: ----		
C-O-C number	: E2012-031-003	Quote number	: EP2012MOBDEW0131 (EP/324/12)
Site	: WASTEROCK		
Sampler	: Dale A./ Nathan F.	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 31-AUG-2012	Issue Date	: 31-AUG-2012 14:09
Client Requested Due Date	: 07-SEP-2012	Scheduled Reporting Date	: **07-SEP-2012**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: 5.1 - Ice present
No. of coolers/boxes	: 3 medium hard	No. of samples received	: 9
Security Seal	: Intact.	No. of samples analysed	: 9

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- Samples received in appropriately pretreated and preserved containers.
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- **Samples received in appropriately pretreated and preserved containers.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- **COD/Organics analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (SamplesPerth@alsenviro.com)
- Sample Disposal - Aqueous (14 days), Solid (90 days) from date of completion of Work Order.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exist.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process neccessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default to 15:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory for processing purposes and will be shown bracketed without a time component.

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EA005P pH (PC)	WATER - EA010P Conductivity (PC)	WATER - EA015H Total Dissolved Solids - High Level	WATER - EA025H Suspended Solids (High Level)	WATER - EA045 Turbidity	WATER - ED038 Acidity as CaCO3	WATER - EG020F Dissolved Metals by ICPMS	WATER - EG020T Total Recoverable Metals by ICPMS
EP1207278-001	30-AUG-2012 11:00	WRMW1-002	✓	✓	✓	✓	✓	✓	✓	✓
EP1207278-002	30-AUG-2012 11:00	WRMW2-002	✓	✓	✓	✓	✓	✓	✓	✓
EP1207278-003	30-AUG-2012 11:00	WRMW3-002	✓	✓	✓	✓	✓	✓	✓	✓
EP1207278-004	30-AUG-2012 11:00	WRMW4-002	✓	✓	✓	✓	✓	✓	✓	✓
EP1207278-005	30-AUG-2012 11:00	WRMW5-002	✓	✓	✓	✓	✓	✓	✓	✓
EP1207278-006	30-AUG-2012 11:00	WRMW6-002	✓	✓	✓	✓	✓	✓	✓	✓
EP1207278-007	30-AUG-2012 11:00	DUP-002	✓	✓	✓	✓	✓	✓	✓	✓
EP1207278-008	30-AUG-2012 11:00	RINSATE-002	✓	✓	✓	✓	✓	✓	✓	✓
EP1207278-009	30-AUG-2012 11:00	BLANK-002	✓	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EG035T Total Mercury by FIMS	WATER - EG050G-F Hexavalent Chromium by Discrete Analyser - Filtered	WATER - EG051G Ferrous Iron by Discrete Analyser	WATER - EK085M Sulfide as S 2-	WATER - EP026ST COD- Sealed Tube	WATER - EP030 BOD	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)	WATER - NT-08A Total Nitrogen + NO2 + NO3 + NH3 + Total P + Reactive P
EP1207278-001	30-AUG-2012 11:00	WRMW1-002	✓	✓	✓	✓	✓	✓	✓	✓
EP1207278-002	30-AUG-2012 11:00	WRMW2-002	✓	✓	✓	✓	✓	✓	✓	✓
EP1207278-003	30-AUG-2012 11:00	WRMW3-002	✓	✓	✓	✓	✓	✓	✓	✓
EP1207278-004	30-AUG-2012 11:00	WRMW4-002	✓	✓	✓	✓	✓	✓	✓	✓
EP1207278-005	30-AUG-2012 11:00	WRMW5-002	✓	✓	✓	✓	✓	✓	✓	✓
EP1207278-006	30-AUG-2012 11:00	WRMW6-002	✓	✓	✓	✓	✓	✓	✓	✓
EP1207278-007	30-AUG-2012 11:00	DUP-002	✓	✓	✓	✓	✓	✓	✓	✓
EP1207278-008	30-AUG-2012 11:00	RINSATE-002	✓	✓	✓	✓	✓	✓	✓	✓
EP1207278-009	30-AUG-2012 11:00	BLANK-002	✓	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - W-09 TPH/VOC	WATER - W-12 OC/OP Pesticides	WATER - W-14A PAH/Phenols (SIM)
EP1207278-001	30-AUG-2012 11:00	WRMW1-002	✓	✓	✓
EP1207278-002	30-AUG-2012 11:00	WRMW2-002	✓	✓	✓
EP1207278-003	30-AUG-2012 11:00	WRMW3-002	✓	✓	✓
EP1207278-004	30-AUG-2012 11:00	WRMW4-002	✓	✓	✓
EP1207278-005	30-AUG-2012 11:00	WRMW5-002	✓	✓	✓
EP1207278-006	30-AUG-2012 11:00	WRMW6-002	✓	✓	✓
EP1207278-007	30-AUG-2012 11:00	DUP-002	✓	✓	✓
EP1207278-008	30-AUG-2012 11:00	RINSATE-002	✓	✓	✓
EP1207278-009	30-AUG-2012 11:00	BLANK-002	✓	✓	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method		**Due for extraction**	**Due for analysis**	**Samples Received**		**Instructions Received**	
Client Sample ID(s)	**Container**			**Date**	**Evaluation**	**Date**	**Evaluation**
EA005-P: pH by PC Titrator							
BLANK-002	Clear Plastic Bottle - Natural	30-AUG-2012	----	31-AUG-2012	×	----	----
DUP-002	Clear Plastic Bottle - Natural	30-AUG-2012	----	31-AUG-2012	×	----	----
RINSATE-002	Clear Plastic Bottle - Natural	30-AUG-2012	----	31-AUG-2012	×	----	----
WRMW1-002	Clear Plastic Bottle - Natural	30-AUG-2012	----	31-AUG-2012	×	----	----
WRMW2-002	Clear Plastic Bottle - Natural	30-AUG-2012	----	31-AUG-2012	×	----	----
WRMW3-002	Clear Plastic Bottle - Natural	30-AUG-2012	----	31-AUG-2012	×	----	----
WRMW4-002	Clear Plastic Bottle - Natural	30-AUG-2012	----	31-AUG-2012	×	----	----
WRMW5-002	Clear Plastic Bottle - Natural	30-AUG-2012	----	31-AUG-2012	×	----	----
WRMW6-002	Clear Plastic Bottle - Natural	30-AUG-2012	----	31-AUG-2012	×	----	----

Requested Deliverables

ACCOUNTS PAYABLE (WA)		
- A4 - AU Tax Invoice (INV)	Email	deb@mobiledewatering.com.au
INFO		
- *AU Certificate of Analysis - NATA (COA)	Email	info@environmentalservices.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	info@environmentalservices.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	info@environmentalservices.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	info@environmentalservices.com.au
- Chain of Custody (CoC) (COC)	Email	info@environmentalservices.com.au
- EDI Format - ENMRG (ENMRG)	Email	info@environmentalservices.com.au
- EDI Format - ESDAT (ESDAT)	Email	info@environmentalservices.com.au
- EDI Format - XTab (XTAB)	Email	info@environmentalservices.com.au

Site: WASTE ROCK
Job #: E2012-031
Sampler: DALE A./NATHAN F.
CoC #: E2012-031-003
Quote #: EP/324/12
Laboratory: ALS ENVIRO.
Date and time delivered: 31/8/12 1050
Received by: M Westnell

ENVIRONMENTAL SERVICES
Mobile Dewatering Environmental Services
22 Elmsfield Road
Midvale WA 6056
P: 08 9250 6960
F: 08 9250 8269
E: info@environmentalservices.com.au

Comments:

Analysis Detection Limits

Sample ID	Lab ID	Type	Sampling Date	Sampling Time	ASS SUITE (2)
WRMW1-002		WATER	30.8.12	1100-1600	✓
WRMW2-002					✓
WRMW3-002					✓
WRMW4-002					✓
WRMW5-002					✓
WRMW6-002					✓
DUP-002					✓
~~RINSATE~~-002					✓
BLANK-002					✓

Environmental Division
Perth
Work Order
EP1207278
Telephone : +61-8-9209 7655

Condition of Sample: Cool / Ambient / Warm   Relinquished by: ....

Environmental and Analytical Laboratory

LABORATORY REPORT

Job Number: 12-5954
Revision: 00
Date: 17 September 2012

ADDRESS: **Mobile Dewatering Environmental Services**
Unit 1, 22 Elmsfield Road
MIDVALE WA 6056

ATTENTION: Greg Watts

DATE RECEIVED: 31/08/2012

YOUR REFERENCE: E2012-031 Wasterock

PURCHASE ORDER: 0837

APPROVALS:

Paul Nottle
Chemist - Organics

Douglas Todd
Section Manager - Inorganics

REPORT COMMENTS:

Samples are analysed on an as received basis unless otherwise noted.

NATA
WORLD RECOGNISED ACCREDITATION
This document is issued in accordance with NATA's accreditation requirements
Accreditation No. 2377

Analytical Reference Laboratory (WA) Pty. Ltd.
46-48 Banksia Road, Welshpool, Western Australia 6106 Telephone: 08 6253 4444 Facsimile: 08 6253 4440
www.arlwa.com.au ABN: 91 050 159 898

Environmental and Analytical Laboratory

METHOD REFERENCES:

ARL No. 007	Benzene, Toluene, Ethylbenzene and Xylenes in Water
ARL No. 005	Polycyclic Aromatic Hydrocarbons in Water
ARL No. 009	Total Petroleum Hydrocarbons (TPH) in Water
ARL No. 002	OCOP and PCB in Water
ARL No. 044	Total Phenols in Water
ARL No. 402/403	Metals in Water by ICPOES/MS
ARL No. 040	Arsenic by Hydride Atomic Absorption
ARL No. 330	Persulphate Method for Simultaneous Determination of TN & TP
ARL No. 308	Total Phosphorus in Water by Discrete Analyser
ARL No. 305	Chloride in Water by Discrete Analyser
ARL No. 309	Filterable Reactive Phosphorus in Water by Discrete Analyser
ARL No. 303	Ammonia in Water by Discrete Analyser
ARL No. 313	NOx in Water by Discrete Analyser
ARL No. 311	Nitrite in Water by Discrete Analyser
ARL No. 021	Acidity in Water
ARL No. 037	Alkalinity in Water
ARL No. 014	pH in Water
ARL No. 019	Conductivity and Salinity in Water
ARL No. 017	Total Dissolved Solids (At 105^oC)
ARL No. 016	Total Suspended Solids
ARL No. 045	Turbidity
ARL No. 011	Biochemical Oxygen Demand
ARL No. 020	Chemical Oxygen Demand
ARL No. 023	Sulphide in Water

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LABORATORY REPORT

Mobile Dewatering Environmental Services

ARL Job No: *12-5954* *Revision:* *00* *Date:* 17 September 2012

ARL Environmental and Analytical Laboratory

BTEX in Water Sample No: Sample Description:	LOR	UNITS	12-5954-1 Trip-002
Benzene	0.001	mg/L	<0.001
Toluene	0.001	mg/L	<0.001
Ethyl Benzene	0.001	mg/L	<0.001
Xylenes (Total)	0.003	mg/L	<0.003
a, a, a-Trifluorotoluene(SS)		%	108

PAH in Water Sample No: Sample Description:	LOR	UNITS	12-5954-1 Trip-002
Naphthalene	0.1	µg/L	<0.1
2-Methylnaphthalene	0.1	µg/L	<0.1
Acenaphthylene	0.1	µg/L	<0.1
Acenaphthene	0.1	µg/L	<0.1
Fluorene	0.1	µg/L	<0.1
Phenanthrene	0.1	µg/L	<0.1
Anthracene	0.1	µg/L	<0.1
Fluoranthene	0.1	µg/L	<0.1
Pyrene	0.1	µg/L	<0.1
Benz(a)anthracene	0.1	µg/L	<0.1
Chrysene	0.1	µg/L	<0.1
Benzo(b)fluoranthene	0.1	µg/L	<0.1
Benzo(k)fluoranthene	0.1	µg/L	<0.1
Benzo(a)pyrene	0.1	µg/L	<0.1
Indeno(1,2,3-c,d)pyrene	0.1	µg/L	<0.1
Dibenz(a,h)anthracene	0.1	µg/L	<0.1
Benzo(ghi)perylene	0.1	µg/L	<0.1
2-Fluoro-1,1'-Biphenyl (SS)		%	[NT]
p-Terphenyl-d14 (SS)		%	[NT]

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LABORATORY REPORT

Mobile Dewatering Environmental Services

ARL Job No: *12-5954* *Revision:* *00* *Date:* 17 September 2012

Environmental and Analytical Laboratory

TPH in Water Sample No: Sample Description:	LOR	UNITS	12-5954-1 Trip-002
C_{6-9}	0.02	mg/L	<0.02
C_{10-14}	0.02	mg/L	<0.02
C_{15-28}	0.04	mg/L	<0.04
C_{29-36}	0.04	mg/L	<0.04
$C_{>36}$	0.04	mg/L	<0.04

OCOP in Water Sample No: Sample Description:	LOR	UNITS	12-5954-1 Trip-002
Aldrin	0.001	µg/L	<0.001
alpha-BHC (HCH)	0.001	µg/L	<0.001
beta-BHC (HCH)	0.001	µg/L	<0.001
delta-BHC (HCH)	0.001	µg/L	<0.001
Bifenthrin	0.05	µg/L	<0.05
Bromophos Ethyl	0.005	µg/L	<0.005
Chlordane	0.002	µg/L	<0.002
Chlorothalonil	0.01	µg/L	<0.01
Chlorpyrifos	0.005	µg/L	<0.005
Diazinon	0.01	µg/L	<0.01
Dieldrin	0.001	µg/L	0.054
Endosulphan I	0.001	µg/L	<0.001
Endosulphan II	0.001	µg/L	<0.001
Endosulphan Sulphate	0.001	µg/L	<0.001
Endrin	0.01	µg/L	<0.01
Ethion	0.01	µg/L	<0.01
Fenitrothion	0.01	µg/L	<0.01
Fipronil	0.02	µg/L	<0.02
Hexachlorobenzene (HCB)	0.001	µg/L	<0.001
Heptachlor Epoxide	0.001	µg/L	<0.001
Heptachlor	0.001	µg/L	<0.001
Lindane	0.001	µg/L	<0.001
Malathion	0.01	µg/L	<0.01
Methoxychlor	0.02	µg/L	<0.02
o,p-DDT	0.001	µg/L	<0.001
Oxychlordane	0.001	µg/L	<0.001
p,p-DDD	0.001	µg/L	<0.001
p,p-DDE	0.001	µg/L	<0.001
p,p-DDT	0.001	µg/L	<0.001
Parathion Ethyl	0.02	µg/L	<0.02
Parathion Methyl	0.02	µg/L	<0.02
Trifluralin	0.01	µg/L	<0.01
Vinclozolin	0.02	µg/L	<0.02
Dibutyl chlorendate (SS)		%	[NT]
Tetrachloro-m-Xylene (SS)		%	[NT]

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ARL
Environmental and Analytical Laboratory

LABORATORY REPORT

Mobile Dewatering Environmental Services

ARL Job No: *12-5954* *Revision:* *00* *Date:* 17 September 2012

Misc. Organics in Water **Sample No:** **Sample Description:**	**LOR**	**UNITS**	**12-5954-1** **Trip-002**
Total Phenols	0.05	mg/L	<0.05

Metals in Water **Sample No:** **Sample Description:**	**LOR**	**UNITS**	**12-5954-1** **Trip-002**
Aluminium - Dissolved	0.1	mg/L	0.3
Aluminium - Total	0.1	mg/L	2.2
Arsenic - Dissolved	0.001	mg/L	<0.001
Arsenic - Total	0.001	mg/L	0.001
Cadmium - Dissolved	0.002	mg/L	<0.002
Cadmium - Total	0.002	mg/L	<0.002
Chromium - Dissolved	0.01	mg/L	<0.01
Chromium - Total	0.01	mg/L	<0.01
Iron - Dissolved	0.01	mg/L	0.10
Iron - Total	0.01	mg/L	0.62
Manganese - Dissolved	0.01	mg/L	<0.01
Manganese - Total	0.01	mg/L	<0.01
Nickel - Dissolved	0.01	mg/L	<0.01
Nickel - Total	0.01	mg/L	<0.01
Selenium - Dissolved	0.001	mg/L	<0.001
Selenium - Total	0.001	mg/L	<0.001
Zinc - Dissolved	0.01	mg/L	0.02
Zinc - Total	0.01	mg/L	0.02

Total Nitrogen in Water **Sample No:** **Sample Description:**	**LOR**	**UNITS**	**12-5954-1** **Trip-002**
Total Nitrogen	0.2	mg/L	6.1
TKN	0.2	mg/L	<0.2

Total Phosporus in Water **Sample No:** **Sample Description:**	**LOR**	**UNITS**	**12-5954-1** **Trip-002**
Total Phosphorus	0.01	mg/L	0.02

Ions by Discrete Analyser **Sample No:** **Sample Description:**	**LOR**	**UNITS**	**12-5954-1** **Trip-002**
Chloride	5	mg/L	34
Filterable Reactive Phosphorus	0.01	mg/L	<0.01
Ammonia-N	0.2	mg/L	<0.2
NOx-N	0.01	mg/L	6.0
Nitrate-N	0.01	mg/L	6.0
Nitrite-N	0.01	mg/L	0.01

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LABORATORY REPORT

Mobile Dewatering Environmental Services

ARL Job No: 12-5954 *Revision: 00* *Date:* 17 September 2012

Physical Parameters **Sample No:** **Sample Description:**	**LOR**	**UNITS**	**12-5954-1** **Trip-002**
Acidity	5	$mgCaCO_3/L$	13
Alkalinity	5	$mgCaCO_3/L$	<5
pH	0.1	pH units	5.1
Conductivity	0.01	mS/cm	0.17
Total Dissolved Solids	5	mg/L	120
Total Suspended Solids	5	mg/L	48
Turbidity	0.1	NTU	40

Biochemical Oxygen Demand **Sample No:** **Sample Description:**	**LOR**	**UNITS**	**12-5954-1** **Trip-002**
Biochemical Oxygen Demand	5	mg/L	<5

Misc. Inorganics in Water **Sample No:** **Sample Description:**	**LOR**	**UNITS**	**12-5954-1** **Trip-002**
Chemical Oxygen Demand	10	mg/L	40
Sulphide	0.1	mg/L	<0.1

Result Definitions

LOR Limit of Reporting
[NT] Not Tested
[ND] Not Detected at indicated Limit of Reporting
[NR] Analysis Not Requested
(SS) Surrogate Standard Compound

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Quality Control Report

Job Number: 12-5954

Date: 17/09/2012

This Quality Control Report is issued in accordance with Section 18 of the ARL Quality Management Manual. All QC parameters are contained within the relevant ARL Method as indicated by the method reference, either on this report or the Laboratory Report.

Acceptance of Holding Times, Duplicate RPD, Spike, LCS and CRM Recoveries are determined at the time of analysis by the Signatory indicated on the Laboratory Report.

DEFINITIONS

Duplicate Analysis

A sample, chosen randomly by the analyst at the time of sample preparation, analysed in duplicate.

RPD

Relative Percent Difference is the absolute difference between the sample and a duplicate analysis compared to the average of the two analytical results. Acceptance Limits can be exceeded by matrix interference or when the result is less than 5 times the LOR.

Matrix Spike

An additional portion of sample to which known amounts of the target analytes are added before sample preparation. Acceptance Limits can be exceeded by matrix interference or when the target analytes are present in the sample.

Certified Reference Material (CRM)

A commercially available certified solution/mixture of the target analyte of known concentration.

Laboratory Control Sample (LCS)

An in-house certified solution/mixture of the target analyte of known concentration.

Analytical Reference Laboratory (WA) PTY. Ltd
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www.arlwa.com.au ABN: 91 050 159 898

Quality Control Report

Job Number: 12-5954

Date: 17/09/2012

BTEX in Water

ARL007

Holding Time Criteria	Date	
Extracted	03/09/2012	
Analysed	04/09/2012	
Matrix Spike (12-5957-A-14)	**Recovery (%)**	**Limits (%)**
Benzene	102	60 - 120
Toluene	100	60 - 120
Ethyl Benzene	92	60 - 120
Xylenes (Total)	82	60 - 120

PAH in Water

ARL005

Holding Time Criteria	Date	
Extracted	07/09/2012	
Analysed	10/09/2012	
Matrix Spike (12-5988-1)	**Recovery (%)**	**Limits (%)**
Naphthalene	81	60 - 120
Acenaphthene	90	60 - 120
Phenanthrene	97	60 - 120
Pyrene	87	60 - 120
Chrysene	104	60 - 120
Benzo(a)pyrene	112	60 - 120

TPH in Water (Water Corp)

ARL009

Holding Time Criteria	Date	
Extracted	03/09/2012	
Analysed	06/09/2012	
Matrix Spike (12-5961-1)	**Recovery (%)**	**Limits (%)**
C_{15-28}	83	60 - 120

OCOP in Water

ARL002

Holding Time Criteria	Date	
Extracted	04/09/2012	
Analysed	05/09/2012	
Matrix Spike (12-5954-1)	**Recovery (%)**	**Limits (%)**
Aldrin	94	60 - 120
Dieldrin	87	60 - 120
Endrin	94	60 - 120

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www.arlwa.com.au ABN: 91 050 159 898

Quality Control Report

Job Number: 12-5954

Date: 17/09/2012

Matrix Spike (12-5954-1)	Recovery (%)	Limits (%)
Heptachlor	103	60 - 120
Lindane	86	60 - 120
p,p-DDT	88	60 - 120

Misc. Organics in Water

ARL044

Holding Time Criteria	Date	
Extracted	03/09/2012	
Analysed	03/09/2012	
Duplicate Analysis (12-5954-1)	**RPD (%)**	**Limits (%)**
Total Phenols	0	25
Matrix Spike (12-5954-1)	**Recovery (%)**	**Limits (%)**
Total Phenols	91	60 - 120
Certified Reference Material	**Recovery (%)**	**Limits (%)**
Total Phenols	111	73 - 127

Metals in Water

Holding Time Criteria	Date	
Analysed	06/09/2012	
Certified Reference Material	**Recovery (%)**	**Limits (%)**
Aluminium - Dissolved	112	80 - 120
Aluminium - Total	112	80 - 120
Arsenic - Dissolved	108	80 - 120
Arsenic - Total	108	80 - 120
Cadmium - Dissolved	95	80 - 120
Cadmium - Total	95	80 - 120
Chromium - Dissolved	80	80 - 120
Chromium - Total	80	80 - 120
Iron - Dissolved	101	80 - 120
Iron - Total	101	80 - 120
Manganese - Dissolved	98	80 - 120
Manganese - Total	98	80 - 120
Nickel - Dissolved	112	80 - 120
Nickel - Total	112	80 - 120
Selenium - Dissolved	100	80 - 120
Selenium - Total	100	80 - 120
Zinc - Dissolved	119	80 - 120
Zinc - Total	119	80 - 120

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Quality Control Report

Job Number: 12-5954

Date: 17/09/2012

Environmental and Analytical Laboratory

Total Nitrogen in Water

Holding Time Criteria	Date	
Extracted	07/09/12	
Analysed	10/09/12	
Duplicate Analysis (12-5982-2)	**RPD (%)**	**Limits (%)**
Total Nitrogen	0	25
TKN	0	25
Certified Reference Material	**Recovery (%)**	**Limits (%)**
Total Nitrogen	108	80 - 120
TKN	108	80 - 120

Total Phosporus in Water

Holding Time Criteria	Date	
Extracted	07/09/12	
Analysed	10/09/12	
Duplicate Analysis (12-5982-2)	**RPD (%)**	**Limits (%)**
Total Phosphorus	0	25
Matrix Spike (12-5982-2)	**Recovery (%)**	**Limits (%)**
Total Phosphorus	111	60 - 120
Certified Reference Material	**Recovery (%)**	**Limits (%)**
Total Phosphorus	118	80 - 120

Ions by Discrete Analyser

Holding Time Criteria	Date	
Analysed	05/09/12	
Certified Reference Material	**Recovery (%)**	**Limits (%)**
Filterable Reactive Phosphorus	110	80 - 120
Ammonia-N	97	80 - 120
NOx-N	91	80 - 120
Nitrate-N	91	80 - 120
Nitrite-N	101	80 - 120
Chloride	93	80 - 120

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Quality Control Report

Job Number: 12-5954

Date: 17/09/2012

Environmental and Analytical Laboratory

Physical Parameters

Holding Time Criteria	Date	
Analysed	01/09/12	
Certified Reference Material	**Recovery (%)**	**Limits (%)**
Turbidity	92	80 - 120
Acidity	106	80 - 120
Alkalinity	93	80 - 120
Conductivity	103	80 - 120
pH	101	80 - 120
Total Dissolved Solids	106	80 - 120
Total Suspended Solids	106	80 - 120

Biochemical Oxygen Demand

Holding Time Criteria	Date	
Analysed	11/09/12	
Certified Reference Material	**Recovery (%)**	**Limits (%)**
Biochemical Oxygen Demand	100	80 - 120

Miscellaneous Inorganic in Water

Holding Time Criteria	Date	
Analysed	07/09/12	
Certified Reference Material	**Recovery (%)**	**Limits (%)**
Chemical Oxygen Demand	90	80 - 120

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www.arlwa.com.au ABN: 91 050 159 898

Site: WASTEROCK
Job #: E2012 -031
Sampler: DALE A. / NATHAN F.
CoC #: E2012 - 031 - 004
Quote #:
Laboratory: ARL WA.
Date and time delivered:
Received by:

ENVIRONMENTAL SERVICES
Mobile Dewatering Environmental Services
22 Elmsfield Road
Midvale WA 6056
P: 08 9250 6960
F: 08 9250 8269
E: info@environmentalservices.com.au

12-5954-1

Comments:
PLEASE CONTACT DALE (0424153646) WITH ANY ISSUES.

Analysis Detection Limits

Sample ID	Lab ID	Type	Sampling Date	Sampling Time	pH, EC, TDS, TSS, TAA	Sulfide, chloride, T.ALK.	BTEX, PHENOLS, TPH	PAH, OC/OP	BOD, COD	FERROUS IRON	TURBIDITY	TKN, TN, NO_3, NO_2, NH_3, TP, SRP	TOTAL Al, As, Cd, Cr, Fe, Mn, Ni, Se, Zn	Diss Al, As, Cd, Cr, Fe, Mn, Ni, Se, Zn
TRIP-002		WATER	30.8.12	1500	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

DATE: 31/8/12
CHECKED BY: Chris
No OF SAMPLES: 1
No OF GLASS: 8
No OF PLASTIC: 5

Chris 31/8/12.

Condition of Sample: Cool / Ambient / Warm   Relinquished by: DALE.

Environmental Services

Specialising in:

Acid Sulphate Soils
Contaminated Site Assessment
Air Quality Investigations
Remediation Advice and Design
Groundwater Management
Facility Maintenance

ABN 36 835 856 256

ADDENDUM 2

Groundwater Monitoring Event #3 Report

Lot 20 Adelaide Street
Hazelmere

PREPARED FOR:

Wasterock Pty Ltd

Mobile Dewatering Environmental Services Pty Ltd as trustee for
Mobile Dewatering Environmental Services Unit Trust
U1/22 Elmsfield Road, Midvale, Western Australia 6056
P: +61 (0) 8 9250 6960 F: +61 (0) 8 92508269
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Environmental Services

DOCUMENT DETAILS

Title:	Groundwater Monitoring Event #3 - Hazelland Landfill Site, Lot 20 Adelaide Street, Hazelmere
Author:	R. Burnell
Status:	Addendum 2
Job number:	E2012-031
Email:	rhian@environmentalservices.com.au
Synopsis:	This document has been prepared to report on the detailed groundwater sampling completed on the Hazelland Landfill Site.

DOCUMENT DISTRIBUTION

Version No	Checked by Date	Issued by Date	Distributed to	Copies
Addendum 2	G. Watts (February 2013)	G. Watts (February 2013)	Hazelland Pty Ltd	1 (Email)
Signed	G. J. Watts	G. J. Watts		

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Table of Contents

1 INTRODUCTION 4
2 SCOPE OF WORK 4
2.1 Objectives 4
3 SITE IDENTIFICATION 4
4 BACKGROUND INFORMATION 7
4.1 Site History 7
4.2 Land Owner 7
4.3 Land Use 7
4.4 Site Boundary 7
4.5 Groundwater Use 7
4.6 Previous Studies 7
4.7 Contaminated Sites Database 7
5 POTENTIAL CONTAMINANTS OF CONCERN (PCOC) 9
5.1 Preferential Contaminant Pathways 9
6 SAMPLING ANALYSIS PLAN AND METHODOLOGY 10
6.1 Groundwater Sampling 10
7 QUALITY ASSURANCE / QUALITY CONTROL 10
7.1 Quality Assurance 10
7.1.1 Groundwater Sampling Procedure 11
7.1.2 Decontamination of Sampling Equipment 11
7.2 Laboratory 11
7.3 Quality Control 11
7.4 Waste Disposal 12
8 RESULTS 18
8.1 Laboratory Results 18
8.2 Historical Data 21
8.3 Groundwater Levels 40
9 DISCUSSION 42
10 REFERENCES 43

List of Figures

Figure 1 Site location Plan 6
Figure 2 Detailed Site View and Monitoring Well Locations. 8
Figure 3 Groundwater Contours 41

List of Tables

Table 1 Groundwater Quality Control Results. 13
Table 2 Laboratory Analysis of Field Blank and Rinsate Samples............................15
Table 3 MW1 Groundwater Laboratory Analysis Results 22
Table 4 MW2 Groundwater Laboratory Analysis Results 25
Table 5 MW3 Groundwater Laboratory Analysis Results 28
Table 6 MW4 Groundwater Laboratory Analysis Results 31
Table 7 MW5 Groundwater Laboratory Analysis Results 34
Table 8 MW6 Groundwater Laboratory Analysis Results 37
Table 4 Groundwater Measurements 40

1 INTRODUCTION

This report has been prepared to detail the sampling methodology and results from Groundwater Monitoring Event #3 (GME) completed at the Hazelland Landfill in Hazelmere, herein referred to as the Site. MDW Environmental Services (MDWES) were commissioned by Wasterock Pty Ltd to complete groundwater investigations and compile a Groundwater Investigation Report in support of Section 3.7 of the *Site Remediation Works Agreement and Site Management Plan.*

2 SCOPE OF WORK

The Scope of Work for this project is as follows:

- Collect and analyse representative samples from six groundwater monitoring wells. Samples will be analysed by a NATA certified laboratory for:
    - Total Petroleum Hydrocarbon (TPH);
    - Benzene, Toluene, Ethyl Benzene and Xylene (BTEX);
    - Phenols;
    - Metalloids (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn); and,
    - Organochlorine and Organophosphorous Pesticides,
- Data interpretation and reporting.

2.1 Objectives

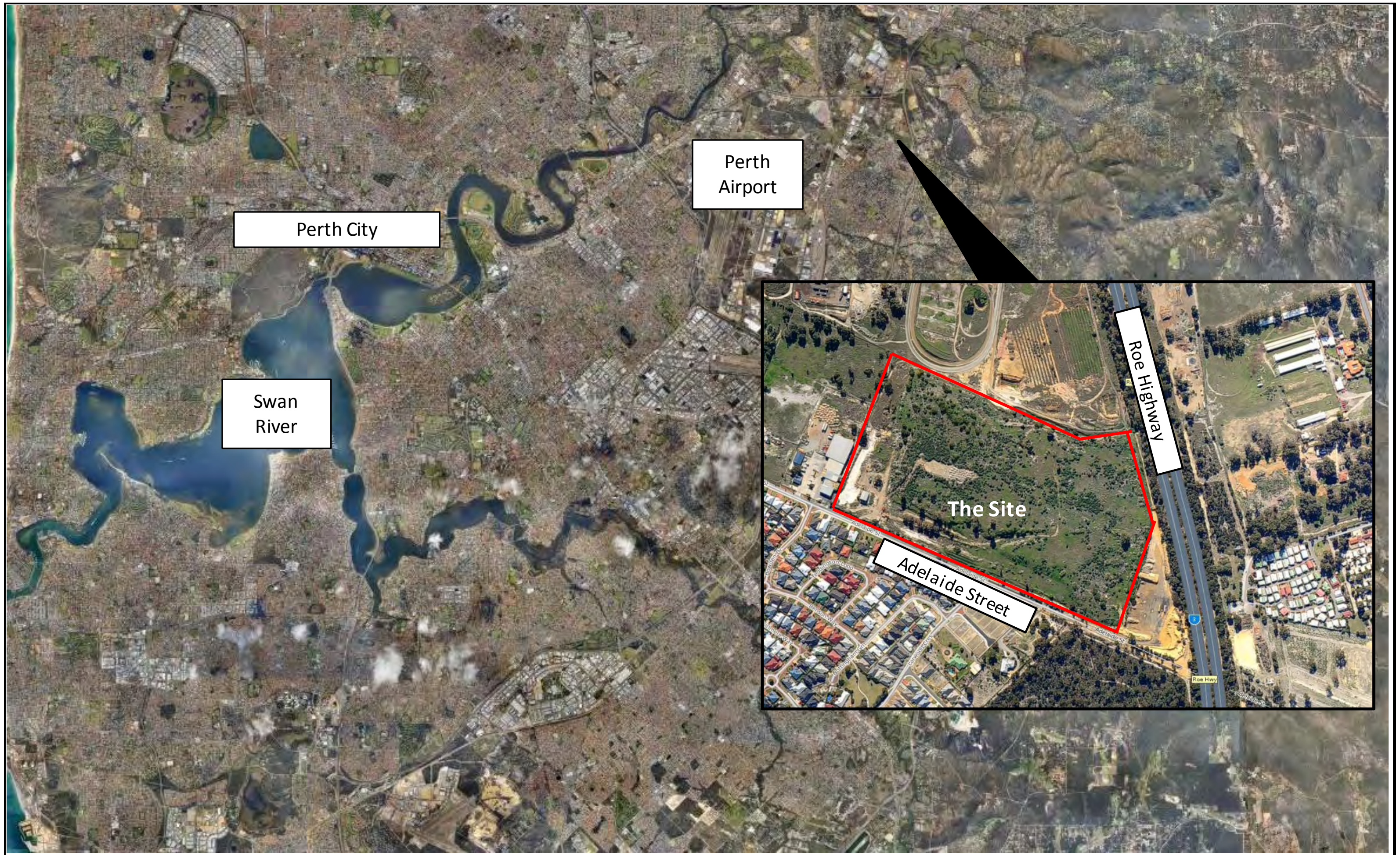
The technical objectives of the investigation are to:

- Identify the directional flow of the groundwater below the site; and,
- To identify and determine the extent of the risk that any identified contamination may pose to human health and the environment;
- Establish baseline groundwater data from the Site prior to the proposed remediation works;
- To determine the suitability of water abstraction from the superficial aquifer for the purposes of dust suppression and compaction.

3 SITE IDENTIFICATION

Address:	Lot 20 Adelaide Street, Hazelmere.
Land description:	Industrial
Lots	20
Volume:	2054
Folio:	299
Certificates of Title:	20/D76128 (Appendix A)
Local government authority:	City of Swan
Locality view:	Figure 1
UTM Co-ordinates:	The Site is bounded by the following coordinates.

BOUNDARY CORNERS	MGA94 Zone 50	
	Easting (E)	Northing (N)
North west corner	406595	6467321
North east corner	407034	6467190
North east corner (mid)	406939	6467172
South east corner	407015	6466812
South west corner	406476	6467046
Eastern Corner	407078	6467020



MDW ENVIRONMENTAL SERVICES

Scale 0 4km

Unit 1, 22 Elmsfield Road, Midvale 6056
Ph (08) 9250 6960 Fax (08) 9250 8269
www.environmentalservices.com.au

N

Figure:	Site Location
Project:	Hazelland Landfill Site
Job No:	E2012-031
Date:	6/07/2012
Source	Nearmap

Figure 1 Site location Plan

4 BACKGROUND INFORMATION

The site (Figure 1) is located within the City of Swan, approximately 14 km east north east of Perth CBD. Situated between Talbot Road and Adelaide Street access is gained from the south of the Site off Adelaide Street. Historically the Site was occupied and used as a licenced inert waste landfill in which potentially contaminating wastes were dumped. Following investigation by Parsons Brinckerhoff (2006) the site was classified "Contaminated – Remediation Required" by the Department of Environment and Conservation (DEC). The Parsons Brinckerhoff report contains substantial amounts of background information regarding this property and the Groundwater Investigation Report should be read in conjunction with this previously completed soil investigation.

4.1 Site History

A detailed historical investigation was not completed as part of this Groundwater Investigation Report.

4.2 Land Owner

The Site is currently vested with Hazelland Pty Ltd and has been so since 2006 under the Land Title City of Swan Location Lot 20 Volume 2054 Folio 299. A copy of the Certificate of Title is in Appendix A.

4.3 Land Use

The Site has been used for collection and storage of inert demolition waste as landfill with some potentially contaminating waste.

4.4 Site Boundary

The Site is surrounded by private land to the north and south with industrial proprieties to the west and Roe Highway runs along the eastern boundary.

4.5 Groundwater Use

The site does not currently make use of groundwater.

4.6 Previous Studies

Soil investigations were completed on the site during 1992 (Dames and Moore) and 2006 (Parsons Brinckerhoff).

4.7 Contaminated Sites Database

The site is currently classed as "*Contaminated – Remediation Required*" as per DEC Contaminated Sites Database.

MDW ENVIRONMENTAL SERVICES	Scale 0 100m Unit 1, 22 Elmsfield Road, Midvale 6056 Ph (08) 9250 6960 Fax (08) 9250 8269 www.environmentalservices.com.au	N	Figure: Detailed Site View Project: Hazelland Landfill Job No: E2012-031 Date: 18/06/2011 Source Nearmap

Figure 2 Detailed Site View and Monitoring Well Locations.

5 POTENTIAL CONTAMINANTS OF CONCERN (PCOC)

The land is proposed for development into industrial lots. The following list of PCOC is based on proposed use, historical and current Site activities, regional soil and issues, proximity to Contaminated Sites and off-site sources of impacts:

- Metalloids: Arsenic (As), barium (Ba), beryllium (Be), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), manganese (Mn), molybdenum (Mo), nickel (Ni), silver (Ag), selenium (Se), vanadium (V), zinc (Zn), and mercury (Hg);
- Polynuclear Aromatic Hydrocarbons (PAH);
- Monocyclic Aromatic Hydrocarbons (MAH);
- Phenolic compounds;
- Total Petroleum Hydrocarbons (TPH);
- Organochlorine and Organophosphorous Pesticides.

5.1 Preferential Contaminant Pathways

Many of the PCOC identified at the Site have the potential to impact soil and groundwater at the Site and surrounding areas. Listed above are the contaminants most likely to be found within the fill and most likely to present a risk to human health and the environment. The PCOC have been identified due to the wide range of inert demolition waste likely to have been deposited at the Site. The preferential contaminant pathways can be summarized as soil, air and groundwater; notwithstanding that the Scope of Works for this investigation only includes assessment of potential groundwater contamination.

6 SAMPLING ANALYSIS PLAN AND METHODOLOGY

The sampling and analysis of the GME were completed to determine whether imported fill on the site had adversely affected the groundwater. The results within this report will complement previous groundwater data and be used to highlight any changes in groundwater quality during the proposed site remediation works.

6.1 Groundwater Sampling

Sampling was completed on the 15th January 2013; the standing water level was recorded using an electronic water level indicator. Sampling was then undertaken using a 12V GeoTech Low Flow Bladder pump, coupled to a YSI Quattro low flow sampler to enable continuous measurement of field parameters. Once stabilisation of the parameters was reached, samples were collected and submitted to a National Association of Testing Authorities (NATA) accredited laboratory for analysis. Field Sheets are attached in Appendix D.

Surveying was completed on the groundwater monitoring wells post installation to establish accurate water levels and enable further characterization of the groundwater below the site. Certificate of Survey is attached in Appendix E.

7 QUALITY ASSURANCE / QUALITY CONTROL

The following Quality Assurance / Quality Control (QA/QC) program was implemented throughout the investigation to ensure the accuracy and precision of the data obtained. QC measures the effectiveness of the procedures of the QA program.

7.1 Quality Assurance

All procedures including staff selection, sampling methodologies, equipment, analysis methods and data transfer were based on:

- *AS/NZS 5667.11:1998: Water Quality, Part 1: Guidance on the design of sampling programs, sampling techniques, and the preservation and handling of samples. (AS/NZS 5667.11:1998),* and
- *AS/NZS 5667.11:1998 Water Quality, Part 11: Guidance on Sampling of Groundwaters (AS/NZS 5667.11:1998)*.

Particularly, the following actions applied:

- Samples were collected by a trained, experienced field technician,
- Samples were collected by the same personnel, ensuring that techniques used were consistent across the sampling program.

Following discussions with the primary laboratory and a review of their laboratory certificates of analysis, the following laboratory QC protocols occurred:

- At least 5% of samples are split into internal laboratory duplicate samples. These samples are homogenised prior to splitting into sub samples;
- At least 5% of samples are run with Matrix Spikes of known additions.
- Laboratory Control Samples (LCS) are run at the required rate; minimum 1 LCS per batch of samples. The LCS results are reported in the laboratory certificates named 'Interpretive Quality Control Report' and the 'Quality Control Report'.

7.1.1 Groundwater Sampling Procedure

All groundwater samples were subject to the following procedures:

- Dedicated tubing was used for each well and the pump and low flow cell were decontaminated between wells;
- Samples were collected within an eight hour period into new, laboratory supplied sample bottles. Preservatives (if required) were provided by the laboratory in the appropriate sample bottle;
- Samples were filled to the top to ensure no headspace remained;
- All samples were marked in the field using permanent marker with a label showing sample location, date and job number;
- Samples were immediately placed on ice within an esky for transport to the laboratory accompanied with standard chain of custody documentation.

7.1.2 Decontamination of Sampling Equipment

All sampling and drilling equipment were decontaminated prior to use and between each sample location. Decontamination was completed using the following procedure:

- Equipment washed in water;
- Equipment thoroughly scrubbed in water with Decon 90;
- Equipment rinsed in tap water;
- Equipment rinsed in de-ionised water.

7.2 Laboratory

Two NATA certificated laboratories were selected to analyse the samples. ALS Laboratory Group was selected as the primary laboratory. ARLWA; the secondary laboratory, was used for the analysis of replicate samples and for inter-laboratory quality control (QC).

7.3 Quality Control

To ensure the quality of the sampling method and laboratory analysis Quality Control (QC) samples were collected consisting of one (1) Rinsate Blank, one (1) Field Blank, one set of (1) duplicate and triplicate samples of groundwater.

- A rinsate sample was collected for each day of field sampling (RINSATE-003);
- A field blank was collected for each day of field sampling (BLANK-003);

- WRMW4-003 was used as the DUP and TRIP.

Laboratory certificates of analysis including sample receipt notification, chain of custody, and laboratory quality control are available in Appendix F.

The reproducibility of the sampling and analytical methodology is measured as precision. Laboratory and field precision is measured using the Relative Percent Difference (RPD) between the sample and its duplicates. For those RPD values which exceed a generally acceptable 30% - 50% (Australian Standard AS 4482.1), data precision is considered poor, however, consideration needs to be given to sample homogeneity and the concentrations detected. Therefore, the acceptable ranges adopted for the RPDs are based on the laboratories RPD acceptance criteria and are dependent on the magnitude of results in comparison to the limits of reporting (LOR) as follows:

Result < 10 times LOR = No limit

Result 10 – 20 times LOR = 0% - 50%

Result > 20 times LOR = 0% - 20%

Groundwater QC results (Table 1) indicated exceedances of RPD limits of the triplicate sample. Exceedances were noted of total dissolved solids, suspended solids, turbidity and total aluminium. As RPD limits between the primary and secondary samples were within allowable limits it is MDWES opinion that the variances noted between the primary and triplicate sample could be due to differing laboratory techniques. ALS Laboratory Group QC documentation indicates the lab's internal QC were observed.

Laboratory analysis of QA samples indicates exceedances of adopted criteria for pH within the Field and Rinsate samples. Detailed results are found in Table 2.

7.4 Waste Disposal

Sampling was completed in consultation with MDWES Standard Operating Procedure and all waste was disposed of appropriately as to not impose a risk or cause contamination.

Table 1 Groundwater Quality Control Results.

Analyte grouping/Analyte	Units	WRMW4	DUP	DUP RL (%)	DUP RPD (%)	TRIP	TRIP RL (%)	TRIP RPD
pH Value	pH Unit	5.61	5.16	0-20	8.02	4.8	0-20	14.44
Electrical Conductivity	μS/cm	118	118	0-20	0.00	150	0-50	21.33
Total Dissolved Solids	mg/L	74	101	0-50	26.73	150	0-20	50.67
Suspended Solids	mg/L	313	254	0-20	18.85	590	0-20	46.95
Turbidity	NTU	81.8	58.7	0-20	28.24	500	0-20	83.64
Total Alkalinity $CaCO_3$	mg/L	2	<1	N/L	0.00	<5	N/L	-
Acidity as $CaCO_3$	mg/L	16	8	N/L	50.00	19	N/L	15.79
Sulfate as SO_4^{2-}	mg/L	2	2	N/L	0.00	-	-	-
Chloride	mg/L	23	23	0-20	0.00	24	N/L	-
Dissolved Metals								
Aluminium	mg/L	0.34	0.26	0-50	23.53	0.52	N/L	34.62
Arsenic	mg/L	<0.001	<0.001	N/L	-	<0.001	N/L	-
Cadmium	mg/L	<0.0001	<0.0001	N/L	-	0.0002	N/L	-
Chromium	mg/L	<0.001	<0.001	N/L	-	<0.001	N/L	-
Manganese	mg/L	0.005	0.003	N/L	40.00	<0.01	N/L	-
Nickel	mg/L	0.012	0.012	0-50	0.00	0.013	N/L	-
Selenium	mg/L	<0.01	<0.01	N/L	-	<0.001	N/L	-
Zinc	mg/L	0.072	0.072	0-50	0.00	0.096	N/L	25.00
Iron	mg/L	0.31	0.14	N/L	-	0.39	0-20	-
Ferrous Iron	mg/L	0.09	0.1	N/L	-	-	-	-
Chromium VI	mg/L	<0.01	<0.01	N/L	-	-	-	-
Total Metals								
Aluminium	mg/L	13.9	13.2	0-20	5.04	9.3	0-20	33.09
Arsenic	mg/L	<0.001	<0.001	N/L	-	<0.001	N/L	-
Cadmium	mg/L	<0.0001	<0.0001	N/L	-	0.0005	N/L	-
Chromium	mg/L	0.008	0.008	N/L	-	0.01	N/L	-
Copper	mg/L	0.025	0.029	0-20	13.79	-	-	-
Lead	mg/L	0.012	0.011	0-50	8.33	-	-	-
Manganese	mg/L	0.007	0.006	N/L	14.29	<0.01	N/L	-
Molybdenum	mg/L	<0.001	<0.001	N/L	-	-	-	-
Nickel	mg/L	0.016	0.016	0-50	0.00	0.014	N/L	-
Selenium	mg/L	<0.01	<0.01	N/L	-	<0.001	N/L	-
Silver	mg/L	<0.001	<0.001	N/L	-	-	-	-
Zinc	mg/L	0.11	0.109	0-20	0.91	0.1	N/L	9.09
Iron	mg/L	1.5	1.49	0-20	0.67	1.8	0-20	16.67
Mercury	mg/L	<0.0001	<0.0001	N/L	-	-	-	-
Nutrients								
Ammonia as N	mg/L	0.03	0.01	N/L	66.67	<0.2	N/L	0.00
Nitrite as N	mg/L	<0.01	<0.01	N/L	-	<0.01	N/L	-
Nitrate as N	mg/L	4.38	4.33	0-20	1.14	4.7	0-20	6.81
Kjeldhal Nitrogen	mg/L	0.7	<0.5	50	0.00	<0.2	N/L	0.00
Total Nitrogen	mg/L	5.1	4.3	0-20	15.69	4.7	0-20	7.84
Total Phosphorus	mg/L	0.06	0.09	N/L	33.33	<0.01	50	0.00
Reactive Phosphorus	mg/L	<0.01	<0.01	N/L	-	<0.01	N/L	-
Sulfide	mg/L	<0.1	<0.1	N/L	-	<0.1	N/L	-
COD	mg/L	16	<5	N/L	0.00	<10	N/L	0.00
BOD	mg/L	4	12	N/L	-	<5	N/L	-
Organochlorine Pesticides (OC)								
alpha-BHC	μg/L	<0.5	<0.5	N/L	-	<0.001	N/L	-
Hexachlorobenzene (HCB)	μg/L	<0.5	<0.5	N/L	-	<0.001	N/L	-
beta-BHC	μg/L	<0.5	<0.5	N/L	-	<0.001	N/L	-
gamma-BHC	μg/L	<0.5	<0.5	N/L	-	-	-	-
delta-BHC	μg/L	<0.5	<0.5	N/L	-	<0.001	N/L	-
Heptachlor	μg/L	<0.5	<0.5	N/L	-	<0.001	N/L	-
Aldrin	μg/L	<0.5	<0.5	N/L	-	<0.001	N/L	-
Heptachlor epoxide	μg/L	<0.5	<0.5	N/L	-	<0.001	N/L	-
trans-Chlordane	μg/L	<0.5	<0.5	N/L	-	-	-	-
alpha-Endosulfan	μg/L	<0.5	<0.5	N/L	-	-	-	-
cis-Chlordane	μg/L	<0.5	<0.5	N/L	-	-	-	-
Dieldrin	μg/L	<0.5	<0.5	N/L	-	0.041	N/L	-
4.4`-DDE	μg/L	<0.5	<0.5	N/L	-	<0.001	N/L	-
Endrin	μg/L	<0.5	<0.5	N/L	-	<0.01	N/L	-
beta-Endosulfan	μg/L	<0.5	<0.5	N/L	-	-	-	-
4.4`-DDD	μg/L	<0.5	<0.5	N/L	-	<0.001	N/L	-
Endrin aldehyde	μg/L	<0.5	<0.5	N/L	-	-	-	-
Endosulfan sulfate	μg/L	<0.5	<0.5	N/L	-	<0.001	N/L	-
4.4`-DDT	μg/L	<2.0	<2.0	N/L	-	<0.001	N/L	-
Endrin ketone	μg/L	<0.5	<0.5	N/L	-	-	-	-
Methoxychlor	μg/L	<2.0	<2.0	N/L	-	<0.02	N/L	-
Organophosphorus Pesticides (OP)								
Dichlorvos	μg/L	<0.5	<0.5	N/L	-	-	-	-
Demeton-S-methyl	μg/L	<0.5	<0.5	N/L	-	-	-	-
Monocrotophos	μg/L	<2.0	<2.0	N/L	-	-	-	-
Dimethoate	μg/L	<0.5	<0.5	N/L	-	-	-	-
Diazinon	μg/L	<0.5	<0.5	N/L	-	<0.01	N/L	-
Chlorpyrifos-methyl	μg/L	<0.5	<0.5	N/L	-	-	-	-
Parathion-methyl	μg/L	<2.0	<2.0	N/L	-	<0.02	N/L	-
Malathion	μg/L	<0.5	<0.5	N/L	-	<0.01	N/L	-
Fenthion	μg/L	<0.5	<0.5	N/L	-	-	-	-
Chlorpyrifos	μg/L	<0.5	<0.5	N/L	-	<0.005	N/L	-
Parathion	μg/L	<2.0	<2.0	N/L	-	-	-	-
Pirimphos-ethyl	μg/L	<0.5	<0.5	N/L	-	-	N/L	-
Chlorfenvinphos	μg/L	<0.5	<0.5	N/L	-	-	-	-
Bromophos-ethyl	μg/L	<0.5	<0.5	N/L	-	<0.005	N/L	-
Fenamiphos	μg/L	<0.5	<0.5	N/L	-	-	-	-
Prothiofos	μg/L	<0.5	<0.5	N/L	-	-	-	-
Ethion	μg/L	<0.5	<0.5	N/L	-	<0.01	N/L	-
Carbophenothion	μg/L	<0.5	<0.5	N/L	-	-	-	-
Azinphos Methyl	μg/L	<0.5	<0.5	N/L	-	-	-	-
Monocyclic Aromatic Hydrocarbons								
Benzene	μg/L	<1	<1	N/L	-	<0.001	N/L	-
Toluene	μg/L	<2	<2	N/L	-	<0.001	N/L	-
Ethylbenzene	μg/L	<2	<2	N/L	-	<0.001	N/L	-
meta- & para-Xylene	μg/L	<2	<2	N/L	-	-	-	-
Styrene	μg/L	<5	<5	N/L	-	-	-	-
ortho-Xylene	μg/L	<2	<2	N/L	-	-	-	-
Isopropylbenzene	μg/L	<5	<5	N/L	-	-	-	-
n-Propylbenzene	μg/L	<5	<5	N/L	-	-	-	-
1.3.5-Trimethylbenzene	μg/L	<5	<5	N/L	-	-	-	-
sec-Butylbenzene	μg/L	<5	<5	N/L	-	-	-	-
1.2.4-Trimethylbenzene	μg/L	<5	<5	N/L	-	-	-	-
tert-Butylbenzene	μg/L	<5	<5	N/L	-	-	-	-
p-Isopropyltoluene	μg/L	<5	<5	N/L	-	-	-	-
n-Butylbenzene	μg/L	<5	<5	N/L	-	-	-	-

Oxygenated Compounds								
Vinyl Acetate	µg/L	<50	<50	N/L	-	-	-	-
2-Butanone (MEK)	µg/L	<50	<50	N/L	-	-	-	-
4-Methyl-2-pentanone (MIBK)	µg/L	<50	<50	N/L	-	-	-	-
2-Hexanone (MBK)	µg/L	<50	<50	N/L	-	-	-	-
Sulfonated Compounds								
Carbon disulfide	µg/L	<5	<5	N/L	-	-	-	-
Fumigants								
2.2-Dichloropropane	µg/L	<5	<5	N/L	-	-	-	-
1.2-Dichloropropane	µg/L	<5	<5	N/L	-	-	-	-
cis-1.3-Dichloropropylene	µg/L	<5	<5	N/L	-	-	-	-
trans-1.3-Dichloropropylene	µg/L	<5	<5	N/L	-	-	-	-
1.2-Dibromoethane (EDB)	µg/L	<5	<5	N/L	-	-	-	-
Halogenated Aliphatic Compounds								
Dichlorodifluoromethane	µg/L	<50	<50	N/L	-	-	-	-
Chloromethane	µg/L	<50	<50	N/L	-	-	-	-
Vinyl chloride	µg/L	<50	<50	N/L	-	-	-	-
Bromomethane	µg/L	<50	<50	N/L	-	-	-	-
Chloroethane	µg/L	<50	<50	N/L	-	-	-	-
Trichlorofluoromethane	µg/L	<50	<50	N/L	-	-	-	-
1.1-Dichloroethene	µg/L	<5	<5	N/L	-	-	-	-
Iodomethane	µg/L	<5	<5	N/L	-	-	-	-
trans-1.2-Dichloroethene	µg/L	<5	<5	N/L	-	-	-	-
1.1-Dichloroethane	µg/L	<5	<5	N/L	-	-	-	-
cis-1.2-Dichloroethene	µg/L	<5	<5	N/L	-	-	-	-
1.1.1-Trichloroethane	µg/L	<5	<5	N/L	-	-	-	-
1.1-Dichloropropylene	µg/L	<5	<5	N/L	-	-	-	-
Carbon Tetrachloride	µg/L	<5	<5	N/L	-	-	-	-
1.2-Dichloroethane	µg/L	<5	<5	N/L	-	-	-	-
Trichloroethene	µg/L	<5	<5	N/L	-	-	-	-
Dibromomethane	µg/L	<5	<5	N/L	-	-	-	-
1.1.2-Trichloroethane	µg/L	<5	<5	N/L	-	-	-	-
1.3-Dichloropropane	µg/L	<5	<5	N/L	-	-	-	-
Tetrachloroethene	µg/L	<5	<5	N/L	-	-	-	-
1.1.1.2-Tetrachloroethane	µg/L	<5	<5	N/L	-	-	-	-
trans-1.4-Dichloro-2-butene	µg/L	<5	<5	N/L	-	-	-	-
cis-1.4-Dichloro-2-butene	µg/L	<5	<5	N/L	-	-	-	-
1.1.2.2-Tetrachloroethane	µg/L	<5	<5	N/L	-	-	-	-
1.2.3-Trichloropropane	µg/L	<5	<5	N/L	-	-	-	-
Pentachloroethane	µg/L	<5	<5	N/L	-	-	-	-
1.2-Dibromo-3-chloropropane	µg/L	<5	<5	N/L	-	-	-	-
Hexachlorobutadiene	µg/L	<5	<5	N/L	-	-	-	-
Halogenated Aromatic Compounds								
Chlorobenzene	µg/L	<5	<5	N/L	-	-	-	-
Bromobenzene	µg/L	<5	<5	N/L	-	-	-	-
2-Chlorotoluene	µg/L	<5	<5	N/L	-	-	-	-
4-Chlorotoluene	µg/L	<5	<5	N/L	-	-	-	-
1.3-Dichlorobenzene	µg/L	<5	<5	N/L	-	-	-	-
1.4-Dichlorobenzene	µg/L	<5	<5	N/L	-	-	-	-
1.2-Dichlorobenzene	µg/L	<5	<5	N/L	-	-	-	-
1.2.4-Trichlorobenzene	µg/L	<5	<5	N/L	-	-	-	-
1.2.3-Trichlorobenzene	µg/L	<5	<5	N/L	-	-	-	-
Trihalomethanes								
Chloroform	µg/L	<5	<5	N/L	-	-	-	-
Bromodichloromethane	µg/L	<5	<5	N/L	-	-	-	-
Dibromochloromethane	µg/L	<5	<5	N/L	-	-	-	-
Bromoform	µg/L	<5	<5	N/L	-	-	-	-
Phenolic Compounds								
Phenol	µg/L	<1.0	<1.0	N/L	-	<0.05	N/L	-
2-Chlorophenol	µg/L	<1.0	<1.0	N/L	-	-	-	-
2-Methylphenol	µg/L	<1.0	<1.0	N/L	-	-	-	-
3- & 4-Methylphenol	µg/L	<2.0	<2.0	N/L	-	-	-	-
2-Nitrophenol	µg/L	<1.0	<1.0	N/L	-	-	-	-
2.4-Dimethylphenol	µg/L	<1.0	<1.0	N/L	-	-	-	-
2.4-Dichlorophenol	µg/L	<1.0	<1.0	N/L	-	-	-	-
2.6-Dichlorophenol	µg/L	<1.0	<1.0	N/L	-	-	-	-
4-Chloro-3-Methylphenol	µg/L	<1.0	<1.0	N/L	-	-	-	-
2.4.6-Trichlorophenol	µg/L	<1.0	<1.0	N/L	-	-	-	-
2.4.5-Trichlorophenol	µg/L	<1.0	<1.0	N/L	-	-	-	-
Pentachlorophenol	µg/L	<2.0	<2.0	N/L	-	-	-	-
Polynuclear Aromatic Hydrocarbons								
Naphthalene	µg/L	<1.0	<1.0	N/L	-	<0.1	N/L	-
Acenaphthylene	µg/L	<1.0	<1.0	N/L	-	<0.1	N/L	-
Acenaphthene	µg/L	<1.0	<1.0	N/L	-	<0.1	N/L	-
Fluorene	µg/L	<1.0	<1.0	N/L	-	<0.1	N/L	-
Phenanthrene	µg/L	<1.0	<1.0	N/L	-	<0.1	N/L	-
Anthracene	µg/L	<1.0	<1.0	N/L	-	<0.1	N/L	-
Fluoranthene	µg/L	<1.0	<1.0	N/L	-	<0.1	N/L	-
Pyrene	µg/L	<1.0	<1.0	N/L	-	<0.1	N/L	-
Benz(a)anthracene	µg/L	<1.0	<1.0	N/L	-	<0.1	N/L	-
Chrysene	µg/L	<1.0	<1.0	N/L	-	<0.1	N/L	-
Benzo(b)fluoranthene	µg/L	<1.0	<1.0	N/L	-	<0.1	N/L	-
Benzo(k)fluoranthene	µg/L	<1.0	<1.0	N/L	-	<0.1	N/L	-
Benzo(a)pyrene	µg/L	<0.5	<0.5	N/L	-	<0.1	N/L	-
Indeno(1.2.3.cd)pyrene	µg/L	<1.0	<1.0	N/L	-	<0.1	N/L	-
Dibenz(a.h)anthracene	µg/L	<1.0	<1.0	N/L	-	<0.1	N/L	-
Benzo(g.h.i)perylene	µg/L	<1.0	<1.0	N/L	-	<0.1	N/L	-
Total Petroleum Hydrocarbons								
C6 - C9 Fraction	µg/L	<20	<20	N/L	-	<0.02	N/L	-
C10 - C14 Fraction	µg/L	<50	<50	N/L	-	<0.02	N/L	-
C15 - C28 Fraction	µg/L	<100	<100	N/L	-	<0.04	N/L	-
C29 - C36 Fraction	µg/L	<50	<50	N/L	-	<0.04	N/L	-
C10 - C36 Fraction (sum)	µg/L	<50	<50	N/L	-	<0.04	N/L	-

Table 2 Laboratory Analysis of Field Blank and Rinsate Samples

Analyte grouping/Analyte	Units	ANZECC & ARMCANZ (2000)[1]		ADWG (2004)[2]		DOH (2006)[3]	ANZECC & ARMCANZ (2000)[1]		15/01/2013	15/01/2013
		Fresh Waters[4]	**Marine Waters[4]**	**Drinking Water Health Value (HV)**	**Drinking Water Aesthetic Value**	**Domestic non-potable**	**Short-term Irrigation Water**	**Long-term Irrigation Water[5]**	**RINSATE-003**	**BLANK-003**
pH Value	pH Unit	6.5-8.5	8.0-8.4		6.5-8.5			6.0-8.5	5.4	5.54
Electrical Conductivity	µS/cm								7	15
Total Dissolved Solids	mg/L								<10	<10
Suspended Solids	mg/L								<5	5
Turbidity	NTU								<0.1	<0.1
Total Alkalinity $CaCO_3$	mg/L								<1	<1
Acidity as $CaCO_3$	mg/L								4	4
Sulfate as SO_4^{2-}	mg/L								<1	<1
Chloride	mg/L								3	4
Dissolved Metals										
Arsenic	mg/L	0.013		0.01		0.07	2	0.1	<0.01	<0.01
Cadmium	mg/L	0.0002	0.0007	0.00		0.02	0.05	0.01	<0.001	<0.001
Chromium	mg/L						1	0.1	<0.0001	<0.0001
Manganese	mg/L	1.9		0.50	0.1	5	10	0.2	<0.001	<0.001
Nickel	mg/L	0.011	0.02	0.02		0.2	2	0.2	<0.001	<0.001
Selenium	mg/L	0.005		0.01		0.1	0.05	0.02	<0.001	<0.001
Zinc	mg/L	0.008	0.015		3	30	5	2	<0.01	<0.01
Iron	mg/L	0.3	1.0 / 0.3[5]		0.33	3	10	0.2	0.034	<0.005
Ferrous Iron	mg/L								<0.05	<0.05
Total Metals										
Aluminium	mg/L	0.055			0.2	2	20	5	<0.01	<0.01
Arsenic	mg/L	0.013		0.01		0.07	2	0.1	<0.001	<0.001
Cadmium	mg/L	0.0002	0.0007	0.002		0.02	0.05	0.01	<0.0001	<0.0001
Chromium	mg/L						1	0.1	<0.001	<0.001
Copper	mg/L	0.0014	0.0013	2	1	20	5	0.2	<0.001	<0.001
Lead	mg/L	0.0034	0.0044	0.01		0.1	5	2	<0.001	<0.001
Manganese	mg/L	1.9		0.5	0.1	5	10	0.2	<0.001	<0.001
Molybdenum	mg/L			0.05		0.5	0.05	0.01	<0.001	<0.001
Nickel	mg/L	0.011	0.02	0.02		0.2	2	0.2	<0.001	<0.001
Selenium	mg/L	0.005		0.01		0.1	0.05	0.02	<0.01	<0.01
Silver	mg/L	0.00005	0.0014	0.1		1			<0.001	<0.001
Zinc	mg/L	0.008	0.015		3	30	5	2	<0.005	<0.005
Iron	mg/L	0.3	1.0 / 0.35		0.33	3	10	0.2	<0.05	<0.05
Mercury	mg/L	0.00006	0.0001	0.001		0.01	0.002	0.002	<0.0001	<0.0001
Nutrients										
Ammonia as N	mg/L	0.9	0.91						0.01	<0.01
Nitrite as N	mg/L			3.0		30			<0.01	<0.01
Nitrate as N	mg/L			50		500			<0.01	<0.01
Kjeldhal Nitrogen	mg/L								<0.1	<0.1
Total Nitrogen	mg/L	1.0 / 2.0[1]							<0.1	<0.1
Total Phosphorus	mg/L	0.1 / 0.2[1]							<0.01	<0.01
Reactive Phosphorus	mg/L								<0.01	<0.01
Sulfide	mg/L	0.001							<0.1	<0.1
COD	mg/L								<5	<5
BOD	mg/L								<2	<2
Organochlorine Pesticides (OC)										
alpha-BHC	µg/L								<0.5	<0.5
Hexachlorobenzene (HCB)	µg/L								<0.5	<0.5
beta-BHC	µg/L								<0.5	<0.5
gamma-BHC	µg/L								<0.5	<0.5
delta-BHC	µg/L								<0.5	<0.5
Heptachlor	µg/L	0.01							<0.5	<0.5
Aldrin	µg/L								<0.5	<0.5
Heptachlor epoxide	µg/L			0.05	0.3	3			<0.5	<0.5
trans-Chlordane	µg/L	0.03 [2]		0.01	1	10			<0.5	<0.5
alpha-Endosulfan	µg/L	0.03 [3]	0.005 [3]	0.05	30	30			<0.5	<0.5
cis-Chlordane	µg/L	0.03 [2]		0.01	1	10			<0.5	<0.5
Dieldrin	µg/L								<0.5	<0.5
4.4`-DDE	µg/L								<0.5	<0.5
Endrin	µg/L	0.01	0.004						<0.5	<0.5
beta-Endosulfan	µg/L	0.03 [3]	0.005 [3]						<0.5	<0.5
4.4`-DDD	µg/L								<0.5	<0.5
Endrin aldehyde	µg/L								<0.5	<0.5
Endosulfan sulfate	µg/L								<0.5	<0.5
4.4`-DDT	µg/L	0.006		0.06	30	0.1			<2.0	<2.0
Endrin ketone	µg/L								<0.5	<0.5
Methoxychlor	µg/L								<2.0	<2.0
Organophosphorus Pesticides (OP)										
Dichlorvos	µg/L								<0.5	<0.5
Demeton-S-methyl	µg/L								<0.5	<0.5
Monocrotophos	µg/L								<2.0	<2.0
Dimethoate	µg/L	0.15			50	50			<0.5	<0.5
Diazinon	µg/L	0.01		1	3	1			<0.5	<0.5
Chlorpyrifos-methyl	µg/L	0.01	0.009		10	100			<0.5	<0.5
Parathion-methyl	µg/L								<2.0	<2.0
Malathion	µg/L	0.05							<0.5	<0.5
Fenthion	µg/L								<0.5	<0.5
Chlorpyrifos	µg/L	0.01	0.009						<0.5	<0.5
Parathion	µg/L	0.004			10	10			<2.0	<2.0
Pirimphos-ethyl	µg/L								<0.5	<0.5
Chlorfenvinphos	µg/L								<0.5	<0.5
Bromophos-ethyl	µg/L								<0.5	<0.5
Fenamiphos	µg/L								<0.5	<0.5
Prothiofos	µg/L								<0.5	<0.5
Ethion	µg/L								<0.5	<0.5
Carbophenothion	µg/L								<0.5	<0.5
Azinphos Methyl	µg/L	0.02							<0.5	<0.5

Monocyclic Aromatic Hydrocarbons										
Benzene	µg/L	0.95	0.5	0.001		0.01			<1	<1
Toluene	µg/L			0.80	0.025	0.025			<2	<2
Ethylbenzene	µg/L			0.30	0.003	0.003			<2	<2
meta- & para-Xylene	µg/L	200							<2	<2
Styrene	µg/L			0.03	0.004	0.004			<5	<5
ortho-Xylene	µg/L	350							<2	<2
Isopropylbenzene	µg/L								<5	<5
n-Propylbenzene	µg/L								<5	<5
1.3.5-Trimethylbenzene	µg/L								<5	<5
sec-Butylbenzene	µg/L								<5	<5
1.2.4-Trimethylbenzene	µg/L								<5	<5
tert-Butylbenzene	µg/L								<5	<5
p-Isopropyltoluene	µg/L								<5	<5
n-Butylbenzene	µg/L								<5	<5
Oxygenated Compounds										
Vinyl Acetate	µg/L								<50	<50
2-Butanone (MEK)	µg/L								<50	<50
4-Methyl-2-pentanone (MIBK)	µg/L								<50	<50
2-Hexanone (MBK)	µg/L								<50	<50
Sulfonated Compounds										
Carbon disulfide	µg/L								<5	<5
Fumigants										
2.2-Dichloropropane	µg/L								<5	<5
1.2-Dichloropropane	µg/L								<5	<5
cis-1.3-Dichloropropylene	µg/L								<5	<5
trans-1.3-Dichloropropylene	µg/L								<5	<5
1.2-Dibromoethane (EDB)	µg/L								<5	<5
Halogenated Aliphatic Compounds										
Dichlorodifluoromethane	µg/L								<50	<50
Chloromethane	µg/L								<50	<50
Vinyl chloride	µg/L			0.0003		0.003			<50	<50
Bromomethane	µg/L								<50	<50
Chloroethane	µg/L								<50	<50
Trichlorofluoromethane	µg/L								<50	<50
1.1-Dichloroethene	µg/L			0.03		0.3			<5	<5
Iodomethane	µg/L								<5	<5
trans-1.2-Dichloroethene	µg/L								<5	<5
1.1-Dichloroethane	µg/L								<5	<5
cis-1.2-Dichloroethene	µg/L								<5	<5
1.1.1-Trichloroethane	µg/L								<5	<5
1.1-Dichloropropylene	µg/L								<5	<5
Carbon Tetrachloride	µg/L								<5	<5
1.2-Dichloroethane	µg/L			0.003		0.03			<5	<5
Trichloroethene	µg/L								<5	<5
Dibromomethane	µg/L								<5	<5
1.1.2-Trichloroethane	µg/L	6500	1900						<5	<5
1.3-Dichloropropane	µg/L								<5	<5
Tetrachloroethene	µg/L			0.05		0.5			<5	<5
1.1.1.2-Tetrachloroethane	µg/L								<5	<5
trans-1.4-Dichloro-2-butene	µg/L								<5	<5
cis-1.4-Dichloro-2-butene	µg/L								<5	<5
1.1.2.2-Tetrachloroethane	µg/L								<5	<5
1.2.3-Trichloropropane	µg/L								<5	<5
Pentachloroethane	µg/L								<5	<5
1.2-Dibromo-3-chloropropane	µg/L								<5	<5
Hexachlorobutadiene	µg/L								<5	<5
Halogenated Aromatic Compounds										
Chlorobenzene	µg/L			0.30	0.01	0.01			<5	<5
Bromobenzene	µg/L								<5	<5
2-Chlorotoluene	µg/L								<5	<5
4-Chlorotoluene	µg/L								<5	<5
1.3-Dichlorobenzene	µg/L	0.26			0.02	0.02			<5	<5
1.4-Dichlorobenzene	µg/L	0.06		0.04	0.003	0.003			<5	<5
1.2-Dichlorobenzene	µg/L	0.16		1.5	0.001	0.001			<5	<5
1.2.4-Trichlorobenzene	µg/L	0.085	80	0.03	0.005	0.005			<5	<5
1.2.3-Trichlorobenzene	µg/L	0.003		0.03	0.005	0.005			<5	<5
Trihalomethanes										
Chloroform	µg/L								<5	<5
Bromodichloromethane	µg/L								<5	6
Dibromochloromethane	µg/L								<5	9
Bromoform	µg/L								<5	<5
Phenolic Compounds										
Phenol	µg/L	320	400						<1.0	<1.0
2-Chlorophenol	µg/L	340		300	0.1	3000			<1.0	<1.0
2-Methylphenol	µg/L								<1.0	<1.0
3- & 4-Methylphenol	µg/L								<2.0	<2.0
2-Nitrophenol	µg/L								<1.0	<1.0
2.4-Dimethylphenol	µg/L								<1.0	<1.0
2.4-Dichlorophenol	µg/L	120		200	0.3	2000			<1.0	<1.0
2.6-Dichlorophenol	µg/L								<1.0	<1.0
4-Chloro-3-Methylphenol	µg/L								<1.0	<1.0
2.4.6-Trichlorophenol	µg/L	3		20	2	200			<1.0	<1.0
2.4.5-Trichlorophenol	µg/L								<1.0	<1.0
Pentachlorophenol	µg/L	3.6	11						<2.0	<2.0

Polynuclear Aromatic Hydrocarbons										
Naphthalene	µg/L	16	50						<1.0	<1.0
Acenaphthylene	µg/L								<1.0	<1.0
Acenaphthene	µg/L								<1.0	<1.0
Fluorene	µg/L								<1.0	<1.0
Phenanthrene	µg/L								<1.0	<1.0
Anthracene	µg/L								<1.0	<1.0
Fluoranthene	µg/L								<1.0	<1.0
Pyrene	µg/L								<1.0	<1.0
Benz(a)anthracene	µg/L								<1.0	<1.0
Chrysene	µg/L								<1.0	<1.0
Benzo(b)fluoranthene	µg/L								<1.0	<1.0
Benzo(k)fluoranthene	µg/L								<1.0	<1.0
Benzo(a)pyrene	µg/L			0.01		0.1			<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L								<1.0	<1.0
Dibenz(a.h)anthracene	µg/L								<1.0	<1.0
Benzo(g.h.i)perylene	µg/L								<1.0	<1.0
Total Petroleum Hydrocarbons										
C6 - C9 Fraction	µg/L								<20	<20
C10 - C14 Fraction	µg/L								<50	<50
C15 - C28 Fraction	µg/L								<100	<100
C29 - C36 Fraction	µg/L								<50	<50
C10 - C36 Fraction (sum)	µg/L	600 [4]							<50	<50

NOTES:
1. SRT Healthy Rivers Action Plan Long Term / Short Term Targets
2. ANZECC 99% protection level for Chlordane
3. ANZECC 99% protection level for Endosulfan
4. Dutch intervention values (2000).
5. pH > 6 / pH < 6
6. ASS disturbance indicators
7. Effluent treatment triggers

8 RESULTS

8.1 Laboratory Results

Field results and laboratory analysis of groundwater samples undertaken onsite are presented in Table 3 through to Table 8. To assess the groundwater quality at the Site, water quality results were compared against the criteria outlined within the DEC's *Contaminated Site Management Series - Assessment Levels for Soil, Sediment and Water* (DEC, 2010). Laboratory results were compared against the following criteria;

- Freshwater Ecosystem Trigger Values, Marine Ecosystem Trigger Values, Short-term Irrigation Water and the Long-term Irrigation Water from the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* prepared by the Australian and New Zealand Environment and Conservation Council (ANZECC, 2000);
- Drinking Water Health Value and Drinking Water Aesthetic Value from the *Australian Drinking Water Guidelines* (NHMRC & ARMCANZ, 2004); and,
- Domestic Non-potable Groundwater Use from the Department of Health's (DoH) Contaminated Sites Reporting Guideline for Chemicals in Groundwater (DoH, 2006).

The following notes are the summaries of laboratory results and the comparison to assessment criteria.

Total Petroleum Hydrocarbons (TPH)
Laboratory results indicate the presence of TPH with in WRMW6 however concentrations are below assessment criteria. TPH concentrations within the remaining monitoring wells were below LOR.

Monocyclic Aromatic Hydrocarbons (MAH)
MAHs were not detected in any of the samples analysed.

Polycyclic Aromatic Hydrocarbons
PAHs were not detected in any of the samples analysed.

Phenols
Phenolic compounds were not detected in any of the samples analysed.

Metals
The following dissolved metals exceedances were detected:

- Dissolved aluminium exceeded the following assessment criteria at the associated locations;
    - WRMW1 and WRMW2 exceeded Fresh Waters assessment criteria;
    - WRMW3, WRMW4, WRMW5 and WRMW6 exceeded Fresh Waters and ADWG AV assessment criteria.
- Dissolved zinc exceeded the following assessment criteria at the associated locations;
    - WRMW3 exceeded Fresh Waters assessment criteria;

    - WRMW1, WRMW2, WRMW4, WRMW5 and WRMW6 exceeded Fresh Waters and Marine Waters assessment criteria.
- Dissolved iron exceeded the following assessment criteria at the associated locations;
    - WRMW4 exceeded Long-term Irrigation Water and Fresh Waters assessment criteria;
    - WRMW3 exceeded Long-term Irrigation Water, Fresh Waters and Marine Waters assessment criteria;
    - WRMW6 exceeded Long-term Irrigation Water, Fresh Waters and ADWG AV assessment criteria
- Dissolved nickel exceeded the following assessment criteria at the associated locations;
    - WRMW4 and WRMW6 exceeded Fresh Waters assessment criteria

The following total metals exceedances were detected:

- Total aluminium exceeded the following assessment criteria at the associated locations;
    - WRMW6 exceeded Fresh Waters and ADWG AV assessment criteria;
    - WRMW1 and WRMW2 exceeded Fresh Waters, ADWG AV and DoH assessment criteria;
    - WRMW4 and WRMW5 exceeded Fresh Waters, ADWG AV, DoH and Long-term Irrigation Water assessment criteria;
    - WRMW3 exceeded all assessment criteria.
- Total copper exceeded the Fresh Water assessment criteria for all locations.
- Total lead exceeded the following assessment criteria at the associated locations;
    - WRMW1 exceeded Fresh Waters assessment criteria;
    - WRMW2, WRMW5 and WRMW6 exceeded Fresh Waters and Marine Waters assessment criteria;
    - WRMW3 and WRMW5 exceeded Fresh Waters, Marine Waters and ADWG HV assessment criteria.
- Total nickel exceeded Fresh Waters assessment criteria within WRMW4 and WRMW6.
- Total zinc exceeded the Fresh Waters and Marine Waters assessment criteria at all locations.
- Total iron exceeded the following assessment criteria at the associated locations;
    - WRMW1 exceeded Long-term Irrigation Water assessment criteria;
    - WRMW5 exceeded Long-term Irrigation Waters, Fresh Waters and ADWG AV assessment criteria;
    - WRMW2, WRMW4 and WRMW6 exceeded Long-term Irrigation Water, Fresh Waters and Marine Water assessment criteria;
    - WRMW3 exceeded Long-term Irrigation Water, Fresh Waters, Marine Waters, ADWG AV and DoH assessment criteria.

OC Pesticides

OC pesticides were below laboratory assessment criteria for all laboratory samples.

OP Pesticides

OP pesticides were not detected in any of the samples analysed. It is noted that the primary laboratory detection limits were not low enough to detect methyl parathion at DNPGW trigger values.

Major Anions and Cations

No exceedances were identified.

Nutrients

Total Nitrogen exceeded Fresh Waters assessment criteria for all monitoring well locations tested.

Total Phosphorus exceeded Fresh Waters assessment criteria at WRMW3.

8.2 Historical Data

Laboratory analyses of samples completed for GME#3 are tabulated against historical monitoring events to identify changes in groundwater quality. The following points are comparisons of current results from GME#3 against historical data.

- Laboratory results of MW1 samples indicate a decrease in pH, Total Aluminium, Total Lead and Total Nitrogen and Total Phosphorus. Increases in levels were observed for Total Copper, Total Zinc and Total Iron. All other analytes remained similar throughout both monitoring events.
- MW2 laboratory results indicate that pH, Suspended Solids (SS), Total Acidity, Total Zinc and Total Iron have decreased between monitoring events. Electrical Conductivity (EC), Total Dissolved Solids (TDS) Total Aluminium, Total Copper and Total Lead have increased whilst all other analytes have remained similar.
- Results for MW3 show that pH, SS, Turbidity, Total Alkalinity, Total Acidity, Total Aluminium, Total Copper, Total Lead, Total Manganese, Total Zinc, Total Iron and Total Nitrogen have decreased. TDS, Sulfate, Chloride and Total Phosphorus have increased. All other analytes remained similar throughout all monitoring events.
- Laboratory results of MW4 indicate a decrease in EC, TDS, Total Acidity, Chloride, Total Nitrogen and Total Phosphorus; however an increase of SS, Turbidity, Total Aluminium, Total Copper, Total Lead, Total Nickel, Total Zinc, and Total iron were noted. All other analytes remained similar over the monitoring events.
- Comparisons of MW5 results indicate a decrease in SS, Turbidity, Total Acidity, Total Copper, Total Nitrogen and Total Phosphorus, whilst increases were evident in EC, TDS, Total Alkalinity, Sulfate, Chloride, Total Aluminium, Total Lead, Total Nickel, Total Zinc and Total Iron. All other analytes remained relatively similar throughout the monitoring events.
- MW6 laboratory results show a decrease in Total Alkalinity, Total Acidity, Sulfate, Total Iron and Total Nitrogen. Increases were observed for SS, Turbidity, Total Aluminium, Total Copper, Total Nickel, Total Zinc, TPH in the C29 – C36 Fraction and the sum of TPH. All other analytes remained similar throughout the monitoring event.

Table 3 MW1 Groundwater Laboratory Analysis Results

Analyte grouping/Analyte	Units	ANZECC & ARMCANZ		ADWG		DoH	ANZECC & ARMCANZ		18/05/2012	30/08/2012	15/01/2013
		Fresh Waters	Marine Waters	Drinking Water Health Value (HV)	Drinking Water Aesthetic Value (AV)	Domestic non-potable groundwater use	Short-term Irrigation Water	Long-term Irrigation Water	WRMW1	WRMW1	WRMW1
pH Value	pH Unit	6.5-8.5	8.0-8.4		6.5-8.5			6.0-8.5	6.58	6.77	6.17
Electrical Conductivity	µS/cm								635	716	788
Total Dissolved Solids	mg/L								434	474	562
Suspended Solids	mg/L								582	950	138
Turbidity	NTU								166	202	62.8
Total Alkalinity $CaCO_3$	mg/L								43	36	35
Acidity as $CaCO_3$	mg/L								15	35	40
Sulfate as SO_4^{2-}	mg/L			500	250	5000			105	123	108
Chloride	mg/L				250	2500			134	138	157
Dissolved Metals											
Aluminium	mg/L	0.055			0.2	2	20	5	0.04	0.09	0.11
Arsenic	mg/L	0.013		0.01		0.07	2	0.1	<0.001	<0.001	<0.001
Cadmium	mg/L	0.0002	0.0007	0.00		0.02	0.05	0.01	<0.0001	<0.0001	<0.0001
Chromium	mg/L						1	0.1	<0.001	<0.001	<0.001
Manganese	mg/L	1.9		0.50	0.1	5	10	0.2	0.005	0.004	0.002
Nickel	mg/L	0.011	0.02	0.02		0.2	2	0.2	<0.001	0.002	0.007
Selenium	mg/L	0.005		0.01		0.1	0.05	0.02	<0.01	<0.01	<0.01
Zinc	mg/L	0.008	0.015		3	30	5	2	0.005	0.013	0.045
Iron	mg/L	0.3	1.0 / 0.3[5]		0.33	3	10	0.2	<0.05	0.52	0.07
Ferrous Iron	mg/L								<0.05	0.34	0.11
Chromium VI	mg/L	0.001	0.0044	0.05		0.5			<0.010	<0.010	<0.01
Total Metals											
Aluminium	mg/L	0.055			0.2	2	20	5	11.1	7.69	4.69
Arsenic	mg/L	0.013		0.01		0.07	2	0.1	<0.001	<0.001	<0.001
Cadmium	mg/L	0.0002	0.0007	0.002		0.02	0.05	0.01	<0.0001	<0.0001	<0.0001
Chromium	mg/L						1	0.1	0.007	0.005	0.003
Copper	mg/L	0.0014	0.0013	2	1	20	5	0.2	0.004	0.002	0.005
Lead	mg/L	0.0034	0.0044	0.01		0.1	5	2	0.013	0.015	0.004
Manganese	mg/L	1.9		0.5	0.1	5	10	0.2	0.006	0.004	0.003
Molybdenum	mg/L			0.05		0.5	0.05	0.01	<0.001	<0.001	<0.001
Nickel	mg/L	0.011	0.02	0.02		0.2	2	0.2	0.002	0.003	0.007
Selenium	mg/L	0.005		0.01		0.1	0.05	0.02	<0.01	<0.01	<0.01
Silver	mg/L	0.00005	0.0014	0.1		1			<0.001	<0.001	<0.001
Zinc	mg/L	0.008	0.015		3	30	5	2	0.008	0.007	0.044
Iron	mg/L	0.3	1.0 / 0.35		0.33	3	10	0.2	0.29	0.21	0.23
Mercury	mg/L	0.00006	0.0001	0.001		0.01	0.002	0.002	0.0001	0.0001	<0.0001
Nutrients											
Ammonia as N	mg/L	0.9	0.91						0.06	0.03	0.02
Nitrite as N	mg/L			3.0		30			0.03	0.02	0.01
Nitrate as N	mg/L			50		500			5.15	4.91	1.86
Kjeldhal Nitrogen	mg/L								0.5	1.4	0.5
Total Nitrogen	mg/L	1.0 / 2.0[1]							5.7	6.3	2.4
Total Phosphorus	mg/L	0.1 / 0.2[1]							0.01	0.19	<0.01
Reactive Phosphorus	mg/L								<0.01	<0.01	<0.01
Sulfide	mg/L	0.001							0.1	<0.1	<0.1
COD	mg/L								18	14	13
BOD	mg/L								<2	<2	<2
Organochlorine Pesticides (OC)											
alpha-BHC	µg/L								<0.5	<0.5	<0.5
Hexachlorobenzene (HCB)	µg/L								<0.5	<0.5	<0.5
beta-BHC	µg/L								<0.5	<0.5	<0.5
gamma-BHC	µg/L								<0.5	<0.5	<0.5
delta-BHC	µg/L								<0.5	<0.5	<0.5
Heptachlor	µg/L	0.01							<0.5	<0.5	<0.5
Aldrin	µg/L								<0.5	<0.5	<0.5
Heptachlor epoxide	µg/L			0.05	0.3	3			<0.5	<0.5	<0.5
trans-Chlordane	µg/L	0.03[2]		0.01	1	10			<0.5	<0.5	<0.5
alpha-Endosulfan	µg/L	0.03[3]	0.005[3]	0.05	30	30			<0.5	<0.5	<0.5
cis-Chlordane	µg/L	0.03[2]		0.01	1	10			<0.5	<0.5	<0.5
Dieldrin	µg/L								<0.5	<0.5	<0.5
4.4`-DDE	µg/L								<0.5	<0.5	<0.5
Endrin	µg/L	0.01	0.004						<0.5	<0.5	<0.5
beta-Endosulfan	µg/L	0.03[3]	0.005[3]						<0.5	<0.5	<0.5
4.4`-DDD	µg/L								<0.5	<0.5	<0.5
Endrin aldehyde	µg/L								<0.5	<0.5	<0.5
Endosulfan sulfate	µg/L								<0.5	<0.5	<0.5
4.4`-DDT	µg/L	0.006		0.06	30	0.1			<2	<2	<2.0
Endrin ketone	µg/L								<0.5	<0.5	<0.5
Methoxychlor	µg/L								<2	<2	<2.0
Aldrin plus dieldrin	µg/L			0.010	0.3	3			<1	<0.5	<1.0
Organophosphorus Pesticides (OP)											
Dichlorvos	µg/L								<0.5	<0.5	<0.5
Demeton-S-methyl	µg/L								<0.5	<0.5	<0.5
Monocrotophos	µg/L								<2	<2	<2.0
Dimethoate	µg/L	0.15			50	50			<0.5	<0.5	<0.5
Diazinon	µg/L	0.01		1	3	1			<0.5	<0.5	<0.5
Chlorpyrifos-methyl	µg/L	0.01	0.009		10	100			<0.5	<0.5	<0.5
Parathion-methyl	µg/L								<2	<2	<2.0
Malathion	µg/L	0.05							<0.5	<0.5	<0.5
Fenthion	µg/L								<0.5	<0.5	<0.5
Chlorpyrifos	µg/L	0.01	0.009						<0.5	<0.5	<0.5
Parathion	µg/L	0.004			10	10			<2	<2	<2.0
Pirimphos-ethyl	µg/L								<0.5	<0.5	<0.5
Chlorfenvinphos	µg/L								<0.5	<0.5	<0.5
Bromophos-ethyl	µg/L								<0.5	<0.5	<0.5
Fenamiphos	µg/L								<0.5	<0.5	<0.5
Prothiofos	µg/L								<0.5	<0.5	<0.5
Ethion	µg/L								<0.5	<0.5	<0.5
Carbophenothion	µg/L								<0.5	<0.5	<0.5
Azinphos Methyl	µg/L	0.02							<0.5	<0.5	<0.5

Monocyclic Aromatic Hydrocarbons											
Benzene	µg/L	0.95	0.5	0.001		0.01			-	-	<1
Toluene	µg/L			0.80	0.025	0.025			-	-	<2
Ethylbenzene	µg/L			0.30	0.003	0.003			-	-	<2
meta- & para-Xylene	µg/L	200							-	-	<2
Styrene	µg/L			0.03	0.004	0.004			<5	<5	<5
ortho-Xylene	µg/L	350							-	-	<2
Isopropylbenzene	µg/L								<5	<5	<5
n-Propylbenzene	µg/L								<5	<5	<5
1.3.5-Trimethylbenzene	µg/L								<5	<5	<5
sec-Butylbenzene	µg/L								<5	<5	<5
1.2.4-Trimethylbenzene	µg/L								<5	<5	<5
tert-Butylbenzene	µg/L								<5	<5	<5
p-Isopropyltoluene	µg/L								<5	<5	<5
n-Butylbenzene	µg/L								<5	<5	<5
Oxygenated Compounds											
Vinyl Acetate	µg/L								<50	<50	<50
2-Butanone (MEK)	µg/L								<50	<50	<50
4-Methyl-2-pentanone (MIBK)	µg/L								<50	<50	<50
2-Hexanone (MBK)	µg/L								<50	<50	<50
Sulfonated Compounds											
Carbon disulfide	µg/L								<5	<5	<5
Fumigants											
2.2-Dichloropropane	µg/L								<5	<5	<5
1.2-Dichloropropane	µg/L								<5	<5	<5
cis-1.3-Dichloropropylene	µg/L								<5	<5	<5
trans-1.3-Dichloropropylene	µg/L								<5	<5	<5
1.2-Dibromoethane (EDB)	µg/L								<5	<5	<5
Halogenated Aliphatic Compounds											
Dichlorodifluoromethane	µg/L								<50	<50	<50
Chloromethane	µg/L								<50	<50	<50
Vinyl chloride	µg/L			0.0003		0.003			<50	<50	<50
Bromomethane	µg/L								<50	<50	<50
Chloroethane	µg/L								<50	<50	<50
Trichlorofluoromethane	µg/L								<50	<50	<50
1.1-Dichloroethene	µg/L			0.03		0.3			<5	<5	<5
Iodomethane	µg/L								<5	<5	<5
trans-1.2-Dichloroethene	µg/L								<5	<5	<5
1.1-Dichloroethane	µg/L								<5	<5	<5
cis-1.2-Dichloroethene	µg/L								<5	<5	<5
1.1.1-Trichloroethane	µg/L								<5	<5	<5
1.1-Dichloropropylene	µg/L								<5	<5	<5
Carbon Tetrachloride	µg/L								<5	<5	<5
1.2-Dichloroethane	µg/L			0.003		0.03			<5	<5	<5
Trichloroethene	µg/L								<5	<5	<5
Dibromomethane	µg/L								<5	<5	<5
1.1.2-Trichloroethane	µg/L	6500	1900						<5	<5	<5
1.3-Dichloropropane	µg/L								<5	<5	<5
Tetrachloroethene	µg/L			0.05		0.5			<5	<5	<5
1.1.1.2-Tetrachloroethane	µg/L								<5	<5	<5
trans-1.4-Dichloro-2-butene	µg/L								<5	<5	<5
cis-1.4-Dichloro-2-butene	µg/L								<5	<5	<5
1.1.2.2-Tetrachloroethane	µg/L								<5	<5	<5
1.2.3-Trichloropropane	µg/L								<5	<5	<5
Pentachloroethane	µg/L								<5	<5	<5
1.2-Dibromo-3-chloropropane	µg/L								<5	<5	<5
Hexachlorobutadiene	µg/L								<5	<5	<5
Halogenated Aromatic Compounds											
Chlorobenzene	µg/L			0.30	0.01	0.01			<5	<5	<5
Bromobenzene	µg/L								<5	<5	<5
2-Chlorotoluene	µg/L								<5	<5	<5
4-Chlorotoluene	µg/L								<5	<5	<5
1.3-Dichlorobenzene	µg/L	0.26			0.02	0.02			<5	<5	<5
1.4-Dichlorobenzene	µg/L	0.06		0.04	0.003	0.003			<5	<5	<5
1.2-Dichlorobenzene	µg/L	0.16		1.5	0.001	0.001			<5	<5	<5
1.2.4-Trichlorobenzene	µg/L	0.085	80	0.03	0.005	0.005			<5	<5	<5
1.2.3-Trichlorobenzene	µg/L	0.003		0.03	0.005	0.005			<5	<5	<5
Trihalomethanes											
Chloroform	µg/L								<5	<5	<5
Bromodichloromethane	µg/L								<5	<5	<5
Dibromochloromethane	µg/L								<5	<5	<5
Bromoform	µg/L								<5	<5	<5
Phenolic Compounds											
Phenol	µg/L	320	400						<1.0	<1.0	<1.0
2-Chlorophenol	µg/L	340		300	0.1	3000			<1.0	<1.0	<1.0
2-Methylphenol	µg/L								<1.0	<1.0	<1.0
3- & 4-Methylphenol	µg/L								<2.0	<2.0	<2.0
2-Nitrophenol	µg/L								<1.0	<1.0	<1.0
2.4-Dimethylphenol	µg/L								<1.0	<1.0	<1.0
2.4-Dichlorophenol	µg/L	120		200	0.3	2000			<1.0	<1.0	<1.0
2.6-Dichlorophenol	µg/L								<1.0	<1.0	<1.0
4-Chloro-3-Methylphenol	µg/L								<1.0	<1.0	<1.0
2.4.6-Trichlorophenol	µg/L	3		20	2	200			<1.0	<1.0	<1.0
2.4.5-Trichlorophenol	µg/L								<1.0	<1.0	<1.0
Pentachlorophenol	µg/L	3.6	11						<2.0	<2.0	<2.0

Polynuclear Aromatic Hydrocarbons											
Naphthalene	µg/L	16	50						<1.0	<1.0	<1.0
Acenaphthylene	µg/L								<1.0	<1.0	<1.0
Acenaphthene	µg/L								<1.0	<1.0	<1.0
Fluorene	µg/L								<1.0	<1.0	<1.0
Phenanthrene	µg/L								<1.0	<1.0	<1.0
Anthracene	µg/L								<1.0	<1.0	<1.0
Fluoranthene	µg/L								<1.0	<1.0	<1.0
Pyrene	µg/L								<1.0	<1.0	<1.0
Benz(a)anthracene	µg/L								<1.0	<1.0	<1.0
Chrysene	µg/L								<1.0	<1.0	<1.0
Benzo(b)fluoranthene	µg/L								<1.0	<1.0	<1.0
Benzo(k)fluoranthene	µg/L								<1.0	<1.0	<1.0
Benzo(a)pyrene	µg/L			0.01		0.1			<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L								<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	µg/L								<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	µg/L								<1.0	<1.0	<1.0
Total Petroleum Hydrocarbons											
C6 - C9 Fraction	µg/L								<20	<20	<20
C10 - C14 Fraction	µg/L								<50	<50	<50
C15 - C28 Fraction	µg/L								<100	<100	<100
C29 - C36 Fraction	µg/L								<50	<50	<50
C10 - C36 Fraction (sum)	µg/L	600 [4]							<50	<50	<50

NOTES:
1. SRT Healthy Rivers Action Plan Long Term / Short Term Targets
2. ANZECC 99% protection level for Chlordane
3. ANZECC 99% protection level for Endosulfan
4. Dutch intervention values (2000).
5. pH > 6 / pH < 6
6. ASS disturbance indicators
7. Effluent treatment triggers

Table 4 MW2 Groundwater Laboratory Analysis Results

Analyte grouping/Analyte	Units	ANZECC & ARMCANZ		ADWG		DoH	ANZECC & ARMCANZ				
		Fresh Waters	Marine Waters	Drinking Water Health Value (HV)	Drinking Water Aesthetic Value (AV)	Domestic non-potable groundwater use	Short-term Irrigation Water	Long-term Irrigation Water	18/05/2012 WRMW2	30/08/2012 WRMW2	15/01/2013 WRMW2
pH Value	pH Unit	6.5-8.5	8.0-8.4		6.5-8.5			6.0-8.5	6.14	5.72	5.21
Electrical Conductivity	µS/cm								307	292	347
Total Dissolved Solids	mg/L								244	169	290
Suspended Solids	mg/L								292	106	75
Turbidity	NTU								236	32	54.7
Total Alkalinity $CaCO_3$	mg/L								17	3	2
Acidity as $CaCO_3$	mg/L								26	42	39
Sulfate as SO_4^{2-}	mg/L			500	250	5000			13	11	9
Chloride	mg/L				250	2500			80	82	88
Dissolved Metals											
Aluminium	mg/L	0.055			0.2	2	20	5	0.02	0.03	0.1
Arsenic	mg/L	0.013		0.01		0.07	2	0.1	0.001	<0.001	<0.001
Cadmium	mg/L	0.0002	0.0007	0.00		0.02	0.05	0.01	<0.0001	<0.0001	<0.0001
Chromium	mg/L						1	0.1	<0.001	<0.001	<0.001
Manganese	mg/L	1.9		0.50	0.1	5	10	0.2	0.022	0.003	0.001
Nickel	mg/L	0.011	0.02	0.02		0.2	2	0.2	0.002	0.006	0.008
Selenium	mg/L	0.005		0.01		0.1	0.05	0.02	<0.01	<0.01	<0.01
Zinc	mg/L	0.008	0.015		3	30	5	2	0.048	0.025	0.066
Iron	mg/L	0.3	1.0 / 0.3[5]		0.33	3	10	0.2	0.68	0.75	0.12
Ferrous Iron	mg/L								0.43	0.76	0.12
Chromium VI	mg/L	0.001	0.0044	0.05		0.5			<0.010	<0.010	<0.01
Total Metals											
Aluminium	mg/L	0.055			0.2	2	20	5	16.2	3.15	3.3
Arsenic	mg/L	0.013		0.01		0.07	2	0.1	<0.001	<0.001	<0.001
Cadmium	mg/L	0.0002	0.0007	0.002		0.02	0.05	0.01	<0.0001	<0.0001	<0.0001
Chromium	mg/L						1	0.1	0.016	0.003	0.003
Copper	mg/L	0.0014	0.0013	2	1	20	5	0.2	0.07	0.005	0.011
Lead	mg/L	0.0034	0.0044	0.01		0.1	5	2	0.017	0.003	0.005
Manganese	mg/L	1.9		0.5	0.1	5	10	0.2	0.026	0.004	0.002
Molybdenum	mg/L			0.05		0.5	0.05	0.01	<0.001	<0.001	<0.001
Nickel	mg/L	0.011	0.02	0.02		0.2	2	0.2	0.005	0.006	0.009
Selenium	mg/L	0.005		0.01		0.1	0.05	0.02	<0.01	<0.01	<0.01
Silver	mg/L	0.00005	0.0014	0.1		1			<0.001	<0.001	<0.001
Zinc	mg/L	0.008	0.015		3	30	5	2	0.08	0.079	0.07
Iron	mg/L	0.3	1.0 / 0.35		0.33	3	10	0.2	4.82	2.12	1.37
Mercury	mg/L	0.00006	0.0001	0.001		0.01	0.002	0.002	0.0001	<0.0001	<0.0001
Nutrients											
Ammonia as N	mg/L	0.9	0.91						0.36	0.03	0.01
Nitrite as N	mg/L			3.0		30			0.02	0.01	<0.01
Nitrate as N	mg/L			50		500			0.62	1.09	1.24
Kjeldhal Nitrogen	mg/L								0.5	0.3	0.2
Total Nitrogen	mg/L	1.0 / 2.0[1]							1.1	1.4	1.4
Total Phosphorus	mg/L	0.1 / 0.2[1]							0.15	0.03	0.04
Reactive Phosphorus	mg/L								<0.01	<0.01	<0.01
Sulfide	mg/L	0.001							<0.1	<0.1	<0.1
COD	mg/L								16	<5	<5
BOD	mg/L								3	<2	<2
Organochlorine Pesticides (OC)											
alpha-BHC	µg/L								<0.5	<0.5	<0.5
Hexachlorobenzene (HCB)	µg/L								<0.5	<0.5	<0.5
beta-BHC	µg/L								<0.5	<0.5	<0.5
gamma-BHC	µg/L								<0.5	<0.5	<0.5
delta-BHC	µg/L								<0.5	<0.5	<0.5
Heptachlor	µg/L	0.01							<0.5	<0.5	<0.5
Aldrin	µg/L								<0.5	<0.5	<0.5
Heptachlor epoxide	µg/L			0.05	0.3	3			<0.5	<0.5	<0.5
trans-Chlordane	µg/L	0.03[2]		0.01	1	10			<0.5	<0.5	<0.5
alpha-Endosulfan	µg/L	0.03[3]	0.005[3]	0.05	30	30			<0.5	<0.5	<0.5
cis-Chlordane	µg/L	0.03[2]		0.01	1	10			<0.5	<0.5	<0.5
Dieldrin	µg/L								<0.5	<0.5	<0.5
4.4`-DDE	µg/L								<0.5	<0.5	<0.5
Endrin	µg/L	0.01	0.004						<0.5	<0.5	<0.5
beta-Endosulfan	µg/L	0.03[3]	0.005[3]						<0.5	<0.5	<0.5
4.4`-DDD	µg/L								<0.5	<0.5	<0.5
Endrin aldehyde	µg/L								<0.5	<0.5	<0.5
Endosulfan sulfate	µg/L								<0.5	<0.5	<0.5
4.4`-DDT	µg/L	0.006		0.06	30	0.1			<2	<2	<2.0
Endrin ketone	µg/L								<0.5	<0.5	<0.5
Methoxychlor	µg/L								<2	<2	<2.0
Aldrin plus dieldrin	µg/L			0.010	0.3	3			<1	<0.5	<1.0
Organophosphorus Pesticides (OP)											
Dichlorvos	µg/L								<0.5	<0.5	<0.5
Demeton-S-methyl	µg/L								<0.5	<0.5	<0.5
Monocrotophos	µg/L								<2	<2	<2.0
Dimethoate	µg/L	0.15			50	50			<0.5	<0.5	<0.5
Diazinon	µg/L	0.01		1	3	1			<0.5	<0.5	<0.5
Chlorpyrifos-methyl	µg/L	0.01	0.009		10	100			<0.5	<0.5	<0.5
Parathion-methyl	µg/L								<2	<2	<2.0
Malathion	µg/L	0.05							<0.5	<0.5	<0.5
Fenthion	µg/L								<0.5	<0.5	<0.5
Chlorpyrifos	µg/L	0.01	0.009						<0.5	<0.5	<0.5
Parathion	µg/L	0.004			10	10			<2	<2	<2.0
Pirimphos-ethyl	µg/L								<0.5	<0.5	<0.5
Chlorfenvinphos	µg/L								<0.5	<0.5	<0.5
Bromophos-ethyl	µg/L								<0.5	<0.5	<0.5
Fenamiphos	µg/L								<0.5	<0.5	<0.5
Prothiofos	µg/L								<0.5	<0.5	<0.5
Ethion	µg/L								<0.5	<0.5	<0.5
Carbophenothion	µg/L								<0.5	<0.5	<0.5
Azinphos Methyl	µg/L	0.02							<0.5	<0.5	<0.5

Monocyclic Aromatic Hydrocarbons											
Benzene	µg/L	0.95	0.5	0.001		0.01			-	-	<1
Toluene	µg/L			0.80	0.025	0.025			-	-	<2
Ethylbenzene	µg/L			0.30	0.003	0.003			-	-	<2
meta- & para-Xylene	µg/L	200							-	-	<2
Styrene	µg/L			0.03	0.004	0.004			<5	<5	<5
ortho-Xylene	µg/L	350							-	-	<2
Isopropylbenzene	µg/L								<5	<5	<5
n-Propylbenzene	µg/L								<5	<5	<5
1.3.5-Trimethylbenzene	µg/L								<5	<5	<5
sec-Butylbenzene	µg/L								<5	<5	<5
1.2.4-Trimethylbenzene	µg/L								<5	<5	<5
tert-Butylbenzene	µg/L								<5	<5	<5
p-Isopropyltoluene	µg/L								<5	<5	<5
n-Butylbenzene	µg/L								<5	<5	<5
Oxygenated Compounds											
Vinyl Acetate	µg/L								<50	<50	<50
2-Butanone (MEK)	µg/L								<50	<50	<50
4-Methyl-2-pentanone (MIBK)	µg/L								<50	<50	<50
2-Hexanone (MBK)	µg/L								<50	<50	<50
Sulfonated Compounds											
Carbon disulfide	µg/L								<5	<5	<5
Fumigants											
2.2-Dichloropropane	µg/L								<5	<5	<5
1.2-Dichloropropane	µg/L								<5	<5	<5
cis-1.3-Dichloropropylene	µg/L								<5	<5	<5
trans-1.3-Dichloropropylene	µg/L								<5	<5	<5
1.2-Dibromoethane (EDB)	µg/L								<5	<5	<5
Halogenated Aliphatic Compounds											
Dichlorodifluoromethane	µg/L								<50	<50	<50
Chloromethane	µg/L								<50	<50	<50
Vinyl chloride	µg/L			0.0003		0.003			<50	<50	<50
Bromomethane	µg/L								<50	<50	<50
Chloroethane	µg/L								<50	<50	<50
Trichlorofluoromethane	µg/L								<50	<50	<50
1.1-Dichloroethene	µg/L			0.03		0.3			<5	<5	<5
Iodomethane	µg/L								<5	<5	<5
trans-1.2-Dichloroethene	µg/L								<5	<5	<5
1.1-Dichloroethane	µg/L								<5	<5	<5
cis-1.2-Dichloroethene	µg/L								<5	<5	<5
1.1.1-Trichloroethane	µg/L								<5	<5	<5
1.1-Dichloropropylene	µg/L								<5	<5	<5
Carbon Tetrachloride	µg/L								<5	<5	<5
1.2-Dichloroethane	µg/L			0.003		0.03			<5	<5	<5
Trichloroethene	µg/L								<5	<5	<5
Dibromomethane	µg/L								<5	<5	<5
1.1.2-Trichloroethane	µg/L	6500	1900						<5	<5	<5
1.3-Dichloropropane	µg/L								<5	<5	<5
Tetrachloroethene	µg/L			0.05		0.5			<5	<5	<5
1.1.1.2-Tetrachloroethane	µg/L								<5	<5	<5
trans-1.4-Dichloro-2-butene	µg/L								<5	<5	<5
cis-1.4-Dichloro-2-butene	µg/L								<5	<5	<5
1.1.2.2-Tetrachloroethane	µg/L								<5	<5	<5
1.2.3-Trichloropropane	µg/L								<5	<5	<5
Pentachloroethane	µg/L								<5	<5	<5
1.2-Dibromo-3-chloropropane	µg/L								<5	<5	<5
Hexachlorobutadiene	µg/L								<5	<5	<5
Halogenated Aromatic Compounds											
Chlorobenzene	µg/L			0.30	0.01	0.01			<5	<5	<5
Bromobenzene	µg/L								<5	<5	<5
2-Chlorotoluene	µg/L								<5	<5	<5
4-Chlorotoluene	µg/L								<5	<5	<5
1.3-Dichlorobenzene	µg/L	0.26			0.02	0.02			<5	<5	<5
1.4-Dichlorobenzene	µg/L	0.06		0.04	0.003	0.003			<5	<5	<5
1.2-Dichlorobenzene	µg/L	0.16		1.5	0.001	0.001			<5	<5	<5
1.2.4-Trichlorobenzene	µg/L	0.085	80	0.03	0.005	0.005			<5	<5	<5
1.2.3-Trichlorobenzene	µg/L	0.003		0.03	0.005	0.005			<5	<5	<5
Trihalomethanes											
Chloroform	µg/L								<5	<5	<5
Bromodichloromethane	µg/L								<5	<5	<5
Dibromochloromethane	µg/L								<5	<5	<5
Bromoform	µg/L								<5	<5	<5
Phenolic Compounds											
Phenol	µg/L	320	400						<1.0	<1.0	<1.0
2-Chlorophenol	µg/L	340		300	0.1	3000			<1.0	<1.0	<1.0
2-Methylphenol	µg/L								<1.0	<1.0	<1.0
3- & 4-Methylphenol	µg/L								**2.6**	<2.0	<2.0
2-Nitrophenol	µg/L								<1.0	<1.0	<1.0
2.4-Dimethylphenol	µg/L								<1.0	<1.0	<1.0
2.4-Dichlorophenol	µg/L	120		200	0.3	2000			<1.0	<1.0	<1.0
2.6-Dichlorophenol	µg/L								<1.0	<1.0	<1.0
4-Chloro-3-Methylphenol	µg/L								<1.0	<1.0	<1.0
2.4.6-Trichlorophenol	µg/L	3		20	2	200			<1.0	<1.0	<1.0
2.4.5-Trichlorophenol	µg/L								<1.0	<1.0	<1.0
Pentachlorophenol	µg/L	3.6	11						<2.0	<2.0	<2.0

Polynuclear Aromatic Hydrocarbons											
Naphthalene	µg/L	16	50						<1.0	<1.0	<1.0
Acenaphthylene	µg/L								<1.0	<1.0	<1.0
Acenaphthene	µg/L								<1.0	<1.0	<1.0
Fluorene	µg/L								<1.0	<1.0	<1.0
Phenanthrene	µg/L								<1.0	<1.0	<1.0
Anthracene	µg/L								<1.0	<1.0	<1.0
Fluoranthene	µg/L								<1.0	<1.0	<1.0
Pyrene	µg/L								<1.0	<1.0	<1.0
Benz(a)anthracene	µg/L								<1.0	<1.0	<1.0
Chrysene	µg/L								<1.0	<1.0	<1.0
Benzo(b)fluoranthene	µg/L								<1.0	<1.0	<1.0
Benzo(k)fluoranthene	µg/L								<1.0	<1.0	<1.0
Benzo(a)pyrene	µg/L			0.01		0.1			<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L								<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	µg/L								<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	µg/L								<1.0	<1.0	<1.0
Total Petroleum Hydrocarbons											
C6 - C9 Fraction	µg/L								<20	<20	<20
C10 - C14 Fraction	µg/L								<50	<50	<50
C15 - C28 Fraction	µg/L								<100	<100	<100
C29 - C36 Fraction	µg/L								<50	<50	<50
C10 - C36 Fraction (sum)	µg/L	600 [4]							<50	<50	<50

NOTES:
1. SRT Healthy Rivers Action Plan Long Term / Short Term Targets
2. ANZECC 99% protection level for Chlordane
3. ANZECC 99% protection level for Endosulfan
4. Dutch intervention values (2000).
5. pH > 6 / pH < 6
6. ASS disturbance indicators
7. Effluent treatment triggers

Table 5 MW3 Groundwater Laboratory Analysis Results

Analyte grouping/Analyte	Units	ANZECC & ARMCANZ		ADWG		DoH	ANZECC & ARMCANZ				
		Fresh Waters	Marine Waters	Drinking Water Health Value (HV)	Drinking Water Aesthetic Value (AV)	Domestic non-potable groundwater use	Short-term Irrigation Water	Long-term Irrigation Water	18/05/2012 WRMW3	30/08/2012 WRMW3	15/01/2013 WRMW3
pH Value	pH Unit	6.5-8.5	8.0-8.4		6.5-8.5			6.0-8.5	7.41	7.83	7.13
Electrical Conductivity	µS/cm								1070	901	906
Total Dissolved Solids	mg/L								704	567	598
Suspended Solids	mg/L								425	1610	287
Turbidity	NTU								383	1120	900
Total Alkalinity $CaCO_3$	mg/L								292	157	130
Acidity as $CaCO_3$	mg/L								16	18	8
Sulfate as SO_4^{2-}	mg/L			500	250	5000			40	18	41
Chloride	mg/L				250	2500			216	219	184
Dissolved Metals											
Aluminium	mg/L	0.055			0.2	2	20	5	<0.01	0.02	0.61
Arsenic	mg/L	0.013		0.01		0.07	2	0.1	0.004	0.002	0.002
Cadmium	mg/L	0.0002	0.0007	0.00		0.02	0.05	0.01	<0.0001	<0.0001	<0.0001
Chromium	mg/L						1	0.1	<0.001	<0.001	<0.001
Manganese	mg/L	1.9		0.50	0.1	5	10	0.2	0.182	0.108	0.082
Nickel	mg/L	0.011	0.02	0.02		0.2	2	0.2	0.001	0.003	0.003
Selenium	mg/L	0.005		0.01		0.1	0.05	0.02	<0.01	<0.01	<0.01
Zinc	mg/L	0.008	0.015		3	30	5	2	0.005	0.006	0.011
Iron	mg/L	0.3	1.0 / 0.3[5]		0.33	3	10	0.2	2.16	<0.05	1.17
Ferrous Iron	mg/L								2.28	<0.05	0.61
Chromium VI	mg/L	0.001	0.0044	0.05		0.5			<0.010	<0.010	<0.01
Total Metals											
Aluminium	mg/L	0.055			0.2	2	20	5	34.4	24.9	21.5
Arsenic	mg/L	0.013		0.01		0.07	2	0.1	0.01	0.007	0.006
Cadmium	mg/L	0.0002	0.0007	0.002		0.02	0.05	0.01	0.0001	0.0002	<0.0001
Chromium	mg/L						1	0.1	0.047	0.044	0.03
Copper	mg/L	0.0014	0.0013	2	1	20	5	0.2	0.032	0.036	0.022
Lead	mg/L	0.0034	0.0044	0.01		0.1	5	2	0.087	0.079	0.052
Manganese	mg/L	1.9		0.5	0.1	5	10	0.2	0.191	0.129	0.094
Molybdenum	mg/L			0.05		0.5	0.05	0.01	<0.001	0.001	<0.001
Nickel	mg/L	0.011	0.02	0.02		0.2	2	0.2	0.014	0.019	0.011
Selenium	mg/L	0.005		0.01		0.1	0.05	0.02	<0.01	<0.01	<0.01
Silver	mg/L	0.00005	0.0014	0.1		1			<0.001	<0.001	<0.001
Zinc	mg/L	0.008	0.015		3	30	5	2	0.068	0.079	0.061
Iron	mg/L	0.3	1.0 / 0.35		0.33	3	10	0.2	11.9	12.4	9.35
Mercury	mg/L	0.00006	0.0001	0.001		0.01	0.002	0.002	<0.0001	<0.0001	<0.0001
Nutrients											
Ammonia as N	mg/L	0.9	0.91						0.03	0.45	0.1
Nitrite as N	mg/L			3.0		30			<0.01	0.02	<0.01
Nitrate as N	mg/L			50		500			0.17	0.31	0.24
Kjeldhal Nitrogen	mg/L								0.3	1.4	0.9
Total Nitrogen	mg/L	1.0 / 2.0[1]							0.5	1.7	1.1
Total Phosphorus	mg/L	0.1 / 0.2[1]							0.24	0.51	0.63
Reactive Phosphorus	mg/L								<0.01	<0.01	<0.01
Sulfide	mg/L	0.001							<0.1	<0.1	<0.1
COD	mg/L								155	21	11
BOD	mg/L								69	5	2
Organochlorine Pesticides (OC)											
alpha-BHC	µg/L								<0.5	<0.5	<0.5
Hexachlorobenzene (HCB)	µg/L								<0.5	<0.5	<0.5
beta-BHC	µg/L								<0.5	<0.5	<0.5
gamma-BHC	µg/L								<0.5	<0.5	<0.5
delta-BHC	µg/L								<0.5	<0.5	<0.5
Heptachlor	µg/L	0.01							<0.5	<0.5	<0.5
Aldrin	µg/L								<0.5	<0.5	<0.5
Heptachlor epoxide	µg/L			0.05	0.3	3			<0.5	<0.5	<0.5
trans-Chlordane	µg/L	0.03 [2]		0.01	1	10			<0.5	<0.5	<0.5
alpha-Endosulfan	µg/L	0.03 [3]	0.005 [3]	0.05	30	30			<0.5	<0.5	<0.5
cis-Chlordane	µg/L	0.03 [2]		0.01	1	10			<0.5	<0.5	<0.5
Dieldrin	µg/L								<0.5	<0.5	<0.5
4.4`-DDE	µg/L								<0.5	<0.5	<0.5
Endrin	µg/L	0.01	0.004						<0.5	<0.5	<0.5
beta-Endosulfan	µg/L	0.03 [3]	0.005 [3]						<0.5	<0.5	<0.5
4.4`-DDD	µg/L								<0.5	<0.5	<0.5
Endrin aldehyde	µg/L								<0.5	<0.5	<0.5
Endosulfan sulfate	µg/L								<0.5	<0.5	<0.5
4.4`-DDT	µg/L	0.006		0.06	30	0.1			<2	<2	<2.0
Endrin ketone	µg/L								<0.5	<0.5	<0.5
Methoxychlor	µg/L								<2	<2	<2.0
Aldrin plus dieldrin	µg/L			0.010	0.3	3			<1	<0.5	<1.0
Organophosphorus Pesticides (OP)											
Dichlorvos	µg/L								<0.5	<0.5	<0.5
Demeton-S-methyl	µg/L								<0.5	<0.5	<0.5
Monocrotophos	µg/L								<2	<2	<2.0
Dimethoate	µg/L	0.15			50	50			<0.5	<0.5	<0.5
Diazinon	µg/L	0.01		1	3	1			<0.5	<0.5	<0.5
Chlorpyrifos-methyl	µg/L	0.01	0.009		10	100			<0.5	<0.5	<0.5
Parathion-methyl	µg/L								<2	<2	<2.0
Malathion	µg/L	0.05							<0.5	<0.5	<0.5
Fenthion	µg/L								<0.5	<0.5	<0.5
Chlorpyrifos	µg/L	0.01	0.009						<0.5	<0.5	<0.5
Parathion	µg/L	0.004			10	10			<2	<2	<2.0
Pirimphos-ethyl	µg/L								<0.5	<0.5	<0.5
Chlorfenvinphos	µg/L								<0.5	<0.5	<0.5
Bromophos-ethyl	µg/L								<0.5	<0.5	<0.5
Fenamiphos	µg/L								<0.5	<0.5	<0.5
Prothiofos	µg/L								<0.5	<0.5	<0.5
Ethion	µg/L								<0.5	<0.5	<0.5
Carbophenothion	µg/L								<0.5	<0.5	<0.5
Azinphos Methyl	µg/L	0.02							<0.5	<0.5	<0.5

Monocyclic Aromatic Hydrocarbons												
Benzene	µg/L	0.95	0.5	0.001		0.01			-	-	<1
Toluene	µg/L			0.80	0.025	0.025			-	-	<2
Ethylbenzene	µg/L			0.30	0.003	0.003			-	-	<2
meta- & para-Xylene	µg/L	200							-	-	<2
Styrene	µg/L			0.03	0.004	0.004			<5	<5	<5
ortho-Xylene	µg/L	350							-	-	<2
Isopropylbenzene	µg/L								<5	<5	<5
n-Propylbenzene	µg/L								<5	<5	<5
1.3.5-Trimethylbenzene	µg/L								<5	<5	<5
sec-Butylbenzene	µg/L								<5	<5	<5
1.2.4-Trimethylbenzene	µg/L								<5	<5	<5
tert-Butylbenzene	µg/L								<5	<5	<5
p-Isopropyltoluene	µg/L								<5	<5	<5
n-Butylbenzene	µg/L								<5	<5	<5
Oxygenated Compounds												
Vinyl Acetate	µg/L								<50	<50	<50
2-Butanone (MEK)	µg/L								<50	<50	<50
4-Methyl-2-pentanone (MIBK)	µg/L								<50	<50	<50
2-Hexanone (MBK)	µg/L								<50	<50	<50
Sulfonated Compounds												
Carbon disulfide	µg/L								<5	<5	<5
Fumigants												
2.2-Dichloropropane	µg/L								<5	<5	<5
1.2-Dichloropropane	µg/L								<5	<5	<5
cis-1.3-Dichloropropylene	µg/L								<5	<5	<5
trans-1.3-Dichloropropylene	µg/L								<5	<5	<5
1.2-Dibromoethane (EDB)	µg/L								<5	<5	<5
Halogenated Aliphatic Compounds												
Dichlorodifluoromethane	µg/L								<50	<50	<50
Chloromethane	µg/L								<50	<50	<50
Vinyl chloride	µg/L			0.0003		0.003			<50	<50	<50
Bromomethane	µg/L								<50	<50	<50
Chloroethane	µg/L								<50	<50	<50
Trichlorofluoromethane	µg/L								<50	<50	<50
1.1-Dichloroethene	µg/L			0.03		0.3			<5	<5	<5
Iodomethane	µg/L								<5	<5	<5
trans-1.2-Dichloroethene	µg/L								<5	<5	<5
1.1-Dichloroethane	µg/L								<5	<5	<5
cis-1.2-Dichloroethene	µg/L								<5	<5	<5
1.1.1-Trichloroethane	µg/L								<5	<5	<5
1.1-Dichloropropylene	µg/L								<5	<5	<5
Carbon Tetrachloride	µg/L								<5	<5	<5
1.2-Dichloroethane	µg/L			0.003		0.03			<5	<5	<5
Trichloroethene	µg/L								<5	<5	<5
Dibromomethane	µg/L								<5	<5	<5
1.1.2-Trichloroethane	µg/L	6500	1900						<5	<5	<5
1.3-Dichloropropane	µg/L								<5	<5	<5
Tetrachloroethene	µg/L			0.05		0.5			<5	<5	<5
1.1.1.2-Tetrachloroethane	µg/L								<5	<5	<5
trans-1.4-Dichloro-2-butene	µg/L								<5	<5	<5
cis-1.4-Dichloro-2-butene	µg/L								<5	<5	<5
1.1.2.2-Tetrachloroethane	µg/L								<5	<5	<5
1.2.3-Trichloropropane	µg/L								<5	<5	<5
Pentachloroethane	µg/L								<5	<5	<5
1.2-Dibromo-3-chloropropane	µg/L								<5	<5	<5
Hexachlorobutadiene	µg/L								<5	<5	<5
Halogenated Aromatic Compounds												
Chlorobenzene	µg/L			0.30	0.01	0.01			<5	<5	<5
Bromobenzene	µg/L								<5	<5	<5
2-Chlorotoluene	µg/L								<5	<5	<5
4-Chlorotoluene	µg/L								<5	<5	<5
1.3-Dichlorobenzene	µg/L	0.26			0.02	0.02			<5	<5	<5
1.4-Dichlorobenzene	µg/L	0.06		0.04	0.003	0.003			<5	<5	<5
1.2-Dichlorobenzene	µg/L	0.16		1.5	0.001	0.001			<5	<5	<5
1.2.4-Trichlorobenzene	µg/L	0.085	80	0.03	0.005	0.005			<5	<5	<5
1.2.3-Trichlorobenzene	µg/L	0.003		0.03	0.005	0.005			<5	<5	<5
Trihalomethanes												
Chloroform	µg/L								<5	<5	<5
Bromodichloromethane	µg/L								<5	<5	<5
Dibromochloromethane	µg/L								<5	<5	<5
Bromoform	µg/L								<5	<5	<5
Phenolic Compounds												
Phenol	µg/L	320	400						<1.0	<1.0	<1.0
2-Chlorophenol	µg/L	340		300	0.1	3000			<1.0	<1.0	<1.0
2-Methylphenol	µg/L								<1.0	<1.0	<1.0
3- & 4-Methylphenol	µg/L								<2.0	**3.3**	**<2.0**
2-Nitrophenol	µg/L								<1.0	<1.0	<1.0
2.4-Dimethylphenol	µg/L								<1.0	<1.0	<1.0
2.4-Dichlorophenol	µg/L	120		200	0.3	2000			<1.0	<1.0	<1.0
2.6-Dichlorophenol	µg/L								<1.0	<1.0	<1.0
4-Chloro-3-Methylphenol	µg/L								<1.0	<1.0	<1.0
2.4.6-Trichlorophenol	µg/L	3		20	2	200			<1.0	<1.0	<1.0
2.4.5-Trichlorophenol	µg/L								<1.0	<1.0	<1.0
Pentachlorophenol	µg/L	3.6	11						<2.0	<2.0	<2.0

Polynuclear Aromatic Hydrocarbons											
Naphthalene	µg/L	16	50						<1.0	<1.0	<1.0
Acenaphthylene	µg/L								<1.0	<1.0	<1.0
Acenaphthene	µg/L								<1.0	<1.0	<1.0
Fluorene	µg/L								<1.0	<1.0	<1.0
Phenanthrene	µg/L								<1.0	<1.0	<1.0
Anthracene	µg/L								<1.0	<1.0	<1.0
Fluoranthene	µg/L								<1.0	<1.0	<1.0
Pyrene	µg/L								<1.0	<1.0	<1.0
Benz(a)anthracene	µg/L								<1.0	<1.0	<1.0
Chrysene	µg/L								<1.0	<1.0	<1.0
Benzo(b)fluoranthene	µg/L								<1.0	<1.0	<1.0
Benzo(k)fluoranthene	µg/L								<1.0	<1.0	<1.0
Benzo(a)pyrene	µg/L			0.01		0.1			<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L								<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	µg/L								<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	µg/L								<1.0	<1.0	<1.0
Total Petroleum Hydrocarbons											
C6 - C9 Fraction	µg/L								<20	<20	<20
C10 - C14 Fraction	µg/L								<50	<50	<50
C15 - C28 Fraction	µg/L								<100	<100	<100
C29 - C36 Fraction	µg/L								**270**	<50	<50
C10 - C36 Fraction (sum)	µg/L	600 [4]							**270**	<50	<50

NOTES:
1. SRT Healthy Rivers Action Plan Long Term / Short Term Targets
2. ANZECC 99% protection level for Chlordane
3. ANZECC 99% protection level for Endosulfan
4. Dutch intervention values (2000).
5. pH > 6 / pH < 6
6. ASS disturbance indicators
7. Effluent treatment triggers

Table 6 MW4 Groundwater Laboratory Analysis Results

Analyte grouping/Analyte	Units	ANZECC & ARMCANZ		ADWG		DoH	ANZECC & ARMCANZ				
		Fresh Waters	Marine Waters	Drinking Water Health Value (HV)	Drinking Water Aesthetic Value (AV)	Domestic non-potable groundwater use	Short-term Irrigation Water	Long-term Irrigation Water	18/05/2012 WRMW4	30/08/2012 WRMW4	15/01/2013 WRMW4
pH Value	pH Unit	6.5-8.5	8.0-8.4		6.5-8.5			6.0-8.5	6.04	5.96	5.61
Electrical Conductivity	µS/cm								354	144	118
Total Dissolved Solids	mg/L								226	83	74
Suspended Solids	mg/L								144	9	313
Turbidity	NTU								86.9	10.8	81.8
Total Alkalinity $CaCO_3$	mg/L								5	1	2
Acidity as $CaCO_3$	mg/L								8	21	16
Sulfate as SO_4^{2-}	mg/L			500	250	5000			17	2	2
Chloride	mg/L				250	2500			89	30	23
Dissolved Metals											
Aluminium	mg/L	0.055			0.2	2	20	5	0.02	0.06	0.34
Arsenic	mg/L	0.013		0.01		0.07	2	0.1	<0.001	<0.001	<0.001
Cadmium	mg/L	0.0002	0.0007	0.00		0.02	0.05	0.01	<0.0001	0.0001	<0.0001
Chromium	mg/L						1	0.1	<0.001	<0.001	<0.001
Manganese	mg/L	1.9		0.50	0.1	5	10	0.2	0.013	0.005	0.005
Nickel	mg/L	0.011	0.02	0.02		0.2	2	0.2	<0.001	0.003	0.012
Selenium	mg/L	0.005		0.01		0.1	0.05	0.02	<0.01	<0.01	<0.01
Zinc	mg/L	0.008	0.015		3	30	5	2	0.01	0.01	0.072
Iron	mg/L	0.3	1.0 / 0.3[5]		0.33	3	10	0.2	0.11	<0.05	0.31
Ferrous Iron	mg/L								<0.05	<0.05	0.09
Chromium VI	mg/L	0.001	0.0044	0.05		0.5			<0.010	<0.01	<0.01
Total Metals											
Aluminium	mg/L	0.055			0.2	2	20	5	4.3	1.61	13.9
Arsenic	mg/L	0.013		0.01		0.07	2	0.1	0.001	<0.001	<0.001
Cadmium	mg/L	0.0002	0.0007	0.002		0.02	0.05	0.01	<0.0001	<0.0001	<0.0001
Chromium	mg/L						1	0.1	0.004	0.001	0.008
Copper	mg/L	0.0014	0.0013	2	1	20	5	0.2	0.005	0.003	0.025
Lead	mg/L	0.0034	0.0044	0.01		0.1	5	2	0.011	0.005	0.012
Manganese	mg/L	1.9		0.5	0.1	5	10	0.2	0.016	0.006	0.007
Molybdenum	mg/L			0.05		0.5	0.05	0.01	<0.001	<0.001	<0.001
Nickel	mg/L	0.011	0.02	0.02		0.2	2	0.2	0.001	0.003	0.016
Selenium	mg/L	0.005		0.01		0.1	0.05	0.02	<0.01	<0.01	<0.01
Silver	mg/L	0.00005	0.0014	0.1		1			<0.001	<0.001	<0.001
Zinc	mg/L	0.008	0.015		3	30	5	2	0.017	0.011	0.11
Iron	mg/L	0.3	1.0 / 0.35		0.33	3	10	0.2	0.88	0.4	1.5
Mercury	mg/L	0.00006	0.0001	0.001		0.01	0.002	0.002	<0.0001	<0.0001	<0.0001
Nutrients											
Ammonia as N	mg/L	0.9	0.91						0.11	0.05	0.03
Nitrite as N	mg/L			3.0		30			0.01	<0.01	<0.01
Nitrate as N	mg/L			50		500			3.75	4.92	4.38
Kjeldhal Nitrogen	mg/L								0.5	1.1	0.7
Total Nitrogen	mg/L	1.0 / 2.0[1]							4.3	6	5.1
Total Phosphorus	mg/L	0.1 / 0.2[1]							0.04	0.12	0.06
Reactive Phosphorus	mg/L								<0.01	<0.01	<0.01
Sulfide	mg/L	0.001							<0.1	<0.1	<0.1
COD	mg/L								11	7	16
BOD	mg/L								4	<2	4
Organochlorine Pesticides (OC)											
alpha-BHC	µg/L								<0.5	<0.5	<0.5
Hexachlorobenzene (HCB)	µg/L								<0.5	<0.5	<0.5
beta-BHC	µg/L								<0.5	<0.5	<0.5
gamma-BHC	µg/L								<0.5	<0.5	<0.5
delta-BHC	µg/L								<0.5	<0.5	<0.5
Heptachlor	µg/L	0.01							<0.5	<0.5	<0.5
Aldrin	µg/L								<0.5	<0.5	<0.5
Heptachlor epoxide	µg/L			0.05	0.3	3			<0.5	<0.5	<0.5
trans-Chlordane	µg/L	0.03 [2]		0.01	1	10			<0.5	<0.5	<0.5
alpha-Endosulfan	µg/L	0.03 [3]	0.005 [3]	0.05	30	30			<0.5	<0.5	<0.5
cis-Chlordane	µg/L	0.03 [2]		0.01	1	10			<0.5	<0.5	<0.5
Dieldrin	µg/L								<0.5	<0.5	<0.5
4.4`-DDE	µg/L								<0.5	<0.5	<0.5
Endrin	µg/L	0.01	0.004						<0.5	<0.5	<0.5
beta-Endosulfan	µg/L	0.03 [3]	0.005 [3]						<0.5	<0.5	<0.5
4.4`-DDD	µg/L								<0.5	<0.5	<0.5
Endrin aldehyde	µg/L								<0.5	<0.5	<0.5
Endosulfan sulfate	µg/L								<0.5	<0.5	<0.5
4.4`-DDT	µg/L	0.006		0.06	30	0.1			<2	<2	<2.0
Endrin ketone	µg/L								<0.5	<0.5	<0.5
Methoxychlor	µg/L								<2	<2	<2.0
Aldrin plus dieldrin	µg/L			0.010	0.3	3			<1	<0.5	<1.0
Organophosphorus Pesticides (OP)											
Dichlorvos	µg/L								<0.5	<0.5	<0.5
Demeton-S-methyl	µg/L								<0.5	<0.5	<0.5
Monocrotophos	µg/L								<2	<2	<2.0
Dimethoate	µg/L	0.15			50	50			<0.5	<0.5	<0.5
Diazinon	µg/L	0.01		1	3	1			<0.5	<0.5	<0.5
Chlorpyrifos-methyl	µg/L	0.01	0.009		10	100			<0.5	<0.5	<0.5
Parathion-methyl	µg/L								<2	<2	<2.0
Malathion	µg/L	0.05							<0.5	<0.5	<0.5
Fenthion	µg/L								<0.5	<0.5	<0.5
Chlorpyrifos	µg/L	0.01	0.009						<0.5	<0.5	<0.5
Parathion	µg/L	0.004			10	10			<2	<2	<2.0
Pirimphos-ethyl	µg/L								<0.5	<0.5	<0.5
Chlorfenvinphos	µg/L								<0.5	<0.5	<0.5
Bromophos-ethyl	µg/L								<0.5	<0.5	<0.5
Fenamiphos	µg/L								<0.5	<0.5	<0.5
Prothiofos	µg/L								<0.5	<0.5	<0.5
Ethion	µg/L								<0.5	<0.5	<0.5
Carbophenothion	µg/L								<0.5	<0.5	<0.5
Azinphos Methyl	µg/L	0.02							<0.5	<0.5	<0.5

Monocyclic Aromatic Hydrocarbons											
Benzene	µg/L	0.95	0.5	0.001		0.01			-	-	<1
Toluene	µg/L			0.80	0.025	0.025			-	-	<2
Ethylbenzene	µg/L			0.30	0.003	0.003			-	-	<2
meta- & para-Xylene	µg/L	200							-	-	<2
Styrene	µg/L			0.03	0.004	0.004			<5	<5	<5
ortho-Xylene	µg/L	350							-	-	<2
Isopropylbenzene	µg/L								<5	<5	<5
n-Propylbenzene	µg/L								<5	<5	<5
1.3.5-Trimethylbenzene	µg/L								<5	<5	<5
sec-Butylbenzene	µg/L								<5	<5	<5
1.2.4-Trimethylbenzene	µg/L								<5	<5	<5
tert-Butylbenzene	µg/L								<5	<5	<5
p-Isopropyltoluene	µg/L								<5	<5	<5
n-Butylbenzene	µg/L								<5	<5	<5
Oxygenated Compounds											
Vinyl Acetate	µg/L								<50	<50	<50
2-Butanone (MEK)	µg/L								<50	<50	<50
4-Methyl-2-pentanone (MIBK)	µg/L								<50	<50	<50
2-Hexanone (MBK)	µg/L								<50	<50	<50
Sulfonated Compounds											
Carbon disulfide	µg/L								<5	<5	<5
Fumigants											
2.2-Dichloropropane	µg/L								<5	<5	<5
1.2-Dichloropropane	µg/L								<5	<5	<5
cis-1.3-Dichloropropylene	µg/L								<5	<5	<5
trans-1.3-Dichloropropylene	µg/L								<5	<5	<5
1.2-Dibromoethane (EDB)	µg/L								<5	<5	<5
Halogenated Aliphatic Compounds											
Dichlorodifluoromethane	µg/L								<50	<50	<50
Chloromethane	µg/L								<50	<50	<50
Vinyl chloride	µg/L			0.0003		0.003			<50	<50	<50
Bromomethane	µg/L								<50	<50	<50
Chloroethane	µg/L								<50	<50	<50
Trichlorofluoromethane	µg/L								<50	<50	<50
1.1-Dichloroethene	µg/L			0.03		0.3			<5	<5	<5
Iodomethane	µg/L								<5	<5	<5
trans-1.2-Dichloroethene	µg/L								<5	<5	<5
1.1-Dichloroethane	µg/L								<5	<5	<5
cis-1.2-Dichloroethene	µg/L								<5	<5	<5
1.1.1-Trichloroethane	µg/L								<5	<5	<5
1.1-Dichloropropylene	µg/L								<5	<5	<5
Carbon Tetrachloride	µg/L								<5	<5	<5
1.2-Dichloroethane	µg/L			0.003		0.03			<5	<5	<5
Trichloroethene	µg/L								<5	<5	<5
Dibromomethane	µg/L								<5	<5	<5
1.1.2-Trichloroethane	µg/L	6500	1900						<5	<5	<5
1.3-Dichloropropane	µg/L								<5	<5	<5
Tetrachloroethene	µg/L			0.05		0.5			<5	<5	<5
1.1.1.2-Tetrachloroethane	µg/L								<5	<5	<5
trans-1.4-Dichloro-2-butene	µg/L								<5	<5	<5
cis-1.4-Dichloro-2-butene	µg/L								<5	<5	<5
1.1.2.2-Tetrachloroethane	µg/L								<5	<5	<5
1.2.3-Trichloropropane	µg/L								<5	<5	<5
Pentachloroethane	µg/L								<5	<5	<5
1.2-Dibromo-3-chloropropane	µg/L								<5	<5	<5
Hexachlorobutadiene	µg/L								<5	<5	<5
Halogenated Aromatic Compounds											
Chlorobenzene	µg/L			0.30	0.01	0.01			<5	<5	<5
Bromobenzene	µg/L								<5	<5	<5
2-Chlorotoluene	µg/L								<5	<5	<5
4-Chlorotoluene	µg/L								<5	<5	<5
1.3-Dichlorobenzene	µg/L	0.26			0.02	0.02			<5	<5	<5
1.4-Dichlorobenzene	µg/L	0.06		0.04	0.003	0.003			<5	<5	<5
1.2-Dichlorobenzene	µg/L	0.16		1.5	0.001	0.001			<5	<5	<5
1.2.4-Trichlorobenzene	µg/L	0.085	80	0.03	0.005	0.005			<5	<5	<5
1.2.3-Trichlorobenzene	µg/L	0.003		0.03	0.005	0.005			<5	<5	<5
Trihalomethanes											
Chloroform	µg/L								<5	<5	<5
Bromodichloromethane	µg/L								<5	<5	<5
Dibromochloromethane	µg/L								**12**	<5	<5
Bromoform	µg/L								**13**	<5	<5
Phenolic Compounds											
Phenol	µg/L	320	400						<1.0	<1.0	<1.0
2-Chlorophenol	µg/L	340		300	0.1	3000			<1.0	<1.0	<1.0
2-Methylphenol	µg/L								<1.0	<1.0	<1.0
3- & 4-Methylphenol	µg/L								<2.0	<2.0	<2.0
2-Nitrophenol	µg/L								<1.0	<1.0	<1.0
2.4-Dimethylphenol	µg/L								<1.0	<1.0	<1.0
2.4-Dichlorophenol	µg/L	120		200	0.3	2000			<1.0	<1.0	<1.0
2.6-Dichlorophenol	µg/L								<1.0	<1.0	<1.0
4-Chloro-3-Methylphenol	µg/L								<1.0	<1.0	<1.0
2.4.6-Trichlorophenol	µg/L	3		20	2	200			<1.0	<1.0	<1.0
2.4.5-Trichlorophenol	µg/L								<1.0	<1.0	<1.0
Pentachlorophenol	µg/L	3.6	11						<2.0	<2.0	<2.0

Polynuclear Aromatic Hydrocarbons											
Naphthalene	µg/L	16	50						<1.0	<1.0	<1.0
Acenaphthylene	µg/L								<1.0	<1.0	<1.0
Acenaphthene	µg/L								<1.0	<1.0	<1.0
Fluorene	µg/L								<1.0	<1.0	<1.0
Phenanthrene	µg/L								<1.0	<1.0	<1.0
Anthracene	µg/L								<1.0	<1.0	<1.0
Fluoranthene	µg/L								<1.0	<1.0	<1.0
Pyrene	µg/L								<1.0	<1.0	<1.0
Benz(a)anthracene	µg/L								<1.0	<1.0	<1.0
Chrysene	µg/L								<1.0	<1.0	<1.0
Benzo(b)fluoranthene	µg/L								<1.0	<1.0	<1.0
Benzo(k)fluoranthene	µg/L								<1.0	<1.0	<1.0
Benzo(a)pyrene	µg/L			0.01		0.1			<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L								<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	µg/L								<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	µg/L								<1.0	<1.0	<1.0
Total Petroleum Hydrocarbons											
C6 - C9 Fraction	µg/L								<20	<20	<20
C10 - C14 Fraction	µg/L								<50	<50	<50
C15 - C28 Fraction	µg/L								<100	<100	<100
C29 - C36 Fraction	µg/L								<50	<50	<50
C10 - C36 Fraction (sum)	µg/L	600 [4]							<50	<50	<50

NOTES: 1. SRT Healthy Rivers Action Plan Long Term / Short Term Targets
2. ANZECC 99% protection level for Chlordane
3. ANZECC 99% protection level for Endosulfan
4. Dutch intervention values (2000).
5. pH > 6 / pH < 6
6. ASS disturbance indicators
7. Effluent treatment triggers

Table 7 MW5 Groundwater Laboratory Analysis Results

Analyte grouping/Analyte	Units	ANZECC & ARMCANZ		ADWG		DoH	ANZECC & ARMCANZ				
		Fresh Waters	Marine Waters	Drinking Water Health Value (HV)	Drinking Water Aesthetic Value (AV)	Domestic non-potable groundwater use	Short-term Irrigation Water	Long-term Irrigation Water	18/05/2012 WRMW5	30/08/2012 WRMW5	15/01/2013 WRMW5
pH Value	pH Unit	6.5-8.5	8.0-8.4		6.5-8.5			6.0-8.5	5.86	5.72	6.07
Electrical Conductivity	µS/cm								449	97	124
Total Dissolved Solids	mg/L								341	56	133
Suspended Solids	mg/L								59	660	42
Turbidity	NTU								137	854	57.6
Total Alkalinity $CaCO_3$	mg/L								5	<1	3
Acidity as $CaCO_3$	mg/L								13	11	6
Sulfate as SO_4^{2-}	mg/L			500	250	5000			19	7	11
Chloride	mg/L				250	2500			132	17	25
Dissolved Metals											
Aluminium	mg/L	0.055			0.2	2	20	5	0.19	1.48	0.41
Arsenic	mg/L	0.013		0.01		0.07	2	0.1	<0.001	0.001	<0.001
Cadmium	mg/L	0.0002	0.0007	0.00		0.02	0.05	0.01	<0.0001	<0.0001	<0.0001
Chromium	mg/L						1	0.1	<0.001	<0.001	<0.001
Manganese	mg/L	1.9		0.50	0.1	5	10	0.2	0.01	0.005	0.001
Nickel	mg/L	0.011	0.02	0.02		0.2	2	0.2	0.001	0.004	0.004
Selenium	mg/L	0.005		0.01		0.1	0.05	0.02	<0.01	<0.01	<0.01
Zinc	mg/L	0.008	0.015		3	30	5	2	0.008	0.021	0.028
Iron	mg/L	0.3	1.0 / 0.3[5]		0.33	3	10	0.2	0.08	0.54	<0.05
Ferrous Iron	mg/L								<0.05	0.12	<0.05
Chromium VI	mg/L	0.001	0.0044	0.05		0.5			<0.010	<0.010	<0.01
Total Metals											
Aluminium	mg/L	0.055			0.2	2	20	5	10	2.57	5.03
Arsenic	mg/L	0.013		0.01		0.07	2	0.1	0.001	<0.001	<0.001
Cadmium	mg/L	0.0002	0.0007	0.002		0.02	0.05	0.01	<0.0001	<0.0001	<0.0001
Chromium	mg/L						1	0.1	0.005	0.001	0.003
Copper	mg/L	0.0014	0.0013	2	1	20	5	0.2	0.005	0.015	0.006
Lead	mg/L	0.0034	0.0044	0.01		0.1	5	2	0.015	0.002	0.005
Manganese	mg/L	1.9		0.5	0.1	5	10	0.2	0.01	0.002	0.002
Molybdenum	mg/L			0.05		0.5	0.05	0.01	<0.001	<0.001	<0.001
Nickel	mg/L	0.011	0.02	0.02		0.2	2	0.2	0.003	0.002	0.004
Selenium	mg/L	0.005		0.01		0.1	0.05	0.02	<0.01	<0.01	<0.01
Silver	mg/L	0.00005	0.0014	0.1		1			<0.001	<0.001	<0.001
Zinc	mg/L	0.008	0.015		3	30	5	2	0.011	0.007	0.025
Iron	mg/L	0.3	1.0 / 0.35		0.33	3	10	0.2	0.49	0.13	0.37
Mercury	mg/L	0.00006	0.0001	0.001		0.01	0.002	0.002	<0.0001	<0.0001	<0.0001
Nutrients											
Ammonia as N	mg/L	0.9	0.91						0.01	0.06	<0.01
Nitrite as N	mg/L			3.0		30			0.04	<0.01	<0.01
Nitrate as N	mg/L			50		500			0.45	2.03	1.63
Kjeldhal Nitrogen	mg/L								0.1	1.5	0.2
Total Nitrogen	mg/L	1.0 / 2.0[1]							0.6	3.5	1.8
Total Phosphorus	mg/L	0.1 / 0.2[1]							0.02	0.23	0.02
Reactive Phosphorus	mg/L								<0.01	<0.01	<0.01
Sulfide	mg/L	0.001							<0.1	<0.1	<0.1
COD	mg/L								9	<5	<5
BOD	mg/L								3	3	<2
Organochlorine Pesticides (OC)											
alpha-BHC	µg/L								<0.5	<0.5	<0.5
Hexachlorobenzene (HCB)	µg/L								<0.5	<0.5	<0.5
beta-BHC	µg/L								<0.5	<0.5	<0.5
gamma-BHC	µg/L								<0.5	<0.5	<0.5
delta-BHC	µg/L								<0.5	<0.5	<0.5
Heptachlor	µg/L	0.01							<0.5	<0.5	<0.5
Aldrin	µg/L								<0.5	<0.5	<0.5
Heptachlor epoxide	µg/L			0.05	0.3	3			<0.5	<0.5	<0.5
trans-Chlordane	µg/L	0.03[2]		0.01	1	10			<0.5	<0.5	<0.5
alpha-Endosulfan	µg/L	0.03[3]	0.005[3]	0.05	30	30			<0.5	<0.5	<0.5
cis-Chlordane	µg/L	0.03[2]		0.01	1	10			<0.5	<0.5	<0.5
Dieldrin	µg/L								<0.5	<0.5	<0.5
4.4`-DDE	µg/L								<0.5	<0.5	<0.5
Endrin	µg/L	0.01	0.004						<0.5	<0.5	<0.5
beta-Endosulfan	µg/L	0.03[3]	0.005[3]						<0.5	<0.5	<0.5
4.4`-DDD	µg/L								<0.5	<0.5	<0.5
Endrin aldehyde	µg/L								<0.5	<0.5	<0.5
Endosulfan sulfate	µg/L								<0.5	<0.5	<0.5
4.4`-DDT	µg/L	0.006		0.06	30	0.1			<2	<2	<2.0
Endrin ketone	µg/L								<0.5	<0.5	<0.5
Methoxychlor	µg/L								<2	<2	<2.0
Aldrin plus dieldrin	µg/L			0.010	0.3	3			<1	<0.5	<1.0
Organophosphorus Pesticides (OP)											
Dichlorvos	µg/L								<0.5	<0.5	<0.5
Demeton-S-methyl	µg/L								<0.5	<0.5	<0.5
Monocrotophos	µg/L								<2	<2	<2.0
Dimethoate	µg/L	0.15			50	50			<0.5	<0.5	<0.5
Diazinon	µg/L	0.01		1	3	1			<0.5	<0.5	<0.5
Chlorpyrifos-methyl	µg/L	0.01	0.009		10	100			<0.5	<0.5	<0.5
Parathion-methyl	µg/L								<2	<2	<2.0
Malathion	µg/L	0.05							<0.5	<0.5	<0.5
Fenthion	µg/L								<0.5	<0.5	<0.5
Chlorpyrifos	µg/L	0.01	0.009						<0.5	<0.5	<0.5
Parathion	µg/L	0.004			10	10			<2	<2	<2.0
Pirimphos-ethyl	µg/L								<0.5	<0.5	<0.5
Chlorfenvinphos	µg/L								<0.5	<0.5	<0.5
Bromophos-ethyl	µg/L								<0.5	<0.5	<0.5
Fenamiphos	µg/L								<0.5	<0.5	<0.5
Prothiofos	µg/L								<0.5	<0.5	<0.5
Ethion	µg/L								<0.5	<0.5	<0.5
Carbophenothion	µg/L								<0.5	<0.5	<0.5
Azinphos Methyl	µg/L	0.02							<0.5	<0.5	<0.5

Monocyclic Aromatic Hydrocarbons											
Benzene	µg/L	0.95	0.5	0.001		0.01			-	-	<1
Toluene	µg/L			0.80	0.025	0.025			-	-	<2
Ethylbenzene	µg/L			0.30	0.003	0.003			-	-	<2
meta- & para-Xylene	µg/L	200							-	-	<2
Styrene	µg/L			0.03	0.004	0.004			<5	<5	<5
ortho-Xylene	µg/L	350							-	-	<2
Isopropylbenzene	µg/L								<5	<5	<5
n-Propylbenzene	µg/L								<5	<5	<5
1.3.5-Trimethylbenzene	µg/L								<5	<5	<5
sec-Butylbenzene	µg/L								<5	<5	<5
1.2.4-Trimethylbenzene	µg/L								<5	<5	<5
tert-Butylbenzene	µg/L								<5	<5	<5
p-Isopropyltoluene	µg/L								<5	<5	<5
n-Butylbenzene	µg/L								<5	<5	<5
Oxygenated Compounds											
Vinyl Acetate	µg/L								<50	<50	<50
2-Butanone (MEK)	µg/L								<50	<50	<50
4-Methyl-2-pentanone (MIBK)	µg/L								<50	<50	<50
2-Hexanone (MBK)	µg/L								<50	<50	<50
Sulfonated Compounds											
Carbon disulfide	µg/L								<5	<5	<5
Fumigants											
2.2-Dichloropropane	µg/L								<5	<5	<5
1.2-Dichloropropane	µg/L								<5	<5	<5
cis-1.3-Dichloropropylene	µg/L								<5	<5	<5
trans-1.3-Dichloropropylene	µg/L								<5	<5	<5
1.2-Dibromoethane (EDB)	µg/L								<5	<5	<5
Halogenated Aliphatic Compounds											
Dichlorodifluoromethane	µg/L								<50	<50	<50
Chloromethane	µg/L								<50	<50	<50
Vinyl chloride	µg/L			0.0003		0.003			<50	<50	<50
Bromomethane	µg/L								<50	<50	<50
Chloroethane	µg/L								<50	<50	<50
Trichlorofluoromethane	µg/L								<50	<50	<50
1.1-Dichloroethene	µg/L			0.03		0.3			<5	<5	<5
Iodomethane	µg/L								<5	<5	<5
trans-1.2-Dichloroethene	µg/L								<5	<5	<5
1.1-Dichloroethane	µg/L								<5	<5	<5
cis-1.2-Dichloroethene	µg/L								<5	<5	<5
1.1.1-Trichloroethane	µg/L								<5	<5	<5
1.1-Dichloropropylene	µg/L								<5	<5	<5
Carbon Tetrachloride	µg/L								<5	<5	<5
1.2-Dichloroethane	µg/L			0.003		0.03			<5	<5	<5
Trichloroethene	µg/L								<5	<5	<5
Dibromomethane	µg/L								<5	<5	<5
1.1.2-Trichloroethane	µg/L	6500	1900						<5	<5	<5
1.3-Dichloropropane	µg/L								<5	<5	<5
Tetrachloroethene	µg/L			0.05		0.5			<5	<5	<5
1.1.1.2-Tetrachloroethane	µg/L								<5	<5	<5
trans-1.4-Dichloro-2-butene	µg/L								<5	<5	<5
cis-1.4-Dichloro-2-butene	µg/L								<5	<5	<5
1.1.2.2-Tetrachloroethane	µg/L								<5	<5	<5
1.2.3-Trichloropropane	µg/L								<5	<5	<5
Pentachloroethane	µg/L								<5	<5	<5
1.2-Dibromo-3-chloropropane	µg/L								<5	<5	<5
Hexachlorobutadiene	µg/L								<5	<5	<5
Halogenated Aromatic Compounds											
Chlorobenzene	µg/L			0.30	0.01	0.01			<5	<5	<5
Bromobenzene	µg/L								<5	<5	<5
2-Chlorotoluene	µg/L								<5	<5	<5
4-Chlorotoluene	µg/L								<5	<5	<5
1.3-Dichlorobenzene	µg/L	0.26			0.02	0.02			<5	<5	<5
1.4-Dichlorobenzene	µg/L	0.06		0.04	0.003	0.003			<5	<5	<5
1.2-Dichlorobenzene	µg/L	0.16		1.5	0.001	0.001			<5	<5	<5
1.2.4-Trichlorobenzene	µg/L	0.085	80	0.03	0.005	0.005			<5	<5	<5
1.2.3-Trichlorobenzene	µg/L	0.003		0.03	0.005	0.005			<5	<5	<5
Trihalomethanes											
Chloroform	µg/L								<5	<5	<5
Bromodichloromethane	µg/L								5	<5	<5
Dibromochloromethane	µg/L								**20**	<5	<5
Bromoform	µg/L								**22**	<5	<5
Phenolic Compounds											
Phenol	µg/L	320	400						<1.0	<1.0	<1.0
2-Chlorophenol	µg/L	340		300	0.1	3000			<1.0	<1.0	<1.0
2-Methylphenol	µg/L								<1.0	<1.0	<1.0
3- & 4-Methylphenol	µg/L								<2.0	<2.0	<2.0
2-Nitrophenol	µg/L								<1.0	<1.0	<1.0
2.4-Dimethylphenol	µg/L								<1.0	<1.0	<1.0
2.4-Dichlorophenol	µg/L	120		200	0.3	2000			<1.0	<1.0	<1.0
2.6-Dichlorophenol	µg/L								<1.0	<1.0	<1.0
4-Chloro-3-Methylphenol	µg/L								<1.0	<1.0	<1.0
2.4.6-Trichlorophenol	µg/L	3		20	2	200			<1.0	<1.0	<1.0
2.4.5-Trichlorophenol	µg/L								<1.0	<1.0	<1.0
Pentachlorophenol	µg/L	3.6	11						<2.0	<2.0	<2.0

Polynuclear Aromatic Hydrocarbons											
Naphthalene	µg/L	16	50						<1.0	<1.0	<1.0
Acenaphthylene	µg/L								<1.0	<1.0	<1.0
Acenaphthene	µg/L								<1.0	<1.0	<1.0
Fluorene	µg/L								<1.0	<1.0	<1.0
Phenanthrene	µg/L								<1.0	<1.0	<1.0
Anthracene	µg/L								<1.0	<1.0	<1.0
Fluoranthene	µg/L								<1.0	<1.0	<1.0
Pyrene	µg/L								<1.0	<1.0	<1.0
Benz(a)anthracene	µg/L								<1.0	<1.0	<1.0
Chrysene	µg/L								<1.0	<1.0	<1.0
Benzo(b)fluoranthene	µg/L								<1.0	<1.0	<1.0
Benzo(k)fluoranthene	µg/L								<1.0	<1.0	<1.0
Benzo(a)pyrene	µg/L			0.01		0.1			<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L								<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	µg/L								<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	µg/L								<1.0	<1.0	<1.0
Total Petroleum Hydrocarbons											
C6 - C9 Fraction	µg/L								<20	<20	<20
C10 - C14 Fraction	µg/L								<50	<50	<50
C15 - C28 Fraction	µg/L								<100	<100	<100
C29 - C36 Fraction	µg/L								<50	<50	<50
C10 - C36 Fraction (sum)	µg/L	600 [4]							<50	<50	<50

NOTES:
1. SRT Healthy Rivers Action Plan Long Term / Short Term Targets
2. ANZECC 99% protection level for Chlordane
3. ANZECC 99% protection level for Endosulfan
4. Dutch intervention values (2000).
5. pH > 6 / pH < 6
6. ASS disturbance indicators
7. Effluent treatment triggers

Table 8 MW6 Groundwater Laboratory Analysis Results

Analyte grouping/Analyte	Units	ANZECC & ARMCANZ		ADWG		DoH	ANZECC & ARMCANZ		18/05/2012	30/08/2012	15/01/2013
		Fresh Waters	Marine Waters	Drinking Water Health Value (HV)	Drinking Water Aesthetic Value (AV)	Domestic non-potable groundwater use	Short-term Irrigation Water	Long-term Irrigation Water	WRMW6	WRMW6	WRMW6
pH Value	pH Unit	6.5-8.5	8.0-8.4		6.5-8.5			6.0-8.5	5.83	5.87	5.15
Electrical Conductivity	µS/cm								808	914	912
Total Dissolved Solids	mg/L								492	578	588
Suspended Solids	mg/L								50	6	32
Turbidity	NTU								76.6	4	19.9
Total Alkalinity $CaCO_3$	mg/L								38	10	3
Acidity as $CaCO_3$	mg/L								22	39	28
Sulfate as SO_4^{2-}	mg/L			500	250	5000			173	203	169
Chloride	mg/L				250	2500			124	153	168
Dissolved Metals											
Aluminium	mg/L	0.055			0.2	2	20	5	0.01	0.15	0.3
Arsenic	mg/L	0.013		0.01		0.07	2	0.1	<0.001	<0.001	0.001
Cadmium	mg/L	0.0002	0.0007	0.00		0.02	0.05	0.01	<0.0001	<0.0001	<0.0001
Chromium	mg/L						1	0.1	<0.001	<0.001	<0.001
Manganese	mg/L	1.9		0.50	0.1	5	10	0.2	0.035	0.032	0.032
Nickel	mg/L	0.011	0.02	0.02		0.2	2	0.2	0.001	0.004	0.014
Selenium	mg/L	0.005		0.01		0.1	0.05	0.02	<0.01	<0.01	<0.01
Zinc	mg/L	0.008	0.015		3	30	5	2	0.01	0.016	0.132
Iron	mg/L	0.3	1.0 / 0.3[5]		0.33	3	10	0.2	1.42	0.11	0.91
Ferrous Iron	mg/L								0.35	<0.05	0.73
Chromium VI	mg/L	0.001	0.0044	0.05		0.5			<0.010	<0.010	<0.01
Total Metals											
Aluminium	mg/L	0.055			0.2	2	20	5	0.74	0.41	1.15
Arsenic	mg/L	0.013		0.01		0.07	2	0.1	<0.001	<0.001	<0.001
Cadmium	mg/L	0.0002	0.0007	0.002		0.02	0.05	0.01	<0.0001	<0.0001	<0.0001
Chromium	mg/L						1	0.1	<0.001	<0.001	0.005
Copper	mg/L	0.0014	0.0013	2	1	20	5	0.2	0.002	0.003	0.013
Lead	mg/L	0.0034	0.0044	0.01		0.1	5	2	0.007	0.009	0.008
Manganese	mg/L	1.9		0.5	0.1	5	10	0.2	0.034	0.034	0.035
Molybdenum	mg/L			0.05		0.5	0.05	0.01	<0.001	<0.001	<0.001
Nickel	mg/L	0.011	0.02	0.02		0.2	2	0.2	0.002	0.003	0.013
Selenium	mg/L	0.005		0.01		0.1	0.05	0.02	<0.01	<0.01	<0.01
Silver	mg/L	0.00005	0.0014	0.1		1			<0.001	<0.001	<0.001
Zinc	mg/L	0.008	0.015		3	30	5	2	0.012	0.011	0.107
Iron	mg/L	0.3	1.0 / 0.35		0.33	3	10	0.2	10.4	3.21	1.74
Mercury	mg/L	0.00006	0.0001	0.001		0.01	0.002	0.002	<0.0001	<0.0001	<0.0001
Nutrients											
Ammonia as N	mg/L	0.9	0.91						1.64	0.73	0.33
Nitrite as N	mg/L			3.0		30			0.05	0.02	<0.01
Nitrate as N	mg/L			50		500			0.17	1.43	1.16
Kjeldhal Nitrogen	mg/L								1.6	1.1	0.8
Total Nitrogen	mg/L	1.0 / 2.0[1]							1.8	2.6	2
Total Phosphorus	mg/L	0.1 / 0.2[1]							0.03	0.02	0.03
Reactive Phosphorus	mg/L								<0.01	<0.01	<0.01
Sulfide	mg/L	0.001							<0.1	<0.1	<0.1
COD	mg/L								25	30	23
BOD	mg/L								26	2	<2
Organochlorine Pesticides (OC)											
alpha-BHC	µg/L								<0.5	<0.5	<0.5
Hexachlorobenzene (HCB)	µg/L								<0.5	<0.5	<0.5
beta-BHC	µg/L								<0.5	<0.5	<0.5
gamma-BHC	µg/L								<0.5	<0.5	<0.5
delta-BHC	µg/L								<0.5	<0.5	<0.5
Heptachlor	µg/L	0.01							<0.5	<0.5	<0.5
Aldrin	µg/L								<0.5	<0.5	<0.5
Heptachlor epoxide	µg/L			0.05	0.3	3			<0.5	<0.5	<0.5
trans-Chlordane	µg/L	0.03[2]		0.01	1	10			<0.5	<0.5	<0.5
alpha-Endosulfan	µg/L	0.03[3]	0.005[3]	0.05	30	30			<0.5	<0.5	<0.5
cis-Chlordane	µg/L	0.03[2]		0.01	1	10			<0.5	<0.5	<0.5
Dieldrin	µg/L								<0.5	<0.5	<0.5
4.4`-DDE	µg/L								<0.5	<0.5	<0.5
Endrin	µg/L	0.01	0.004						<0.5	<0.5	<0.5
beta-Endosulfan	µg/L	0.03[3]	0.005[3]						<0.5	<0.5	<0.5
4.4`-DDD	µg/L								<0.5	<0.5	<0.5
Endrin aldehyde	µg/L								<0.5	<0.5	<0.5
Endosulfan sulfate	µg/L								<0.5	<0.5	<0.5
4.4`-DDT	µg/L	0.006		0.06	30	0.1			<2	<2	<2.0
Endrin ketone	µg/L								<0.5	<0.5	<0.5
Methoxychlor	µg/L								<2	<2	<2.0
Aldrin plus dieldrin	µg/L			0.010	0.3	3			<1	<0.5	<1.0
Organophosphorus Pesticides (OP)											
Dichlorvos	µg/L								<0.5	<0.5	<0.5
Demeton-S-methyl	µg/L								<0.5	<0.5	<0.5
Monocrotophos	µg/L								<2	<2	<2.0
Dimethoate	µg/L	0.15			50	50			<0.5	<0.5	<0.5
Diazinon	µg/L	0.01		1	3	1			<0.5	<0.5	<0.5
Chlorpyrifos-methyl	µg/L	0.01	0.009		10	100			<0.5	<0.5	<0.5
Parathion-methyl	µg/L								<2	<2	<2.0
Malathion	µg/L	0.05							<0.5	<0.5	<0.5
Fenthion	µg/L								<0.5	<0.5	<0.5
Chlorpyrifos	µg/L	0.01	0.009						<0.5	<0.5	<0.5
Parathion	µg/L	0.004			10	10			<2	<2	<2.0
Pirimphos-ethyl	µg/L								<0.5	<0.5	<0.5
Chlorfenvinphos	µg/L								<0.5	<0.5	<0.5
Bromophos-ethyl	µg/L								<0.5	<0.5	<0.5
Fenamiphos	µg/L								<0.5	<0.5	<0.5
Prothiofos	µg/L								<0.5	<0.5	<0.5
Ethion	µg/L								<0.5	<0.5	<0.5
Carbophenothion	µg/L								<0.5	<0.5	<0.5
Azinphos Methyl	µg/L	0.02							<0.5	<0.5	<0.5

Monocyclic Aromatic Hydrocarbons											
Benzene	µg/L	0.95	0.5	0.001		0.01			-	-	<1
Toluene	µg/L			0.80	0.025	0.025			-	-	<2
Ethylbenzene	µg/L			0.30	0.003	0.003			-	-	<2
meta- & para-Xylene	µg/L	200							-	-	<2
Styrene	µg/L			0.03	0.004	0.004			<5	<5	<5
ortho-Xylene	µg/L	350							-	-	<2
Isopropylbenzene	µg/L								<5	<5	<5
n-Propylbenzene	µg/L								<5	<5	<5
1.3.5-Trimethylbenzene	µg/L								<5	<5	<5
sec-Butylbenzene	µg/L								<5	<5	<5
1.2.4-Trimethylbenzene	µg/L								<5	<5	<5
tert-Butylbenzene	µg/L								<5	<5	<5
p-Isopropyltoluene	µg/L								<5	<5	<5
n-Butylbenzene	µg/L								<5	<5	<5
Oxygenated Compounds											
Vinyl Acetate	µg/L								<50	<50	<50
2-Butanone (MEK)	µg/L								<50	<50	<50
4-Methyl-2-pentanone (MIBK)	µg/L								<50	<50	<50
2-Hexanone (MBK)	µg/L								<50	<50	<50
Sulfonated Compounds											
Carbon disulfide	µg/L								<5	<5	<5
Fumigants											
2.2-Dichloropropane	µg/L								<5	<5	<5
1.2-Dichloropropane	µg/L								<5	<5	<5
cis-1.3-Dichloropropylene	µg/L								<5	<5	<5
trans-1.3-Dichloropropylene	µg/L								<5	<5	<5
1.2-Dibromoethane (EDB)	µg/L								<5	<5	<5
Halogenated Aliphatic Compounds											
Dichlorodifluoromethane	µg/L								<50	<50	<50
Chloromethane	µg/L								<50	<50	<50
Vinyl chloride	µg/L			0.0003		0.003			<50	<50	<50
Bromomethane	µg/L								<50	<50	<50
Chloroethane	µg/L								<50	<50	<50
Trichlorofluoromethane	µg/L								<50	<50	<50
1.1-Dichloroethene	µg/L			0.03		0.3			<5	<5	<5
Iodomethane	µg/L								<5	<5	<5
trans-1.2-Dichloroethene	µg/L								<5	<5	<5
1.1-Dichloroethane	µg/L								<5	<5	<5
cis-1.2-Dichloroethene	µg/L								<5	<5	<5
1.1.1-Trichloroethane	µg/L								<5	<5	<5
1.1-Dichloropropylene	µg/L								<5	<5	<5
Carbon Tetrachloride	µg/L								<5	<5	<5
1.2-Dichloroethane	µg/L			0.003		0.03			<5	<5	<5
Trichloroethene	µg/L								<5	<5	<5
Dibromomethane	µg/L								<5	<5	<5
1.1.2-Trichloroethane	µg/L	6500	1900						<5	<5	<5
1.3-Dichloropropane	µg/L								<5	<5	<5
Tetrachloroethene	µg/L			0.05		0.5			<5	<5	<5
1.1.1.2-Tetrachloroethane	µg/L								<5	<5	<5
trans-1.4-Dichloro-2-butene	µg/L								<5	<5	<5
cis-1.4-Dichloro-2-butene	µg/L								<5	<5	<5
1.1.2.2-Tetrachloroethane	µg/L								<5	<5	<5
1.2.3-Trichloropropane	µg/L								<5	<5	<5
Pentachloroethane	µg/L								<5	<5	<5
1.2-Dibromo-3-chloropropane	µg/L								<5	<5	<5
Hexachlorobutadiene	µg/L								<5	<5	<5
Halogenated Aromatic Compounds											
Chlorobenzene	µg/L			0.30	0.01	0.01			<5	<5	<5
Bromobenzene	µg/L								<5	<5	<5
2-Chlorotoluene	µg/L								<5	<5	<5
4-Chlorotoluene	µg/L								<5	<5	<5
1.3-Dichlorobenzene	µg/L	0.26			0.02	0.02			<5	<5	<5
1.4-Dichlorobenzene	µg/L	0.06		0.04	0.003	0.003			<5	<5	<5
1.2-Dichlorobenzene	µg/L	0.16		1.5	0.001	0.001			<5	<5	<5
1.2.4-Trichlorobenzene	µg/L	0.085	80	0.03	0.005	0.005			<5	<5	<5
1.2.3-Trichlorobenzene	µg/L	0.003		0.03	0.005	0.005			<5	<5	<5
Trihalomethanes											
Chloroform	µg/L								<5	<5	<5
Bromodichloromethane	µg/L								<5	<5	<5
Dibromochloromethane	µg/L								<5	<5	<5
Bromoform	µg/L								<5	<5	<5
Phenolic Compounds											
Phenol	µg/L	320	400						<1.0	<1.0	<1.0
2-Chlorophenol	µg/L	340		300	0.1	3000			<1.0	<1.0	<1.0
2-Methylphenol	µg/L								<1.0	<1.0	<1.0
3- & 4-Methylphenol	µg/L								<2.0	<2.0	<2.0
2-Nitrophenol	µg/L								<1.0	<1.0	<1.0
2.4-Dimethylphenol	µg/L								<1.0	<1.0	<1.0
2.4-Dichlorophenol	µg/L	120		200	0.3	2000			<1.0	<1.0	<1.0
2.6-Dichlorophenol	µg/L								<1.0	<1.0	<1.0
4-Chloro-3-Methylphenol	µg/L								<1.0	<1.0	<1.0
2.4.6-Trichlorophenol	µg/L	3		20	2	200			<1.0	<1.0	<1.0
2.4.5-Trichlorophenol	µg/L								<1.0	<1.0	<1.0
Pentachlorophenol	µg/L	3.6	11						<2.0	<2.0	<2.0

Polynuclear Aromatic Hydrocarbons											
Naphthalene	µg/L	16	50						<1.0	<1.0	<1.0
Acenaphthylene	µg/L								<1.0	<1.0	<1.0
Acenaphthene	µg/L								<1.0	<1.0	<1.0
Fluorene	µg/L								<1.0	<1.0	<1.0
Phenanthrene	µg/L								<1.0	<1.0	<1.0
Anthracene	µg/L								<1.0	<1.0	<1.0
Fluoranthene	µg/L								<1.0	<1.0	<1.0
Pyrene	µg/L								<1.0	<1.0	<1.0
Benz(a)anthracene	µg/L								<1.0	<1.0	<1.0
Chrysene	µg/L								<1.0	<1.0	<1.0
Benzo(b)fluoranthene	µg/L								<1.0	<1.0	<1.0
Benzo(k)fluoranthene	µg/L								<1.0	<1.0	<1.0
Benzo(a)pyrene	µg/L			0.01		0.1			<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L								<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	µg/L								<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	µg/L								<1.0	<1.0	<1.0
Total Petroleum Hydrocarbons											
C6 - C9 Fraction	µg/L								<20	<20	<20
C10 - C14 Fraction	µg/L								<50	<50	<50
C15 - C28 Fraction	µg/L								**260**	**380**	**380**
C29 - C36 Fraction	µg/L								**60**	<50	60
C10 - C36 Fraction (sum)	µg/L	600 [4]							**320**	**380**	**440**

NOTES:
1. SRT Healthy Rivers Action Plan Long Term / Short Term Targets
2. ANZECC 99% protection level for Chlordane
3. ANZECC 99% protection level for Endosulfan
4. Dutch intervention values (2000).
5. pH > 6 / pH < 6
6. ASS disturbance indicators
7. Effluent treatment triggers

8.3 Groundwater Levels

The depth to groundwater was measured on 15th January 2013 and tabulated with historical data (Table 4). An interface meter was used to verify the presence / absence of free phase hydrocarbon products over the groundwater: no free phase products were detected. Groundwater is intercepted between 19.5 RL mAHD (Relative level metres Australian Height Datum) and 23.6 RL mAHD.

Plotting the water table values enable determination of groundwater direction. Figure 3 identifies a groundwater flux towards the northwest.

Table 9 Groundwater Measurements

Groundwater Well I.D.	Date	Top of Casing	Water Level		
		RL mAHD	mBGL	RL mAHD	Change mm
WRMW1	18/05/2012	27.281	3.700	23.581	N/A
	30/08/2012		3.455	23.826	-245
	11/10/2012		3.130	24.151	-325
	15/01/2013		3.646	23.635	516
WRMW2	18/05/2012	30.607	7.666	22.941	N/A
	30/08/2012		7.26	23.347	-406
	11/10/2012		7.316	23.291	56
	15/01/2013		7.682	22.925	366
WRMW3	18/05/2012	34.622	11.846	22.776	N/A
	30/08/2012		11.725	22.897	-121
	11/10/2012		11.794	22.828	69
	15/01/2013		11.858	22.764	64
WRMW4	18/05/2012	27.751	8.509	19.242	N/A
	30/08/2012		7.79	19.961	-719
	11/10/2012		7.753	19.998	-37
	15/01/2013		8.289	19.462	536
WRMW5	18/05/2012	29.034	8.836	20.198	N/A
	30/08/2012		8.28	20.754	-556
	11/10/2012		8.170	20.864	-110
	15/01/2013		8.641	20.393	471
WRMW6	18/05/2012	31.611	8.759	22.852	N/A
	30/08/2012		9.215	22.396	456
	11/10/2012		8.998	22.613	-217
	15/01/2013		9.312	22.299	314

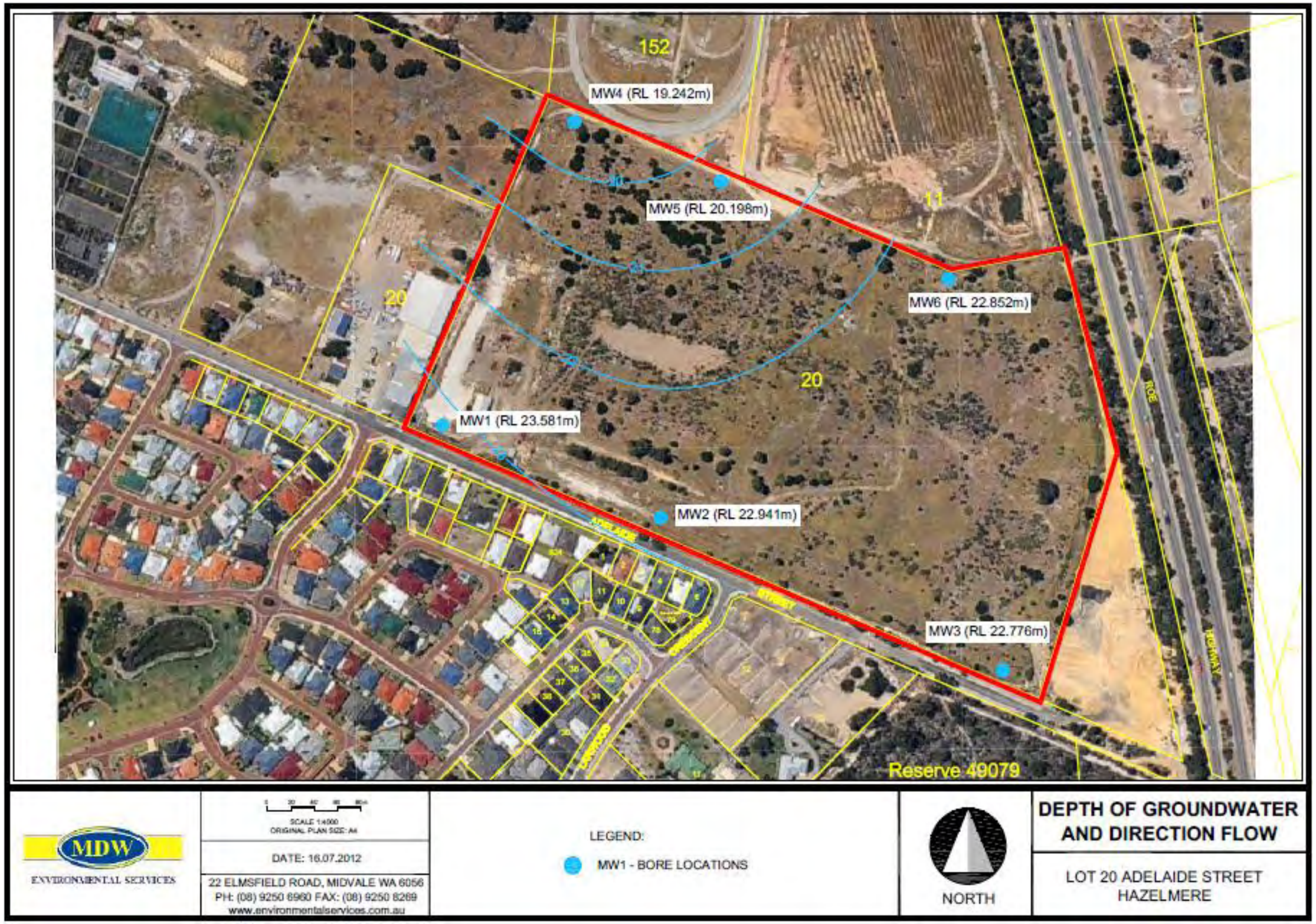


Figure 3 Groundwater Contours

9 DISCUSSION

Standing water level measurements recorded by MDWES during the GME sampling indicate that groundwater is encountered between RL 19.5 mAHD and 23.6 mAHD beneath the Site. Based upon current redevelopment plans, groundwater will not be intercepted during the proposed remediation work.

Field results indicate that the groundwater beneath the site is fresh and mildly acidic with pH ranging from 5.5 to 7.13. This is an acceptable range of pH for groundwater within this locality.

Contamination of the groundwater from material previously deposited on the Site appears to be minimal. With the exception of metalloids, nutrients and low levels of TPH in WRMW6, all other PCOC were below laboratory detection limits.

Metalloid results could be considered higher than expected for background waters within this locality, however, elevated levels of suspended solids within majority of the samples could have contributed to artificially increasing the results. It is further suspected that if dissolved metal concentrations were requested, these would be significantly lower than the total metal results and more indicative of the quality of water that would be abstracted for use for dust suppression and compaction.

Although nutrient levels were slightly elevated above ANZECC criteria, surface waters are not located in the immediate vicinity of the site and downstream receptors are likely to be more significantly impacted upon by land uses to the north of the site including rendering facilities. Comparison of historical data indicates that concentrations of TPH, a contaminant of high concern is increasing, whilst the other contaminant of concern, 3-&4-Methylphenol, is decreasing in concentration. Further data is needed to accurately determine fluctuations in groundwater quality.

MDWES are of the opinion that the contamination of the groundwater from material previously deposited on the Site is minimal and the site does not appear to be a source site for contamination external to the site boundaries. Groundwater flux appears to be in a northwest direction and if the properties to the north of the site are to be included in the redevelopment proposal for this site, it is recommended that groundwater investigations be continued on the property to ensure sufficient data is collected.

It has been recommended that groundwater gauging be completed on a monthly basis and laboratory analysis be completed on a quarterly basis until the remediation commence to gather additional groundwater data prior to the inert wastes being disturbed during remediation earthmoving activities.

10 REFERENCES

ANZECC (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.* Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ).

DEC (2010) *Contaminated Site Management Series - Assessment Levels for Soil, Sediment and Water*. Contaminated Sites Branch, Department of Environment and Conservation.

DEC 2009. Department of Environment and Conservation, Contaminated Sites Management Series - Site classification scheme.

DEC 2006a. Department of Environment and Conservation: Contaminated Sites Management Series – The Use of Risk Assessment in Contaminated Site Assessment Management.

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DEC 2010. Department of Environment and Conservation: Assessment Levels for Soil, Sediment, and Water, Feb 2010

DEP 2004. Department of Environmental Protection, Contaminated Sites Management Series - Potentially contaminating activities, Industries and land uses

DoH 2006. Department of Health Domestic non-potable groundwater use.

DEP 2001. Department of Environmental Protection, Contaminated Sites Management Series - Reporting of site assessments.

Standards Australia/Standards New Zealand. 1998. AS/NZS 5667.1:1998. Water Quality – Sampling. Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of sample. Standards Australia and Standards New Zealand, Homebush NSW and Wellington NZ.

MDW ENVIRONMENTAL SERVICES

Monitoring Well Field Record

Job #: E2012-031 Client: Waste Rock Location: Adelaide Street

Well ID: MW1 Date: 15.1.2013 Sampler: DA + RB

Monitoring Well Information

Depth to Water: 3646 (mm TOC) Depth to Bottom: 6.754 (m)

Standpipe: ______ (m) Monument Cover ☐

Lock: ☐ None ☐ Padlock (YL) ☐ Enviro Cap ☐ Gatic

Equipment IDs

Water Quality Meter: 451 TTA Kit: 3

Pump: Low Flow TALK Kit: 3

Dipper: Con Sites

Sampling

Sample ID: WRMW1-003 COC No: E2012-031-004

Time	pH	EC	DO	Temp	Redox	TTA	TALK
9.15	6.03	789	3.3	27.7	23.6		
9.20	6.10	762	3.2	23.3	26.0		
9.25	5.99	773	1.7	22.7	~~[illegible]~~ 48.0		
9.30	5.98	767	1.5	22.5	35.1	0.65	0.10

Bottles

ASSESSMENT SUITE 2

1 x 1000mL plastic GREEN ☐	2 x 40mL vials MAROON ☐	1 x 500mL plastic GREEN** ☐
1 x 125mL plastic YELLOW ☐	1 x 500mL glass ORANGE ☐	**BRING BACK &FILTER INTO:
1 x 125mL plastic PURPLE ☐	2 x 500mL glass ORANGE per sample set (Lab Dups) ☐	1 x 60mL plastic MAROON ☐
1 x 60mL plastic BLUE ☐		1 x 60mL plastic RED/GREEN ☐
1 x 60mL plastic RED/GREEN ☐	1 x 500mL plastic GREEN ☐	

Comments

MDW ENVIRONMENTAL SERVICES

Monitoring Well Field Record

Job #: E2012-031 Client: Waste Rock Location: Adelaide Street

Well ID: MW2 Date: 15. 1. 2013 Sampler: DA + RB

Monitoring Well Information

Depth to Water: 7682 (mm TOC) Depth to Bottom: 11.180 (m)

Standpipe: ______ (m) Monument Cover ☐

Lock: ☐ None ☒ Padlock (YL) ☐ Enviro Cap ☐ Gatic

Equipment IDs

Water Quality Meter: 451 TTA Kit: 3

Pump: Low Flow TALK Kit: 3

Dipper: Con Sites

Sampling

Sample ID: WRMW2-003 COC No: E2012-031-004

Time	pH	EC	DO	Temp	Redox	TTA	TALK
8.29	5.37	350.9	~~[illegible]~~ -	22.3	176.5		
8.34	4.63	328.1	-	21.5	207.0		
8.39	4.50	331.3	-	21.5	214.0	0.68	0.5
8.44	~~4~~ 4.51	341.4	-	21.8	215.4		

Bottles

ASSESSMENT SUITE 2

1 x 1000mL plastic GREEN ☐	2 x 40mL vials MAROON ☐	1 x 500mL plastic GREEN** ☐
1 x 125mL plastic YELLOW ☐	1 x 500mL glass ORANGE ☐	**BRING BACK &FILTER INTO:
1 x 125mL plastic PURPLE ☐	2 x 500mL glass ORANGE per sample set (Lab Dups) ☐	1 x 60mL plastic MAROON ☐
1 x 60mL plastic BLUE ☐		1 x 60mL plastic RED/GREEN ☐
1 x 60mL plastic RED/GREEN ☐	1 x 500mL plastic GREEN ☐	

Comments

MDW ENVIRONMENTAL SERVICES

Monitoring Well Field Record

Job #: E2012-031 Client: Waste Rock Location: Adelaide Street

Well ID: MW3 Date: 15.1.13 Sampler: DA/RB

Monitoring Well Information

Depth to Water: 11.858 (mm TOC) Depth to Bottom: 15.150 (m)

Standpipe: ______ (m) Monument Cover ☑

Lock: ☐ None ☑ Padlock (YL) ☐ Enviro Cap ☐ Gatic

Equipment IDs

Water Quality Meter: YSI TTA Kit: ______

Pump: LOW FLOW TALK Kit: ______

Dipper: CON SITES

Sampling

Sample ID: WRMW3-003 COC No: E2012-031-004

Time	pH	EC	DO	Temp	Redox	TTA	TALK
741	7.57	1077	0.0	24.4	-56.9		
746	6.91	919	0.0	23.3	-97.1		
751	6.84	884	0.0	23.1	-81.5		
756	6.84	883	0.0	23.2	-71.4	0.3	0.21

Bottles

ASSESSMENT SUITE 2

1 x 1000mL plastic GREEN ☐	2 x 40mL vials MAROON ☐	1 x 500mL plastic GREEN** ☐
1 x 125mL plastic YELLOW ☐	1 x 500mL glass ORANGE ☐	**BRING BACK &FILTER INTO:
1 x 125mL plastic PURPLE ☐	2 x 500mL glass ORANGE per sample set (Lab Dups) ☐	1 x 60mL plastic MAROON ☐
1 x 60mL plastic BLUE ☐		1 x 60mL plastic RED/GREEN ☐
1 x 60mL plastic RED/GREEN ☐	1 x 500mL plastic GREEN ☐	

Comments

ENVIRONMENTAL SERVICES

Monitoring Well Field Record

Job #: E2012-031 Client: Waste Rock Location: Adelaide Street

Well ID: MW4 Date: 15.1.2013 Sampler: OA + RB

Monitoring Well Information

Depth to Water: 8289 (mm TOC) Depth to Bottom: 11470 (m)

Standpipe: ____ (m) Monument Cover ☐

Lock: ☐ None ☒ Padlock (YL) ☐ Enviro Cap ☐ Gatic

Equipment IDs

Water Quality Meter: 451 TTA Kit: 3

Pump: Low Flow TALK Kit: 3

Dipper: Con Sites

Sampling

Sample ID: WRMW4-003 COC No: E2012-031-004

Time	pH	EC	DO	Temp	Redox	TTA	TALK
10.44	5.20	145.9	–	28.7	167.5		
10.49	4.85	133.0	0.2	23.4	193.4		
10.55	4.35	133.1	1.0	23.7	223.7		
10.59	4.70	2.045	1.1	23.8	226.4	0.25	0.05

Bottles — ASSESSMENT SUITE 2

1 x 1000mL plastic GREEN ☐	2 x 40mL vials MAROON ☐	1 x 500mL plastic GREEN** ☐
1 x 125mL plastic YELLOW ☐	1 x 500mL glass ORANGE ☐	**BRING BACK &FILTER INTO:
1 x 125mL plastic PURPLE ☐	2 x 500mL glass ORANGE per sample set (Lab Dups) ☐	1 x 60mL plastic MAROON ☐
1 x 60mL plastic BLUE ☐		1 x 60mL plastic RED/GREEN ☐
1 x 60mL plastic RED/GREEN ☐	1 x 500mL plastic GREEN ☐	

Comments

DUP + TRIP

MDW ENVIRONMENTAL SERVICES

Monitoring Well Field Record

Job #: E2012-031 Client: Waste Rock Location: Adelaide Street

Well ID: MW5 Date: 15.1.2013 Sampler: DA + RB

Monitoring Well Information

Depth to Water: 8641 (mm TOC) Depth to Bottom: 12.375 (m)

Standpipe: ____ (m) Monument Cover ☐

Lock: ☐ None ☒ Padlock (YL) ☐ Enviro Cap ☐ Gatic

Equipment IDs

Water Quality Meter: 451 TTA Kit: 3

Pump: Low Flow TALK Kit: 3

Dipper: Con Sites

Sampling

Sample ID: WRMW5-003 COC No: E2012-031-004

Time	pH	EC	DO	Temp	Redox	TTA	TALK
9.57	6.36	126.9	-	25.2	96.6		
10.02	5.43	132.4	-	22.9	146.7		
10.07	4.96	115.4	-	22.6	175.8		
10.12	4.98	117.7	-	22.6	179.8	0.11	0.06

Bottles

ASSESSMENT SUITE 2

1 x 1000mL plastic GREEN ☐	2 x 40mL vials MAROON ☐	1 x 500mL plastic GREEN** ☐
1 x 125mL plastic YELLOW ☐	1 x 500mL glass ORANGE ☐	**BRING BACK &FILTER INTO:
1 x 125mL plastic PURPLE ☐	2 x 500mL glass ORANGE per sample set (Lab Dups) ☐	1 x 60mL plastic MAROON ☐
1 x 60mL plastic BLUE ☐		1 x 60mL plastic RED/GREEN ☐
1 x 60mL plastic RED/GREEN ☐	1 x 500mL plastic GREEN ☐	

Comments

MDW ENVIRONMENTAL SERVICES

Monitoring Well Field Record

Job #: E2012-031 Client: Waste Rock Location: Adelaide Street

Well ID: MW6 Date: 15.1.2013 Sampler: DA + RB

Monitoring Well Information

Depth to Water: 9312 (mm TOC) Depth to Bottom: 9774 (m)

Standpipe: ________ (m) Monument Cover ☐

Lock: ☐ None ☒ Padlock (YL) ☐ Enviro Cap ☐ Gatic

Equipment IDs

Water Quality Meter: YSI TTA Kit: 3

Pump: Low Flow TALK Kit: 3

Dipper: Con Sites

Sampling

Sample ID: WRMW5-003 COC No: E2012-031-004

Time	pH	EC	DO	Temp	Redox	TTA	TALK
12.36	5.29	1060	1.9	30.1	160.4		
12.41	5.20	957	0.9	25.3	161.7		
12.46	5.26	957	0.8	25.0	154.2	1.59	0.05
12.51							

Bottles

ASSESSMENT SUITE 2

1 x 1000mL plastic GREEN ☐	2 x 40mL vials MAROON ☐	1 x 500mL plastic GREEN** ☐
1 x 125mL plastic YELLOW ☐	1 x 500mL glass ORANGE ☐	**BRING BACK &FILTER INTO:
1 x 125mL plastic PURPLE ☐	2 x 500mL glass ORANGE per sample set (Lab Dups) ☐	1 x 60mL plastic MAROON ☐
1 x 60mL plastic BLUE ☐		1 x 60mL plastic RED/GREEN ☐
1 x 60mL plastic RED/GREEN ☐	1 x 500mL plastic GREEN ☐	

Comments

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **EP1300272**	Page	: 1 of 19
Client	: **MOBILE DEWATERING**	Laboratory	: Environmental Division Perth
Contact	: INFO	Contact	: Lauren Ockwell
Address	: PO BOX 239 MIDLAND WA, AUSTRALIA 6939	Address	: 10 Hod Way Malaga WA Australia 6090
E-mail	: info@environmentalservices.com.au	E-mail	: lauren.ockwell@alsenviro.com
Telephone	: +61 08 9250 4995	Telephone	: 08 9209 7606
Facsimile	: ----	Facsimile	: 08 9209 7600
Project	: E2012-31	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: E2012-31-005	Date Samples Received	: 15-JAN-2013
Sampler	: DA/RB	Issue Date	: 24-JAN-2013
Site	: WASTEROCK		
		No. of samples received	: 9
Quote number	: EP/785/12	No. of samples analysed	: 9

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **EG020: Positive results for sample EP1300272 #8 have been confirmed by reanalysis.**
- **EG020:It has been confirmed by re-digestion and re-analysis that total Zinc concentration is less than dissolved for sample EP1200272 #6.**
- **EP075(SIM) - PAH/Phenols: High d10-Anthracene surrogate recovery for the sample "WRMW1-003". However no positive results recorded and the rest of the surrogates are in acceptable range.**
- **TDS by method EA-015 may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.**

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

NATA WORLD RECOGNISED ACCREDITATION

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Agnes Szilagyi	Senior Organic Chemist	Perth Organics Perth Organics
Benjamin Nicholson	Metals Chemist	Perth Inorganics
Chas Tucker	Inorganic Chemist	Perth Inorganics Perth Inorganics Perth Inorganics
Hoa Nguyen	Senior Inorganic Chemist	Sydney Inorganics
Rassem Ayoubi	Senior Organic Chemist	Perth Organics

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)	Client sample ID			WRMW1-003	WRMW2-003	WRMW3-003	WRMW4-003	WRMW5-003
	Client sampling date / time			[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]
Compound	CAS Number	LOR	Unit	EP1300272-001	EP1300272-002	EP1300272-003	EP1300272-004	EP1300272-005
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	6.17	5.21	7.13	5.61	6.07
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	788	347	906	118	124
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	GIS-210-010	10	mg/L	562	290	598	74	133
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	138	75	287	313	42
EA045: Turbidity								
Turbidity	----	0.1	NTU	62.8	54.7	900	81.8	57.6
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	35	2	130	2	3
Total Alkalinity as CaCO3	ALK_TOTAL	1	mg/L	35	2	130	2	3
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	40	39	8	16	6
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	108	9	41	2	11
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	157	88	184	23	25
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.11	0.10	0.61	0.34	0.41
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.002	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	0.002	0.001	0.082	0.005	0.001
Nickel	7440-02-0	0.001	mg/L	0.007	0.008	0.003	0.012	0.004
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	0.045	0.066	0.011	0.072	0.028
Iron	7439-89-6	0.05	mg/L	0.07	0.12	1.17	0.31	<0.05
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	4.69	3.30	21.5	13.9	5.03
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.006	<0.001	<0.001

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	**WRMW1-003**	**WRMW2-003**	**WRMW3-003**	**WRMW4-003**	**WRMW5-003**
			Client sampling date / time	[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]
Compound	*CAS Number*	*LOR*	*Unit*	**EP1300272-001**	**EP1300272-002**	**EP1300272-003**	**EP1300272-004**	**EP1300272-005**
EG020T: Total Metals by ICP-MS - Continued								
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	**0.003**	**0.003**	**0.030**	**0.008**	**0.003**
Copper	7440-50-8	0.001	mg/L	**0.005**	**0.011**	**0.022**	**0.025**	**0.006**
Lead	7439-92-1	0.001	mg/L	**0.004**	**0.005**	**0.052**	**0.012**	**0.005**
Manganese	7439-96-5	0.001	mg/L	**0.003**	**0.002**	**0.094**	**0.007**	**0.002**
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	**0.007**	**0.009**	**0.011**	**0.016**	**0.004**
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	**0.044**	**0.070**	**0.061**	**0.110**	**0.025**
Iron	7439-89-6	0.05	mg/L	**0.23**	**1.37**	**9.35**	**1.50**	**0.37**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG050F: Dissolved Hexavalent Chromium								
Hexavalent Chromium	18540-29-9	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EG051G: Ferrous Iron by Discrete Analyser								
Ferrous Iron	----	0.05	mg/L	**0.11**	**0.12**	**0.61**	**0.09**	<0.05
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.02**	**0.01**	**0.10**	**0.03**	<0.01
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	**0.01**	<0.01	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**1.86**	**1.24**	**0.24**	**4.38**	**1.63**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**1.87**	**1.24**	**0.24**	**4.38**	**1.63**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**0.5**	**0.2**	**0.9**	**0.7**	**0.2**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ **Total Nitrogen as N**	----	0.1	mg/L	**2.4**	**1.4**	**1.1**	**5.1**	**1.8**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	<0.01	**0.04**	**0.63**	**0.06**	**0.02**
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	----	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	WRMW1-003	WRMW2-003	WRMW3-003	WRMW4-003	WRMW5-003
			Client sampling date / time	[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]
Compound	CAS Number	LOR	Unit	EP1300272-001	EP1300272-002	EP1300272-003	EP1300272-004	EP1300272-005
EK085M: Sulfide as S2-								
Sulfide as S2-	18496-25-8	0.1	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
EP026ST: Chemical Oxygen Demand (Sealed Tube)								
Chemical Oxygen Demand	----	5	mg/L	**13**	<5	**11**	**16**	<5
EP030: Biochemical Oxygen Demand (BOD)								
Biochemical Oxygen Demand	----	2	mg/L	<2	<2	**2**	**4**	<2
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
beta-BHC	319-85-7	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
gamma-BHC	58-89-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
delta-BHC	319-86-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Heptachlor	76-44-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Aldrin	309-00-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Dieldrin	60-57-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDE	72-55-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Endrin	72-20-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDD	72-54-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDT	50-29-3	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Endrin ketone	53494-70-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Methoxychlor	72-43-5	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Monocrotophos	6923-22-4	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Dimethoate	60-51-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Diazinon	333-41-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	WRMW1-003	WRMW2-003	WRMW3-003	WRMW4-003	WRMW5-003
			Client sampling date / time	[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]
Compound	CAS Number	LOR	Unit	EP1300272-001	EP1300272-002	EP1300272-003	EP1300272-004	EP1300272-005
EP068B: Organophosphorus Pesticides (OP) - Continued								
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Parathion-methyl	298-00-0	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Malathion	121-75-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Fenthion	55-38-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Parathion	56-38-2	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Fenamiphos	22224-92-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Prothiofos	34643-46-4	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Ethion	563-12-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Carbophenothion	786-19-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
EP074A: Monocyclic Aromatic Hydrocarbons								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
Styrene	100-42-5	5	µg/L	<5	<5	<5	<5	<5
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
Isopropylbenzene	98-82-8	5	µg/L	<5	<5	<5	<5	<5
n-Propylbenzene	103-65-1	5	µg/L	<5	<5	<5	<5	<5
1.3.5-Trimethylbenzene	108-67-8	5	µg/L	<5	<5	<5	<5	<5
sec-Butylbenzene	135-98-8	5	µg/L	<5	<5	<5	<5	<5
1.2.4-Trimethylbenzene	95-63-6	5	µg/L	<5	<5	<5	<5	<5
tert-Butylbenzene	98-06-6	5	µg/L	<5	<5	<5	<5	<5
p-Isopropyltoluene	99-87-6	5	µg/L	<5	<5	<5	<5	<5
n-Butylbenzene	104-51-8	5	µg/L	<5	<5	<5	<5	<5
EP074B: Oxygenated Compounds								
Vinyl Acetate	108-05-4	50	µg/L	<50	<50	<50	<50	<50
2-Butanone (MEK)	78-93-3	50	µg/L	<50	<50	<50	<50	<50
4-Methyl-2-pentanone (MIBK)	108-10-1	50	µg/L	<50	<50	<50	<50	<50

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	WRMW1-003	WRMW2-003	WRMW3-003	WRMW4-003	WRMW5-003
			Client sampling date / time	[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]
Compound	CAS Number	LOR	Unit	EP1300272-001	EP1300272-002	EP1300272-003	EP1300272-004	EP1300272-005
EP074B: Oxygenated Compounds - Continued								
2-Hexanone (MBK)	591-78-6	50	µg/L	<50	<50	<50	<50	<50
EP074C: Sulfonated Compounds								
Carbon disulfide	75-15-0	5	µg/L	<5	<5	<5	<5	<5
EP074D: Fumigants								
2.2-Dichloropropane	594-20-7	5	µg/L	<5	<5	<5	<5	<5
1.2-Dichloropropane	78-87-5	5	µg/L	<5	<5	<5	<5	<5
cis-1.3-Dichloropropylene	10061-01-5	5	µg/L	<5	<5	<5	<5	<5
trans-1.3-Dichloropropylene	10061-02-6	5	µg/L	<5	<5	<5	<5	<5
1.2-Dibromoethane (EDB)	106-93-4	5	µg/L	<5	<5	<5	<5	<5
EP074E: Halogenated Aliphatic Compounds								
Dichlorodifluoromethane	75-71-8	50	µg/L	<50	<50	<50	<50	<50
Chloromethane	74-87-3	50	µg/L	<50	<50	<50	<50	<50
Vinyl chloride	75-01-4	50	µg/L	<50	<50	<50	<50	<50
Bromomethane	74-83-9	50	µg/L	<50	<50	<50	<50	<50
Chloroethane	75-00-3	50	µg/L	<50	<50	<50	<50	<50
Trichlorofluoromethane	75-69-4	50	µg/L	<50	<50	<50	<50	<50
1.1-Dichloroethene	75-35-4	5	µg/L	<5	<5	<5	<5	<5
Iodomethane	74-88-4	5	µg/L	<5	<5	<5	<5	<5
trans-1.2-Dichloroethene	156-60-5	5	µg/L	<5	<5	<5	<5	<5
1.1-Dichloroethane	75-34-3	5	µg/L	<5	<5	<5	<5	<5
cis-1.2-Dichloroethene	156-59-2	5	µg/L	<5	<5	<5	<5	<5
1.1.1-Trichloroethane	71-55-6	5	µg/L	<5	<5	<5	<5	<5
1.1-Dichloropropylene	563-58-6	5	µg/L	<5	<5	<5	<5	<5
Carbon Tetrachloride	56-23-5	5	µg/L	<5	<5	<5	<5	<5
1.2-Dichloroethane	107-06-2	5	µg/L	<5	<5	<5	<5	<5
Trichloroethene	79-01-6	5	µg/L	<5	<5	<5	<5	<5
Dibromomethane	74-95-3	5	µg/L	<5	<5	<5	<5	<5
1.1.2-Trichloroethane	79-00-5	5	µg/L	<5	<5	<5	<5	<5
1.3-Dichloropropane	142-28-9	5	µg/L	<5	<5	<5	<5	<5
Tetrachloroethene	127-18-4	5	µg/L	<5	<5	<5	<5	<5
1.1.1.2-Tetrachloroethane	630-20-6	5	µg/L	<5	<5	<5	<5	<5
trans-1.4-Dichloro-2-butene	110-57-6	5	µg/L	<5	<5	<5	<5	<5
cis-1.4-Dichloro-2-butene	1476-11-5	5	µg/L	<5	<5	<5	<5	<5

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	WRMW1-003	WRMW2-003	WRMW3-003	WRMW4-003	WRMW5-003
			Client sampling date / time	[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]
Compound	*CAS Number*	*LOR*	*Unit*	EP1300272-001	EP1300272-002	EP1300272-003	EP1300272-004	EP1300272-005
EP074E: Halogenated Aliphatic Compounds - Continued								
1.1.2.2-Tetrachloroethane	79-34-5	5	µg/L	<5	<5	<5	<5	<5
1.2.3-Trichloropropane	96-18-4	5	µg/L	<5	<5	<5	<5	<5
Pentachloroethane	76-01-7	5	µg/L	<5	<5	<5	<5	<5
1.2-Dibromo-3-chloropropane	96-12-8	5	µg/L	<5	<5	<5	<5	<5
Hexachlorobutadiene	87-68-3	5	µg/L	<5	<5	<5	<5	<5
EP074F: Halogenated Aromatic Compounds								
Chlorobenzene	108-90-7	5	µg/L	<5	<5	<5	<5	<5
Bromobenzene	108-86-1	5	µg/L	<5	<5	<5	<5	<5
2-Chlorotoluene	95-49-8	5	µg/L	<5	<5	<5	<5	<5
4-Chlorotoluene	106-43-4	5	µg/L	<5	<5	<5	<5	<5
1.3-Dichlorobenzene	541-73-1	5	µg/L	<5	<5	<5	<5	<5
1.4-Dichlorobenzene	106-46-7	5	µg/L	<5	<5	<5	<5	<5
1.2-Dichlorobenzene	95-50-1	5	µg/L	<5	<5	<5	<5	<5
1.2.4-Trichlorobenzene	120-82-1	5	µg/L	<5	<5	<5	<5	<5
1.2.3-Trichlorobenzene	87-61-6	5	µg/L	<5	<5	<5	<5	<5
EP074G: Trihalomethanes								
Chloroform	67-66-3	5	µg/L	<5	<5	<5	<5	<5
Bromodichloromethane	75-27-4	5	µg/L	<5	<5	<5	<5	<5
Dibromochloromethane	124-48-1	5	µg/L	<5	<5	<5	<5	<5
Bromoform	75-25-2	5	µg/L	<5	<5	<5	<5	<5
EP074H: Naphthalene								
Naphthalene	91-20-3	7	µg/L	<7	<7	<7	<7	<7
EP075(SIM)A: Phenolic Compounds								
Phenol	108-95-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chlorophenol	95-57-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2-Methylphenol	95-48-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
3- & 4-Methylphenol	1319-77-3	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
2-Nitrophenol	88-75-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.4-Dimethylphenol	105-67-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.4-Dichlorophenol	120-83-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.6-Dichlorophenol	87-65-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
4-Chloro-3-Methylphenol	59-50-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.4.6-Trichlorophenol	88-06-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	WRMW1-003	WRMW2-003	WRMW3-003	WRMW4-003	WRMW5-003
			Client sampling date / time	[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]
				EP1300272-001	**EP1300272-002**	**EP1300272-003**	**EP1300272-004**	**EP1300272-005**
EP075(SIM)A: Phenolic Compounds - Continued								
2.4.5-Trichlorophenol	95-95-4	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Pentachlorophenol	87-86-5	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(b)fluoranthene	205-99-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	<50	<50	<50
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.1	%	**102**	**143**	**140**	**146**	**137**
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.1	%	**106**	**69.6**	**104**	**99.4**	**64.8**
EP074S: VOC Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	**95.3**	**97.5**	**110**	**104**	**126**
Toluene-D8	2037-26-5	0.1	%	**96.5**	**91.6**	**89.8**	**92.7**	**92.0**
4-Bromofluorobenzene	460-00-4	0.1	%	**93.0**	**107**	**97.5**	**97.2**	**97.3**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	WRMW1-003	WRMW2-003	WRMW3-003	WRMW4-003	WRMW5-003
			Client sampling date / time	[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]
Compound	CAS Number	LOR	Unit	EP1300272-001	EP1300272-002	EP1300272-003	EP1300272-004	EP1300272-005
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	38.4	39.9	32.6	28.6	36.4
2-Chlorophenol-D4	93951-73-6	0.1	%	86.4	87.7	72.7	65.2	78.7
2.4.6-Tribromophenol	118-79-6	0.1	%	117	122	103	87.7	107
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	82.7	86.4	75.6	73.1	77.0
Anthracene-d10	1719-06-8	0.1	%	126	120	110	101	119
4-Terphenyl-d14	1718-51-0	0.1	%	128	120	107	100	119
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	98.8	99.2	113	107	128
Toluene-D8	2037-26-5	0.1	%	103	101	96.9	99.4	98.7
4-Bromofluorobenzene	460-00-4	0.1	%	93.0	110	103	103	102

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	WRMW6-003	DUP-003	RINSATE -003	BLANK -003	----
			Client sampling date / time	[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]	----
Compound	CAS Number	LOR	Unit	EP1300272-006	EP1300272-007	EP1300272-008	EP1300272-009	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**5.15**	**5.16**	**5.40**	**5.54**	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**912**	**118**	**7**	**15**	----
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	GIS-210-010	10	mg/L	**588**	**101**	<10	<10	----
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	**32**	**254**	<5	**5**	----
EA045: Turbidity								
Turbidity	----	0.1	NTU	**19.9**	**58.7**	<0.1	<0.1	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**3**	<1	<1	<1	----
Total Alkalinity as CaCO3	ALK_TOTAL	1	mg/L	**3**	<1	<1	<1	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**28**	**8**	**4**	**4**	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**169**	**2**	<1	<1	----
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	**168**	**23**	**3**	**4**	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.30**	**0.26**	<0.01	<0.01	----
Arsenic	7440-38-2	0.001	mg/L	**0.001**	<0.001	<0.001	<0.001	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Manganese	7439-96-5	0.001	mg/L	**0.032**	**0.003**	<0.001	<0.001	----
Nickel	7440-02-0	0.001	mg/L	**0.014**	**0.012**	<0.001	<0.001	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Zinc	7440-66-6	0.005	mg/L	**0.132**	**0.072**	**0.034**	<0.005	----
Iron	7439-89-6	0.05	mg/L	**0.91**	**0.14**	<0.05	<0.05	----
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**1.15**	**13.2**	<0.01	<0.01	----
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	WRMW6-003	DUP-003	RINSATE -003	BLANK -003	----
			Client sampling date / time	[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]	----
Compound	CAS Number	LOR	Unit	EP1300272-006	EP1300272-007	EP1300272-008	EP1300272-009	----
EG020T: Total Metals by ICP-MS - Continued								
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
Chromium	7440-47-3	0.001	mg/L	**0.005**	**0.008**	<0.001	<0.001	----
Copper	7440-50-8	0.001	mg/L	**0.013**	**0.029**	<0.001	<0.001	----
Lead	7439-92-1	0.001	mg/L	**0.008**	**0.011**	<0.001	<0.001	----
Manganese	7439-96-5	0.001	mg/L	**0.035**	**0.006**	<0.001	<0.001	----
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Nickel	7440-02-0	0.001	mg/L	**0.013**	**0.016**	<0.001	<0.001	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Zinc	7440-66-6	0.005	mg/L	**0.107**	**0.109**	<0.005	<0.005	----
Iron	7439-89-6	0.05	mg/L	**1.74**	**1.49**	<0.05	<0.05	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
EG050F: Dissolved Hexavalent Chromium								
Hexavalent Chromium	18540-29-9	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
EG051G: Ferrous Iron by Discrete Analyser								
Ferrous Iron	----	0.05	mg/L	**0.73**	**0.10**	<0.05	<0.05	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.33**	**0.01**	**0.01**	<0.01	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**1.16**	**4.33**	<0.01	<0.01	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**1.16**	**4.33**	<0.01	<0.01	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**0.8**	<0.5	<0.1	<0.1	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**2.0**	**4.3**	<0.1	<0.1	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.03**	**0.09**	<0.01	<0.01	----
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	----	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	WRMW6-003	DUP-003	RINSATE -003	BLANK -003	----
			Client sampling date / time	[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]	----
Compound	CAS Number	LOR	Unit	EP1300272-006	EP1300272-007	EP1300272-008	EP1300272-009	----
EK085M: Sulfide as S2-								
Sulfide as S2-	18496-25-8	0.1	mg/L	<0.1	<0.1	<0.1	<0.1	----
EP026ST: Chemical Oxygen Demand (Sealed Tube)								
Chemical Oxygen Demand	----	5	mg/L	**23**	<5	<5	<5	----
EP030: Biochemical Oxygen Demand (BOD)								
Biochemical Oxygen Demand	----	2	mg/L	<2	**12**	<2	<2	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
beta-BHC	319-85-7	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
gamma-BHC	58-89-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
delta-BHC	319-86-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Heptachlor	76-44-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Aldrin	309-00-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Dieldrin	60-57-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
4.4`-DDE	72-55-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Endrin	72-20-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
4.4`-DDD	72-54-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
4.4`-DDT	50-29-3	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	----
Endrin ketone	53494-70-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Methoxychlor	72-43-5	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	----
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Monocrotophos	6923-22-4	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	----
Dimethoate	60-51-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Diazinon	333-41-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)	Client sample ID			WRMW6-003	DUP-003	RINSATE -003	BLANK -003	----
	Client sampling date / time			[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]	----
Compound	CAS Number	LOR	Unit	EP1300272-006	EP1300272-007	EP1300272-008	EP1300272-009	----
EP068B: Organophosphorus Pesticides (OP) - Continued								
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Parathion-methyl	298-00-0	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	----
Malathion	121-75-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Fenthion	55-38-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Parathion	56-38-2	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	----
Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Fenamiphos	22224-92-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Prothiofos	34643-46-4	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Ethion	563-12-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Carbophenothion	786-19-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
EP074A: Monocyclic Aromatic Hydrocarbons								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	----
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	----
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	----
Styrene	100-42-5	5	µg/L	<5	<5	<5	<5	----
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	----
Isopropylbenzene	98-82-8	5	µg/L	<5	<5	<5	<5	----
n-Propylbenzene	103-65-1	5	µg/L	<5	<5	<5	<5	----
1.3.5-Trimethylbenzene	108-67-8	5	µg/L	<5	<5	<5	<5	----
sec-Butylbenzene	135-98-8	5	µg/L	<5	<5	<5	<5	----
1.2.4-Trimethylbenzene	95-63-6	5	µg/L	<5	<5	<5	<5	----
tert-Butylbenzene	98-06-6	5	µg/L	<5	<5	<5	<5	----
p-Isopropyltoluene	99-87-6	5	µg/L	<5	<5	<5	<5	----
n-Butylbenzene	104-51-8	5	µg/L	<5	<5	<5	<5	----
EP074B: Oxygenated Compounds								
Vinyl Acetate	108-05-4	50	µg/L	<50	<50	<50	<50	----
2-Butanone (MEK)	78-93-3	50	µg/L	<50	<50	<50	<50	----
4-Methyl-2-pentanone (MIBK)	108-10-1	50	µg/L	<50	<50	<50	<50	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	WRMW6-003	DUP-003	RINSATE -003	BLANK -003	----
			Client sampling date / time	[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]	----
Compound	CAS Number	LOR	Unit	EP1300272-006	EP1300272-007	EP1300272-008	EP1300272-009	----
EP074B: Oxygenated Compounds - Continued								
2-Hexanone (MBK)	591-78-6	50	µg/L	<50	<50	<50	<50	----
EP074C: Sulfonated Compounds								
Carbon disulfide	75-15-0	5	µg/L	<5	<5	<5	<5	----
EP074D: Fumigants								
2.2-Dichloropropane	594-20-7	5	µg/L	<5	<5	<5	<5	----
1.2-Dichloropropane	78-87-5	5	µg/L	<5	<5	<5	<5	----
cis-1.3-Dichloropropylene	10061-01-5	5	µg/L	<5	<5	<5	<5	----
trans-1.3-Dichloropropylene	10061-02-6	5	µg/L	<5	<5	<5	<5	----
1.2-Dibromoethane (EDB)	106-93-4	5	µg/L	<5	<5	<5	<5	----
EP074E: Halogenated Aliphatic Compounds								
Dichlorodifluoromethane	75-71-8	50	µg/L	<50	<50	<50	<50	----
Chloromethane	74-87-3	50	µg/L	<50	<50	<50	<50	----
Vinyl chloride	75-01-4	50	µg/L	<50	<50	<50	<50	----
Bromomethane	74-83-9	50	µg/L	<50	<50	<50	<50	----
Chloroethane	75-00-3	50	µg/L	<50	<50	<50	<50	----
Trichlorofluoromethane	75-69-4	50	µg/L	<50	<50	<50	<50	----
1.1-Dichloroethene	75-35-4	5	µg/L	<5	<5	<5	<5	----
Iodomethane	74-88-4	5	µg/L	<5	<5	<5	<5	----
trans-1.2-Dichloroethene	156-60-5	5	µg/L	<5	<5	<5	<5	----
1.1-Dichloroethane	75-34-3	5	µg/L	<5	<5	<5	<5	----
cis-1.2-Dichloroethene	156-59-2	5	µg/L	<5	<5	<5	<5	----
1.1.1-Trichloroethane	71-55-6	5	µg/L	<5	<5	<5	<5	----
1.1-Dichloropropylene	563-58-6	5	µg/L	<5	<5	<5	<5	----
Carbon Tetrachloride	56-23-5	5	µg/L	<5	<5	<5	<5	----
1.2-Dichloroethane	107-06-2	5	µg/L	<5	<5	<5	<5	----
Trichloroethene	79-01-6	5	µg/L	<5	<5	<5	<5	----
Dibromomethane	74-95-3	5	µg/L	<5	<5	<5	<5	----
1.1.2-Trichloroethane	79-00-5	5	µg/L	<5	<5	<5	<5	----
1.3-Dichloropropane	142-28-9	5	µg/L	<5	<5	<5	<5	----
Tetrachloroethene	127-18-4	5	µg/L	<5	<5	<5	<5	----
1.1.1.2-Tetrachloroethane	630-20-6	5	µg/L	<5	<5	<5	<5	----
trans-1.4-Dichloro-2-butene	110-57-6	5	µg/L	<5	<5	<5	<5	----
cis-1.4-Dichloro-2-butene	1476-11-5	5	µg/L	<5	<5	<5	<5	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	WRMW6-003	DUP-003	RINSATE -003	BLANK -003	----
			Client sampling date / time	[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]	----
Compound	CAS Number	LOR	Unit	EP1300272-006	EP1300272-007	EP1300272-008	EP1300272-009	----
EP074E: Halogenated Aliphatic Compounds - Continued								
1.1.2.2-Tetrachloroethane	79-34-5	5	µg/L	<5	<5	<5	<5	----
1.2.3-Trichloropropane	96-18-4	5	µg/L	<5	<5	<5	<5	----
Pentachloroethane	76-01-7	5	µg/L	<5	<5	<5	<5	----
1.2-Dibromo-3-chloropropane	96-12-8	5	µg/L	<5	<5	<5	<5	----
Hexachlorobutadiene	87-68-3	5	µg/L	<5	<5	<5	<5	----
EP074F: Halogenated Aromatic Compounds								
Chlorobenzene	108-90-7	5	µg/L	<5	<5	<5	<5	----
Bromobenzene	108-86-1	5	µg/L	<5	<5	<5	<5	----
2-Chlorotoluene	95-49-8	5	µg/L	<5	<5	<5	<5	----
4-Chlorotoluene	106-43-4	5	µg/L	<5	<5	<5	<5	----
1.3-Dichlorobenzene	541-73-1	5	µg/L	<5	<5	<5	<5	----
1.4-Dichlorobenzene	106-46-7	5	µg/L	<5	<5	<5	<5	----
1.2-Dichlorobenzene	95-50-1	5	µg/L	<5	<5	<5	<5	----
1.2.4-Trichlorobenzene	120-82-1	5	µg/L	<5	<5	<5	<5	----
1.2.3-Trichlorobenzene	87-61-6	5	µg/L	<5	<5	<5	<5	----
EP074G: Trihalomethanes								
Chloroform	67-66-3	5	µg/L	<5	<5	<5	<5	----
Bromodichloromethane	75-27-4	5	µg/L	<5	<5	<5	**6**	----
Dibromochloromethane	124-48-1	5	µg/L	<5	<5	<5	**9**	----
Bromoform	75-25-2	5	µg/L	<5	<5	<5	<5	----
EP074H: Naphthalene								
Naphthalene	91-20-3	7	µg/L	<7	<7	<7	<7	----
EP075(SIM)A: Phenolic Compounds								
Phenol	108-95-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
2-Chlorophenol	95-57-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
2-Methylphenol	95-48-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
3- & 4-Methylphenol	1319-77-3	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	----
2-Nitrophenol	88-75-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
2.4-Dimethylphenol	105-67-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
2.4-Dichlorophenol	120-83-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
2.6-Dichlorophenol	87-65-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
4-Chloro-3-Methylphenol	59-50-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
2.4.6-Trichlorophenol	88-06-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	WRMW6-003	DUP-003	RINSATE -003	BLANK -003	----
			Client sampling date / time	[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]	----
Compound	CAS Number	LOR	Unit	EP1300272-006	EP1300272-007	EP1300272-008	EP1300272-009	----
EP075(SIM)A: Phenolic Compounds - Continued								
2.4.5-Trichlorophenol	95-95-4	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Pentachlorophenol	87-86-5	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Benzo(b)fluoranthene	205-99-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	----
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	----
C15 - C28 Fraction	----	100	µg/L	**380**	<100	<100	<100	----
C29 - C36 Fraction	----	50	µg/L	**60**	<50	<50	<50	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	**440**	<50	<50	<50	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.1	%	**124**	**108**	**110**	**140**	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.1	%	**129**	**109**	**108**	**68.2**	----
EP074S: VOC Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	**105**	**104**	**105**	**108**	----
Toluene-D8	2037-26-5	0.1	%	**90.1**	**91.9**	**90.8**	**92.9**	----
4-Bromofluorobenzene	460-00-4	0.1	%	**97.4**	**96.4**	**94.7**	**96.6**	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	WRMW6-003	DUP-003	RINSATE -003	BLANK -003	----
			Client sampling date / time	[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]	[15-JAN-2013]	----
Compound	CAS Number	LOR	Unit	EP1300272-006	EP1300272-007	EP1300272-008	EP1300272-009	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	**32.5**	**23.0**	**42.6**	**35.2**	----
2-Chlorophenol-D4	93951-73-6	0.1	%	**72.8**	**48.0**	**94.4**	**76.8**	----
2.4.6-Tribromophenol	118-79-6	0.1	%	**106**	**61.6**	**129**	**101**	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	**74.1**	**47.9**	**92.1**	**80.2**	----
Anthracene-d10	1719-06-8	0.1	%	**109**	**70.7**	**125**	**114**	----
4-Terphenyl-d14	1718-51-0	0.1	%	**107**	**69.6**	**124**	**113**	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	**110**	**107**	**111**	**107**	----
Toluene-D8	2037-26-5	0.1	%	**96.5**	**97.8**	**96.8**	**97.1**	----
4-Bromofluorobenzene	460-00-4	0.1	%	**102**	**98.2**	**101**	**99.1**	----

Surrogate Control Limits

Sub-Matrix: **WATER**

Compound	CAS Number	Recovery Limits (%) Low	High
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	50.0	146.3
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	26.8	153.4
EP074S: VOC Surrogates			
1.2-Dichloroethane-D4	17060-07-0	62.3	133.9
Toluene-D8	2037-26-5	74.5	124.3
4-Bromofluorobenzene	460-00-4	63.9	118.5
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10.0	67.2
2-Chlorophenol-D4	93951-73-6	29.4	119.5
2.4.6-Tribromophenol	118-79-6	10.0	130.8
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	33.8	130.7
Anthracene-d10	1719-06-8	42.7	126.5
4-Terphenyl-d14	1718-51-0	40.5	142.4
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	60.5	141.2
Toluene-D8	2037-26-5	73.4	126
4-Bromofluorobenzene	460-00-4	59.6	125.3

Environmental Division

QUALITY CONTROL REPORT

Work Order	: **EP1300272**	Page	: 1 of 20
Client	: **MOBILE DEWATERING**	Laboratory	: Environmental Division Perth
Contact	: INFO	Contact	: Lauren Ockwell
Address	: PO BOX 239 MIDLAND WA, AUSTRALIA 6939	Address	: 10 Hod Way Malaga WA Australia 6090
E-mail	: info@environmentalservices.com.au	E-mail	: lauren.ockwell@alsenviro.com
Telephone	: +61 08 9250 4995	Telephone	: 08 9209 7606
Facsimile	: ----	Facsimile	: 08 9209 7600
Project	: E2012-31	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: WASTEROCK		
C-O-C number	: E2012-31-005	Date Samples Received	: 15-JAN-2013
Sampler	: DA/RB	Issue Date	: 24-JAN-2013
Order number	: ----		
		No. of samples received	: 9
Quote number	: EP/785/12	No. of samples analysed	: 9

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

WORLD RECOGNISED ACCREDITATION

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Agnes Szilagyi	Senior Organic Chemist	Perth Organics
		Perth Organics
Benjamin Nicholson	Metals Chemist	Perth Inorganics
Chas Tucker	Inorganic Chemist	Perth Inorganics
		Perth Inorganics
		Perth Inorganics
Hoa Nguyen	Senior Inorganic Chemist	Sydney Inorganics
Rassem Ayoubi	Senior Organic Chemist	Perth Organics

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA005P: pH by PC Titrator (QC Lot: 2689067)									
EP1300266-006	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	6.92	6.90	0.3	0% - 20%
EP1300272-003	WRMW3-003	EA005-P: pH Value	----	0.01	pH Unit	7.13	7.17	0.6	0% - 20%
EA005P: pH by PC Titrator (QC Lot: 2689070)									
EP1300272-009	BLANK -003	EA005-P: pH Value	----	0.01	pH Unit	5.54	5.67	2.3	0% - 20%
EP1300292-001	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.63	7.74	1.4	0% - 20%
EA010P: Conductivity by PC Titrator (QC Lot: 2689066)									
EP1300266-006	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	1030	1040	0.7	0% - 20%
EP1300272-003	WRMW3-003	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	906	911	0.6	0% - 20%
EA010P: Conductivity by PC Titrator (QC Lot: 2689069)									
EP1300272-009	BLANK -003	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	15	10	39.4	0% - 50%
EP1300292-001	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	1310	1300	0.9	0% - 20%
EA015: Total Dissolved Solids (QC Lot: 2690364)									
EP1300269-001	Anonymous	EA015H: Total Dissolved Solids @180°C	GIS-210-010	10	mg/L	579	626	7.8	0% - 20%
EP1300272-005	WRMW5-003	EA015H: Total Dissolved Solids @180°C	GIS-210-010	10	mg/L	133	135	1.5	0% - 50%
EA025: Suspended Solids (QC Lot: 2690365)									
EP1300269-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
EP1300272-005	WRMW5-003	EA025H: Suspended Solids (SS)	----	5	mg/L	42	36	15.4	No Limit
EA045: Turbidity (QC Lot: 2686461)									
EP1300231-001	Anonymous	EA045: Turbidity	----	0.1	NTU	83.2	86.5	3.9	0% - 20%
EP1300272-004	WRMW4-003	EA045: Turbidity	----	0.1	NTU	81.8	80.4	1.7	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 2689068)									
EP1300266-006	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	242	242	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	ALK_TOTAL	1	mg/L	242	242	0.0	0% - 20%
EP1300272-003	WRMW3-003	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	130	132	1.6	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	ALK_TOTAL	1	mg/L	130	132	1.6	0% - 20%
ED038A: Acidity (QC Lot: 2693485)									
EP1300247-001	Anonymous	ED038: Acidity as CaCO3	----	1	mg/L	8	8	0.0	No Limit
EP1300272-007	DUP-003	ED038: Acidity as CaCO3	----	1	mg/L	8	9	0.0	No Limit
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 2686052)									
EP1300269-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	29	29	0.0	0% - 20%

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 2686052) - continued									
EP1300272-007	DUP-003	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2	2	0.0	No Limit
ED045G: Chloride Discrete analyser (QC Lot: 2686051)									
EP1300269-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	264	272	2.7	0% - 20%
EP1300272-007	DUP-003	ED045G: Chloride	16887-00-6	1	mg/L	23	23	0.0	0% - 20%
EG020F: Dissolved Metals by ICP-MS (QC Lot: 2693609)									
EP1300260-005	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	0.0001	<0.0001	0.0	0% - 20%
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.003	0.003	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.097	0.100	3.0	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.332	0.332	0.0	0% - 20%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	1.22	1.22	0.1	0% - 20%
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	0.52	0.54	3.6	0% - 20%
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	0.43	0.45	4.0	No Limit
EP1300272-006	WRMW6-003	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.001	<0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.032	0.033	0.0	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.014	0.015	0.0	0% - 50%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.132	0.135	2.8	0% - 20%
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	0.30	0.31	4.9	0% - 20%
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	0.91	0.96	5.4	0% - 50%
EG020T: Total Metals by ICP-MS (QC Lot: 2689428)									
EP1300254-001	Anonymous	EG020B-T: Silver	7440-22-4	0.001	mg/L	0.001	<0.001	0.0	0% - 20%
EG020T: Total Metals by ICP-MS (QC Lot: 2689430)									
EP1300262-001	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	0.0002	0.0003	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	0.028	0.029	0.0	0% - 20%
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	0.013	0.013	0.0	0% - 20%
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.164	0.163	0.0	0% - 20%
		EG020A-T: Lead	7439-92-1	0.001	mg/L	0.007	0.006	0.0	0% - 20%
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	0.242	0.241	0.0	0% - 20%
		EG020A-T: Molybdenum	7439-98-7	0.001	mg/L	0.012	0.012	0.0	0% - 20%
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	1.47	1.44	2.2	0% - 20%
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.594	0.574	3.3	0% - 20%
		EG020A-T: Aluminium	7429-90-5	0.01	mg/L	0.24	0.24	0.0	0% - 20%
		EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Iron	7439-89-6	0.05	mg/L	3.36	3.29	2.1	0% - 20%
EP1300272-008	RINSATE -003	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG020T: Total Metals by ICP-MS (QC Lot: 2689430) - continued									
EP1300272-008	RINSATE -003	EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.07	146	No Limit
		EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 2693256)									
EP1300251-009	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EP1300261-010	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 2693257)									
EP1300272-009	BLANK -003	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG050F: Dissolved Hexavalent Chromium (QC Lot: 2691938)									
EP1300206-031	Anonymous	EG050G-F: Hexavalent Chromium	18540-29-9	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EP1300272-005	WRMW5-003	EG050G-F: Hexavalent Chromium	18540-29-9	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EG051G: Ferrous Iron by Discrete Analyser (QC Lot: 2685937)									
EP1300238-001	Anonymous	EG051G: Ferrous Iron	----	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EP1300272-001	WRMW1-003	EG051G: Ferrous Iron	----	0.05	mg/L	0.11	0.10	0.0	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 2685987)									
EP1300269-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.32	0.34	4.8	0% - 20%
EP1300272-007	DUP-003	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.01	0.01	0.0	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 2686049)									
EP1300269-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EP1300272-007	DUP-003	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 2685986)									
EP1300267-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.33	0.34	3.7	0% - 20%
EP1300268-005	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	3.11	3.10	0.4	0% - 20%
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 2685988)									
EP1300272-004	WRMW4-003	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	4.38	4.46	2.0	0% - 20%
EP1300275-003	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	325	320	1.6	0% - 20%
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 2689329)									
EP1300257-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.6	0.6	0.0	No Limit
EP1300260-005	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	8.6	8.6	0.0	0% - 20%
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 2689331)									
EP1300272-004	WRMW4-003	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.7	0.8	0.0	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 2689330)									
EP1300257-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.50	0.58	15.0	0% - 20%
EP1300260-005	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	1.18	1.22	2.9	0% - 20%
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 2689332)									
EP1300272-004	WRMW4-003	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.06	0.06	0.0	No Limit
EK071G: Reactive Phosphorus as P by discrete analyser (QC Lot: 2686050)									
EP1300269-001	Anonymous	EK071G: Reactive Phosphorus as P	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EP1300272-007	DUP-003	EK071G: Reactive Phosphorus as P	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK085M: Sulfide as S2- (QC Lot: 2693143)									
EP1300272-001	WRMW1-003	EK085: Sulfide as S2-	18496-25-8	0.1	mg/L	<0.1	<0.1	0.0	No Limit
EP1300290-001	Anonymous	EK085: Sulfide as S2-	18496-25-8	0.1	mg/L	<0.1	<0.1	0.0	No Limit
EP026ST: Chemical Oxygen Demand (Sealed Tube) (QC Lot: 2693333)									
EP1300255-001	Anonymous	EP026ST: Chemical Oxygen Demand	----	5	mg/L	27	27	0.0	No Limit
EP1300270-002	Anonymous	EP026ST: Chemical Oxygen Demand	----	5	mg/L	78	76	2.6	0% - 50%
EP026ST: Chemical Oxygen Demand (Sealed Tube) (QC Lot: 2693334)									
EP1300272-009	BLANK -003	EP026ST: Chemical Oxygen Demand	----	5	mg/L	<5	<5	0.0	No Limit
ES1300931-003	Anonymous	EP026ST: Chemical Oxygen Demand	----	5	mg/L	23	20	14.0	No Limit
EP030: Biochemical Oxygen Demand (BOD) (QC Lot: 2688536)									
EP1300255-001	Anonymous	EP030: Biochemical Oxygen Demand	----	2	mg/L	25	23	6.7	0% - 50%
EP1300272-003	WRMW3-003	EP030: Biochemical Oxygen Demand	----	2	mg/L	2	4	62.1	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 2691795)									
EP1300272-006	WRMW6-003	EP068: alpha-BHC	319-84-6	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: beta-BHC	319-85-7	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: gamma-BHC	58-89-9	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: delta-BHC	319-86-8	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Heptachlor	76-44-8	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Aldrin	309-00-2	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Dieldrin	60-57-1	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: 4.4`-DDE	72-55-9	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Endrin	72-20-8	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: 4.4`-DDD	72-54-8	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Endrin ketone	53494-70-5	0.5	µg/L	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP068A: Organochlorine Pesticides (OC) (QC Lot: 2691795) - continued									
EP1300272-006	WRMW6-003	EP068: 4.4`-DDT	50-29-3	2.0	µg/L	<2.0	<2.0	0.0	No Limit
		EP068: Methoxychlor	72-43-5	2.0	µg/L	<2.0	<2.0	0.0	No Limit
EP068B: Organophosphorus Pesticides (OP) (QC Lot: 2691795)									
EP1300272-006	WRMW6-003	EP068: Dichlorvos	62-73-7	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Dimethoate	60-51-5	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Diazinon	333-41-5	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Malathion	121-75-5	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Fenthion	55-38-9	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Fenamiphos	22224-92-6	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Prothiofos	34643-46-4	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Ethion	563-12-2	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Carbophenothion	786-19-6	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Monocrotophos	6923-22-4	2.0	µg/L	<2.0	<2.0	0.0	No Limit
		EP068: Parathion-methyl	298-00-0	2.0	µg/L	<2.0	<2.0	0.0	No Limit
		EP068: Parathion	56-38-2	2.0	µg/L	<2.0	<2.0	0.0	No Limit
EP074A: Monocyclic Aromatic Hydrocarbons (QC Lot: 2688930)									
EP1300237-001	Anonymous	EP074: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP074: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP074: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP074: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP074: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP074: Styrene	100-42-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: Isopropylbenzene	98-82-8	5	µg/L	<5	<5	0.0	No Limit
		EP074: n-Propylbenzene	103-65-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.3.5-Trimethylbenzene	108-67-8	5	µg/L	<5	<5	0.0	No Limit
		EP074: sec-Butylbenzene	135-98-8	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2.4-Trimethylbenzene	95-63-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: tert-Butylbenzene	98-06-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: p-Isopropyltoluene	99-87-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: n-Butylbenzene	104-51-8	5	µg/L	<5	<5	0.0	No Limit
EP074B: Oxygenated Compounds (QC Lot: 2688930)									
EP1300237-001	Anonymous	EP074: Vinyl Acetate	108-05-4	50	µg/L	<50	<50	0.0	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP074B: Oxygenated Compounds (QC Lot: 2688930) - continued									
EP1300237-001	Anonymous	EP074: 2-Butanone (MEK)	78-93-3	50	µg/L	<50	<50	0.0	No Limit
		EP074: 4-Methyl-2-pentanone (MIBK)	108-10-1	50	µg/L	<50	<50	0.0	No Limit
		EP074: 2-Hexanone (MBK)	591-78-6	50	µg/L	<50	<50	0.0	No Limit
EP074C: Sulfonated Compounds (QC Lot: 2688930)									
EP1300237-001	Anonymous	EP074: Carbon disulfide	75-15-0	5	µg/L	<5	<5	0.0	No Limit
EP074D: Fumigants (QC Lot: 2688930)									
EP1300237-001	Anonymous	EP074: 2.2-Dichloropropane	594-20-7	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dichloropropane	78-87-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: cis-1.3-Dichloropropylene	10061-01-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: trans-1.3-Dichloropropylene	10061-02-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dibromoethane (EDB)	106-93-4	5	µg/L	<5	<5	0.0	No Limit
EP074E: Halogenated Aliphatic Compounds (QC Lot: 2688930)									
EP1300237-001	Anonymous	EP074: 1.1-Dichloroethene	75-35-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: Iodomethane	74-88-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: trans-1.2-Dichloroethene	156-60-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1-Dichloroethane	75-34-3	5	µg/L	<5	<5	0.0	No Limit
		EP074: cis-1.2-Dichloroethene	156-59-2	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1.1-Trichloroethane	71-55-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1-Dichloropropylene	563-58-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: Carbon Tetrachloride	56-23-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dichloroethane	107-06-2	5	µg/L	<5	<5	0.0	No Limit
		EP074: Trichloroethene	79-01-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: Dibromomethane	74-95-3	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1.2-Trichloroethane	79-00-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.3-Dichloropropane	142-28-9	5	µg/L	<5	<5	0.0	No Limit
		EP074: Tetrachloroethene	127-18-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1.1.2-Tetrachloroethane	630-20-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: trans-1.4-Dichloro-2-butene	110-57-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: cis-1.4-Dichloro-2-butene	1476-11-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1.2.2-Tetrachloroethane	79-34-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2.3-Trichloropropane	96-18-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: Pentachloroethane	76-01-7	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dibromo-3-chloropropane	96-12-8	5	µg/L	<5	<5	0.0	No Limit
		EP074: Hexachlorobutadiene	87-68-3	5	µg/L	<5	<5	0.0	No Limit
		EP074: Dichlorodifluoromethane	75-71-8	50	µg/L	<50	<50	0.0	No Limit
		EP074: Chloromethane	74-87-3	50	µg/L	<50	<50	0.0	No Limit
		EP074: Vinyl chloride	75-01-4	50	µg/L	<50	<50	0.0	No Limit
		EP074: Bromomethane	74-83-9	50	µg/L	<50	<50	0.0	No Limit
		EP074: Chloroethane	75-00-3	50	µg/L	<50	<50	0.0	No Limit
		EP074: Trichlorofluoromethane	75-69-4	50	µg/L	<50	<50	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP074F: Halogenated Aromatic Compounds (QC Lot: 2688930)									
EP1300237-001	Anonymous	EP074: Chlorobenzene	108-90-7	5	µg/L	<5	<5	0.0	No Limit
		EP074: Bromobenzene	108-86-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 2-Chlorotoluene	95-49-8	5	µg/L	<5	<5	0.0	No Limit
		EP074: 4-Chlorotoluene	106-43-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.3-Dichlorobenzene	541-73-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.4-Dichlorobenzene	106-46-7	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dichlorobenzene	95-50-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2.4-Trichlorobenzene	120-82-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2.3-Trichlorobenzene	87-61-6	5	µg/L	<5	<5	0.0	No Limit
EP074G: Trihalomethanes (QC Lot: 2688930)									
EP1300237-001	Anonymous	EP074: Chloroform	67-66-3	5	µg/L	<5	<5	0.0	No Limit
		EP074: Bromodichloromethane	75-27-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: Dibromochloromethane	124-48-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: Bromoform	75-25-2	5	µg/L	<5	<5	0.0	No Limit
EP074H: Naphthalene (QC Lot: 2688930)									
EP1300237-001	Anonymous	EP074: Naphthalene	91-20-3	7	µg/L	<7	<7	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 2688931)									
EP1300237-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 2689067)								
EA005-P: pH Value	----	0.01	pH Unit	----	7.00 pH Unit	100	70	130
EA005P: pH by PC Titrator (QCLot: 2689070)								
EA005-P: pH Value	----	0.01	pH Unit	----	7.00 pH Unit	100	70	130
EA010P: Conductivity by PC Titrator (QCLot: 2689066)								
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	24800 µS/cm	99.4	95	110
EA010P: Conductivity by PC Titrator (QCLot: 2689069)								
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	24800 µS/cm	99.1	95	110
EA015: Total Dissolved Solids (QCLot: 2690364)								
EA015H: Total Dissolved Solids @180°C	GIS-210-010	10	mg/L	<10	293 mg/L	117	70	130
EA025: Suspended Solids (QCLot: 2690365)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	97.3	70	130
EA045: Turbidity (QCLot: 2686461)								
EA045: Turbidity	----	0.1	NTU	<0.1	40 NTU	95.3	91	107
ED037P: Alkalinity by PC Titrator (QCLot: 2689068)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	ALK_TOTAL	1	mg/L	<1	200 mg/L	95.2	87	121
ED038A: Acidity (QCLot: 2693485)								
ED038: Acidity as CaCO3	----	1	mg/L	----	20 mg/L	107	85	119
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 2686052)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	93.6	88	121
ED045G: Chloride Discrete analyser (QCLot: 2686051)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	1000 mg/L	92.6	84	120
EG020F: Dissolved Metals by ICP-MS (QCLot: 2693609)								
EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.50 mg/L	102	77	113
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.100 mg/L	94.9	89	109
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1000 mg/L	99.1	89	109
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.100 mg/L	89.1	88	106
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.100 mg/L	91.8	87	107
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.100 mg/L	94.3	87	109
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.10 mg/L	105	93	117

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 2693609) - continued								
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.100 mg/L	101	89	115
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.50 mg/L	87.2	83	109
EG020T: Total Metals by ICP-MS (QCLot: 2689428)								
EG020B-T: Silver	7440-22-4	0.001	mg/L	<0.001	0.01 mg/L	91.3	70	130
EG020T: Total Metals by ICP-MS (QCLot: 2689430)								
EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	103	78	116
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	95.3	77	109
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	98.1	78	108
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	97.5	80	112
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	92.9	79	111
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	97.7	81	109
EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	96.7	80	112
EG020A-T: Molybdenum	7439-98-7	0.001	mg/L	<0.001	0.1 mg/L	103	86	118
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	94.0	80	112
EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	99.0	75	107
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	96.4	74	108
EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	97.0	75	115
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2693256)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.0100 mg/L	96.5	82.3	118
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2693257)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.0100 mg/L	98.6	82.3	118
EG050F: Dissolved Hexavalent Chromium (QCLot: 2691938)								
EG050G-F: Hexavalent Chromium	18540-29-9	0.01	mg/L	<0.01	0.5 mg/L	102	91	115
EG051G: Ferrous Iron by Discrete Analyser (QCLot: 2685937)								
EG051G: Ferrous Iron	----	0.05	mg/L	<0.05	2.00 mg/L	98.5	89	113
EK055G: Ammonia as N by Discrete Analyser (QCLot: 2685987)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1 mg/L	100	87	115
EK057G: Nitrite as N by Discrete Analyser (QCLot: 2686049)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	94.2	86	112
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 2685986)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	98.5	92	112
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 2685988)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	97.6	92	112
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 2689329)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	10 mg/L	94.6	74	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 2689331)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	10 mg/L	94.7	74	130

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 2689330)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	97.5	70	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 2689332)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	101	70	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 2686050)								
EK071G: Reactive Phosphorus as P	----	0.01	mg/L	<0.01	0.5 mg/L	93.4	87	115
EK085M: Sulfide as S2- (QCLot: 2693143)								
EK085: Sulfide as S2-	18496-25-8	0.10	mg/L	<0.1	0.50 mg/L	94.2	82	116
EP026ST: Chemical Oxygen Demand (Sealed Tube) (QCLot: 2693333)								
EP026ST: Chemical Oxygen Demand	----	5	mg/L	<5	500 mg/L	92.9	88	114
EP026ST: Chemical Oxygen Demand (Sealed Tube) (QCLot: 2693334)								
EP026ST: Chemical Oxygen Demand	----	5	mg/L	<5	500 mg/L	92.9	88	114
EP030: Biochemical Oxygen Demand (BOD) (QCLot: 2688536)								
EP030: Biochemical Oxygen Demand	----	2	mg/L	<2	198 mg/L	89.2	84	114
EP068A: Organochlorine Pesticides (OC) (QCLot: 2691795)								
EP068: alpha-BHC	319-84-6	0.5	µg/L	<0.5	5 µg/L	94.2	26.9	125
EP068: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	5 µg/L	93.1	17.1	121
EP068: beta-BHC	319-85-7	0.5	µg/L	<0.5	5 µg/L	90.0	36	128
EP068: gamma-BHC	58-89-9	0.5	µg/L	<0.5	5 µg/L	101	36	124
EP068: delta-BHC	319-86-8	0.5	µg/L	<0.5	5 µg/L	92.4	42	128
EP068: Heptachlor	76-44-8	0.5	µg/L	<0.5	5 µg/L	91.1	26.5	133
EP068: Aldrin	309-00-2	0.5	µg/L	<0.5	5 µg/L	92.6	34	130
EP068: Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	5 µg/L	92.4	36	130
EP068: trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	5 µg/L	90.8	34	134
EP068: alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	5 µg/L	104	42	124
EP068: cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	5 µg/L	91.4	39	127
EP068: Dieldrin	60-57-1	0.5	µg/L	<0.5	5 µg/L	91.0	38	134
EP068: 4.4`-DDE	72-55-9	0.5	µg/L	<0.5	5 µg/L	91.2	41	133
EP068: Endrin	72-20-8	0.5	µg/L	<0.5	5 µg/L	89.3	29.6	148
EP068: beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	5 µg/L	90.1	40	136
EP068: 4.4`-DDD	72-54-8	0.5	µg/L	<0.5	5 µg/L	90.3	38	140
EP068: Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	5 µg/L	95.2	30.8	145
EP068: Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	5 µg/L	94.3	36	132
EP068: 4.4`-DDT	50-29-3	2.0	µg/L	<2.0	5 µg/L	93.0	16	142
EP068: Endrin ketone	53494-70-5	0.5	µg/L	<0.5	5 µg/L	94.3	32	132
EP068: Methoxychlor	72-43-5	2.0	µg/L	<2.0	5 µg/L	92.8	8	154
EP068B: Organophosphorus Pesticides (OP) (QCLot: 2691795)								
EP068: Dichlorvos	62-73-7	0.5	µg/L	<0.5	5 µg/L	82.7	28.5	133
EP068: Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	5 µg/L	104	29	143

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP068B: Organophosphorus Pesticides (OP) (QCLot: 2691795) - continued								
EP068: Monocrotophos	6923-22-4	2.0	µg/L	<2.0	5 µg/L	7.0	4.2	45
EP068: Dimethoate	60-51-5	0.5	µg/L	<0.5	5 µg/L	78.9	28.4	116
EP068: Diazinon	333-41-5	0.5	µg/L	<0.5	5 µg/L	94.2	39	125
EP068: Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	5 µg/L	93.1	40	128
EP068: Parathion-methyl	298-00-0	2.0	µg/L	<2.0	5 µg/L	91.1	33	131
EP068: Malathion	121-75-5	0.5	µg/L	<0.5	5 µg/L	91.7	33	137
EP068: Fenthion	55-38-9	0.5	µg/L	<0.5	5 µg/L	91.9	41	127
EP068: Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	5 µg/L	93.1	43	127
EP068: Parathion	56-38-2	2.0	µg/L	<2.0	5 µg/L	89.8	33	131
EP068: Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	5 µg/L	92.7	35	125
EP068: Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	5 µg/L	91.0	39	135
EP068: Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	5 µg/L	91.4	38	128
EP068: Fenamiphos	22224-92-6	0.5	µg/L	<0.5	5 µg/L	68.2	30.4	140
EP068: Prothiofos	34643-46-4	0.5	µg/L	<0.5	5 µg/L	90.0	40	128
EP068: Ethion	563-12-2	0.5	µg/L	<0.5	5 µg/L	87.1	38	132
EP068: Carbophenothion	786-19-6	0.5	µg/L	<0.5	5 µg/L	93.0	34	134
EP068: Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	5 µg/L	83.0	6.4	158
EP074A: Monocyclic Aromatic Hydrocarbons (QCLot: 2688930)								
EP074: Benzene	71-43-2	1	µg/L	<1	10 µg/L	80.6	76	120
EP074: Toluene	108-88-3	2	µg/L	<2	10 µg/L	80.5	75	121
EP074: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	77.3	74	120
EP074: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	20 µg/L	77.8	75	119
EP074: Styrene	100-42-5	5	µg/L	<5	10 µg/L	80.8	74	124
EP074: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	80.3	75	119
EP074: Isopropylbenzene	98-82-8	5	µg/L	<5	10 µg/L	76.0	75	121
EP074: n-Propylbenzene	103-65-1	5	µg/L	<5	10 µg/L	79.2	72	122
EP074: 1.3.5-Trimethylbenzene	108-67-8	5	µg/L	<5	10 µg/L	79.9	73	121
EP074: sec-Butylbenzene	135-98-8	5	µg/L	<5	10 µg/L	76.6	72	122
EP074: 1.2.4-Trimethylbenzene	95-63-6	5	µg/L	<5	10 µg/L	79.8	74	122
EP074: tert-Butylbenzene	98-06-6	5	µg/L	<5	10 µg/L	78.7	73	121
EP074: p-Isopropyltoluene	99-87-6	5	µg/L	<5	10 µg/L	76.6	73	123
EP074: n-Butylbenzene	104-51-8	5	µg/L	<5	10 µg/L	79.8	70	126
EP074B: Oxygenated Compounds (QCLot: 2688930)								
EP074: Vinyl Acetate	108-05-4	50	µg/L	<50	100 µg/L	86.8	61	135
EP074: 2-Butanone (MEK)	78-93-3	50	µg/L	<50	100 µg/L	82.1	66	130
EP074: 4-Methyl-2-pentanone (MIBK)	108-10-1	50	µg/L	<50	100 µg/L	87.3	72	126
EP074: 2-Hexanone (MBK)	591-78-6	50	µg/L	<50	100 µg/L	79.3	70	126
EP074C: Sulfonated Compounds (QCLot: 2688930)								

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low	High
EP074C: Sulfonated Compounds (QCLot: 2688930) - continued								
EP074: Carbon disulfide	75-15-0	5	µg/L	<5	10 µg/L	86.6	71	127
EP074D: Fumigants (QCLot: 2688930)								
EP074: 2.2-Dichloropropane	594-20-7	5	µg/L	<5	10 µg/L	83.1	71	129
EP074: 1.2-Dichloropropane	78-87-5	5	µg/L	<5	10 µg/L	84.3	74	124
EP074: cis-1.3-Dichloropropylene	10061-01-5	5	µg/L	<5	10 µg/L	89.4	73	127
EP074: trans-1.3-Dichloropropylene	10061-02-6	5	µg/L	<5	10 µg/L	91.4	70	130
EP074: 1.2-Dibromoethane (EDB)	106-93-4	5	µg/L	<5	10 µg/L	83.0	74	124
EP074E: Halogenated Aliphatic Compounds (QCLot: 2688930)								
EP074: Dichlorodifluoromethane	75-71-8	50	µg/L	<50	100 µg/L	85.9	70	130
EP074: Chloromethane	74-87-3	50	µg/L	<50	100 µg/L	87.2	73	125
EP074: Vinyl chloride	75-01-4	50	µg/L	<50	100 µg/L	94.4	72	128
EP074: Bromomethane	74-83-9	50	µg/L	<50	100 µg/L	82.4	73	127
EP074: Chloroethane	75-00-3	50	µg/L	<50	100 µg/L	80.5	74	124
EP074: Trichlorofluoromethane	75-69-4	50	µg/L	<50	100 µg/L	85.5	72	130
EP074: 1.1-Dichloroethene	75-35-4	5	µg/L	<5	10 µg/L	85.2	73	129
EP074: Iodomethane	74-88-4	5	µg/L	<5	10 µg/L	68.6	42	142
EP074: trans-1.2-Dichloroethene	156-60-5	5	µg/L	<5	10 µg/L	83.2	72	126
EP074: 1.1-Dichloroethane	75-34-3	5	µg/L	<5	10 µg/L	83.9	73	125
EP074: cis-1.2-Dichloroethene	156-59-2	5	µg/L	<5	10 µg/L	86.0	76	122
EP074: 1.1.1-Trichloroethane	71-55-6	5	µg/L	<5	10 µg/L	86.6	76	124
EP074: 1.1-Dichloropropylene	563-58-6	5	µg/L	<5	10 µg/L	81.2	74	124
EP074: Carbon Tetrachloride	56-23-5	5	µg/L	<5	10 µg/L	85.6	73	129
EP074: 1.2-Dichloroethane	107-06-2	5	µg/L	<5	10 µg/L	90.3	76	126
EP074: Trichloroethene	79-01-6	5	µg/L	<5	10 µg/L	83.0	75	125
EP074: Dibromomethane	74-95-3	5	µg/L	<5	10 µg/L	92.4	75	127
EP074: 1.1.2-Trichloroethane	79-00-5	5	µg/L	<5	10 µg/L	80.2	74	122
EP074: 1.3-Dichloropropane	142-28-9	5	µg/L	<5	10 µg/L	78.5	72	128
EP074: Tetrachloroethene	127-18-4	5	µg/L	<5	10 µg/L	74.8	74	124
EP074: 1.1.1.2-Tetrachloroethane	630-20-6	5	µg/L	<5	----	----	----	----
EP074: trans-1.4-Dichloro-2-butene	110-57-6	5	µg/L	<5	10 µg/L	73.2	54	142
EP074: cis-1.4-Dichloro-2-butene	1476-11-5	5	µg/L	<5	10 µg/L	84.8	61	135
EP074: 1.1.2.2-Tetrachloroethane	79-34-5	5	µg/L	<5	10 µg/L	82.7	66	132
EP074: 1.2.3-Trichloropropane	96-18-4	5	µg/L	<5	10 µg/L	81.6	66	130
EP074: Pentachloroethane	76-01-7	5	µg/L	<5	10 µg/L	89.8	66	134
EP074: 1.2-Dibromo-3-chloropropane	96-12-8	5	µg/L	<5	10 µg/L	84.8	56	140
EP074: Hexachlorobutadiene	87-68-3	5	µg/L	<5	10 µg/L	78.4	66	134
EP074F: Halogenated Aromatic Compounds (QCLot: 2688930)								
EP074: Chlorobenzene	108-90-7	5	µg/L	<5	10 µg/L	81.1	78	120
EP074: Bromobenzene	108-86-1	5	µg/L	<5	10 µg/L	79.0	76	122

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP074F: Halogenated Aromatic Compounds (QCLot: 2688930) - continued								
EP074: 2-Chlorotoluene	95-49-8	5	µg/L	<5	10 µg/L	80.7	75	121
EP074: 4-Chlorotoluene	106-43-4	5	µg/L	<5	10 µg/L	82.0	74	122
EP074: 1.3-Dichlorobenzene	541-73-1	5	µg/L	<5	10 µg/L	80.4	75	121
EP074: 1.4-Dichlorobenzene	106-46-7	5	µg/L	<5	10 µg/L	81.2	75	121
EP074: 1.2-Dichlorobenzene	95-50-1	5	µg/L	<5	10 µg/L	83.0	76	122
EP074: 1.2.4-Trichlorobenzene	120-82-1	5	µg/L	<5	10 µg/L	78.6	68	132
EP074: 1.2.3-Trichlorobenzene	87-61-6	5	µg/L	<5	10 µg/L	81.5	72	128
EP074G: Trihalomethanes (QCLot: 2688930)								
EP074: Chloroform	67-66-3	5	µg/L	<5	10 µg/L	88.6	75	125
EP074: Bromodichloromethane	75-27-4	5	µg/L	<5	10 µg/L	91.5	73	129
EP074: Dibromochloromethane	124-48-1	5	µg/L	<5	10 µg/L	93.1	68	132
EP074: Bromoform	75-25-2	5	µg/L	<5	10 µg/L	92.5	67	133
EP074H: Naphthalene (QCLot: 2688930)								
EP074: Naphthalene	91-20-3	7	µg/L	<7	10 µg/L	70.7	60	120
EP075(SIM)A: Phenolic Compounds (QCLot: 2691797)								
EP075(SIM): Phenol	108-95-2	1	µg/L	<1.0	25 µg/L	37.4	17.9	56
EP075(SIM): 2-Chlorophenol	95-57-8	1	µg/L	<1.0	25 µg/L	80.2	42	104
EP075(SIM): 2-Methylphenol	95-48-7	1	µg/L	<1.0	25 µg/L	72.8	36	104
EP075(SIM): 3- & 4-Methylphenol	1319-77-3	2	µg/L	<2.0	50 µg/L	67.6	37	95
EP075(SIM): 2-Nitrophenol	88-75-5	1	µg/L	<1.0	25 µg/L	93.9	37	115
EP075(SIM): 2.4-Dimethylphenol	105-67-9	1	µg/L	<1.0	25 µg/L	85.1	37	117
EP075(SIM): 2.4-Dichlorophenol	120-83-2	1	µg/L	<1.0	25 µg/L	93.4	38	116
EP075(SIM): 2.6-Dichlorophenol	87-65-0	1	µg/L	<1.0	25 µg/L	86.8	36	110
EP075(SIM): 4-Chloro-3-Methylphenol	59-50-7	1	µg/L	<1.0	25 µg/L	91.6	37	117
EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	1	µg/L	<1.0	25 µg/L	90.4	29	117
EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	1	µg/L	<1.0	25 µg/L	94.4	36	120
EP075(SIM): Pentachlorophenol	87-86-5	2	µg/L	<2.0	25 µg/L	94.1	5.4	155
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2691797)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	25 µg/L	92.0	43	97
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	25 µg/L	97.0	41	113
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	25 µg/L	91.9	43	121
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	25 µg/L	94.7	46	122
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	25 µg/L	108	50	122
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	25 µg/L	109	47	123
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	25 µg/L	111	55	125
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	25 µg/L	110	55	131
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	25 µg/L	110	48	142
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	25 µg/L	110	33	143

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2691797) - continued								
EP075(SIM): Benzo(b)fluoranthene	205-99-2	1	µg/L	<1.0	25 µg/L	127	35	145
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	25 µg/L	121	43	139
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	25 µg/L	132	33	151
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	25 µg/L	126	30.7	137
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	25 µg/L	126	27.4	133
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	25 µg/L	125	25.4	135
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2688931)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	320 µg/L	90.5	74.2	142
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2691796)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	4000 µg/L	71.2	30.7	123
EP071: C15 - C28 Fraction	----	100	µg/L	<100	4000 µg/L	73.2	34	142
EP071: C29 - C36 Fraction	----	50	µg/L	<50	4000 µg/L	62.8	32	124

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
				Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 2686052)							
EP1300269-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	112	70	130
ED045G: Chloride Discrete analyser (QCLot: 2686051)							
EP1300269-001	Anonymous	ED045G: Chloride	16887-00-6	250 mg/L	99.1	70	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 2693609)							
EP1300260-006	Anonymous	EG020A-F: Arsenic	7440-38-2	0.200 mg/L	110	70	130
		EG020A-F: Cadmium	7440-43-9	0.0500 mg/L	108	70	130
		EG020A-F: Chromium	7440-47-3	0.200 mg/L	97.2	70	130
		EG020A-F: Manganese	7439-96-5	0.200 mg/L	97.5	70	130
		EG020A-F: Nickel	7440-02-0	0.200 mg/L	# Not Determined	70	130
		EG020A-F: Zinc	7440-66-6	0.200 mg/L	# Not Determined	70	130
EG020T: Total Metals by ICP-MS (QCLot: 2689430)							
EP1300270-004	Anonymous	EG020A-T: Arsenic	7440-38-2	1.00 mg/L	116	70	130
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	109	70	130
		EG020A-T: Chromium	7440-47-3	1.00 mg/L	104	70	130
		EG020A-T: Copper	7440-50-8	1.00 mg/L	105	70	130

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	High
EG020T: Total Metals by ICP-MS (QCLot: 2689430) - continued							
EP1300270-004	Anonymous	EG020A-T: Lead	7439-92-1	1.00 mg/L	103	70	130
		EG020A-T: Manganese	7439-96-5	1.00 mg/L	105	70	130
		EG020A-T: Nickel	7440-02-0	1.00 mg/L	105	70	130
		EG020A-T: Zinc	7440-66-6	1.00 mg/L	112	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2693256)							
EP1300261-001	Anonymous	EG035T: Mercury	7439-97-6	0.0100 mg/L	98.6	70	130
EG050F: Dissolved Hexavalent Chromium (QCLot: 2691938)							
EP1300206-031	Anonymous	EG050G-F: Hexavalent Chromium	18540-29-9	0.5 mg/L	106	70	130
EG051G: Ferrous Iron by Discrete Analyser (QCLot: 2685937)							
EP1300238-001	Anonymous	EG051G: Ferrous Iron	----	2.5 mg/L	106	70	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 2685987)							
EP1300269-001	Anonymous	EK055G: Ammonia as N	7664-41-7	1.00 mg/L	106	70	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 2686049)							
EP1300269-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.6 mg/L	86.7	70	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 2685986)							
EP1300267-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	104	70	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 2685988)							
EP1300272-004	WRMW4-003	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	# Not Determined	70	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 2689329)							
EP1300257-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	4.293 mg/L	71.6	70	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 2689331)							
EP1300272-004	WRMW4-003	EK061G: Total Kjeldahl Nitrogen as N	----	25 mg/L	89.9	70	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 2689330)							
EP1300257-001	Anonymous	EK067G: Total Phosphorus as P	----	1 mg/L	87.2	70	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 2689332)							
EP1300272-004	WRMW4-003	EK067G: Total Phosphorus as P	----	5 mg/L	93.4	70	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 2686050)							
EP1300269-001	Anonymous	EK071G: Reactive Phosphorus as P	----	0.5 mg/L	96.7	70	130
EP026ST: Chemical Oxygen Demand (Sealed Tube) (QCLot: 2693333)							
EP1300255-001	Anonymous	EP026ST: Chemical Oxygen Demand	----	143 mg/L	120	70	130
EP026ST: Chemical Oxygen Demand (Sealed Tube) (QCLot: 2693334)							
EP1300272-009	BLANK -003	EP026ST: Chemical Oxygen Demand	----	143 mg/L	123	70	130
EP074A: Monocyclic Aromatic Hydrocarbons (QCLot: 2688930)							

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	Recovery Limits (%) High
EP074A: Monocyclic Aromatic Hydrocarbons (QCLot: 2688930) - continued							
EP1300272-001	WRMW1-003	EP074: Benzene	71-43-2	20 µg/L	84.5	82.7	115
		EP074: Toluene	108-88-3	20 µg/L	96.2	77.1	118
EP074E: Halogenated Aliphatic Compounds (QCLot: 2688930)							
EP1300272-001	WRMW1-003	EP074: 1.1-Dichloroethene	75-35-4	20 µg/L	96.3	73.7	126
		EP074: Trichloroethene	79-01-6	20 µg/L	87.6	79.1	120
EP074F: Halogenated Aromatic Compounds (QCLot: 2688930)							
EP1300272-001	WRMW1-003	EP074: Chlorobenzene	108-90-7	20 µg/L	99.7	81.4	115
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2688931)							
EP1300272-001	WRMW1-003	EP080: C6 - C9 Fraction	----	280 µg/L	81.9	77.0	137

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report

The quality control term Matrix Spike (MS) and Matrix Spike Duplicate (MSD) refers to intralaboratory split samples spiked with a representative set of target analytes. The purpose of these QC parameters are to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report: Spike Concentration	Spike Recovery (%) MS	Spike Recovery (%) MSD	Recovery Limits (%) Low	Recovery Limits (%) High	RPDs (%) Value	RPDs (%) Control Limit
EG051G: Ferrous Iron by Discrete Analyser (QCLot: 2685937)										
EP1300238-001	Anonymous	EG051G: Ferrous Iron	----	2.5 mg/L	106	----	70	130	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 2685986)										
EP1300267-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	104	----	70	130	----	----
EK055G: Ammonia as N by Discrete Analyser (QCLot: 2685987)										
EP1300269-001	Anonymous	EK055G: Ammonia as N	7664-41-7	1.00 mg/L	106	----	70	130	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 2685988)										
EP1300272-004	WRMW4-003	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	# Not Determined	----	70	130	----	----
EK057G: Nitrite as N by Discrete Analyser (QCLot: 2686049)										
EP1300269-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.6 mg/L	86.7	----	70	130	----	----
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 2686050)										
EP1300269-001	Anonymous	EK071G: Reactive Phosphorus as P	----	0.5 mg/L	96.7	----	70	130	----	----
ED045G: Chloride Discrete analyser (QCLot: 2686051)										
EP1300269-001	Anonymous	ED045G: Chloride	16887-00-6	250 mg/L	99.1	----	70	130	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 2686052)										
EP1300269-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	112	----	70	130	----	----
EP074A: Monocyclic Aromatic Hydrocarbons (QCLot: 2688930)										
EP1300272-001	WRMW1-003	EP074: Benzene	71-43-2	20 µg/L	84.5	----	82.7	115	----	----

Sub-Matrix: **WATER**

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Spike Concentration	Spike Recovery (%) MS	Spike Recovery (%) MSD	Recovery Limits (%) Low	Recovery Limits (%) High	RPDs (%) Value	RPDs (%) Control Limit
EP074A: Monocyclic Aromatic Hydrocarbons (QCLot: 2688930) - continued										
EP1300272-001	WRMW1-003	EP074: Toluene	108-88-3	20 µg/L	96.2	----	77.1	118	----	----
EP074E: Halogenated Aliphatic Compounds (QCLot: 2688930)										
EP1300272-001	WRMW1-003	EP074: 1.1-Dichloroethene	75-35-4	20 µg/L	96.3	----	73.7	126	----	----
		EP074: Trichloroethene	79-01-6	20 µg/L	87.6	----	79.1	120	----	----
EP074F: Halogenated Aromatic Compounds (QCLot: 2688930)										
EP1300272-001	WRMW1-003	EP074: Chlorobenzene	108-90-7	20 µg/L	99.7	----	81.4	115	----	----
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2688931)										
EP1300272-001	WRMW1-003	EP080: C6 - C9 Fraction	----	280 µg/L	81.9	----	77.0	137	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 2689329)										
EP1300257-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	4.293 mg/L	71.6	----	70	130	----	----
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 2689330)										
EP1300257-001	Anonymous	EK067G: Total Phosphorus as P	----	1 mg/L	87.2	----	70	130	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 2689331)										
EP1300272-004	WRMW4-003	EK061G: Total Kjeldahl Nitrogen as N	----	25 mg/L	89.9	----	70	130	----	----
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 2689332)										
EP1300272-004	WRMW4-003	EK067G: Total Phosphorus as P	----	5 mg/L	93.4	----	70	130	----	----
EG020T: Total Metals by ICP-MS (QCLot: 2689430)										
EP1300270-004	Anonymous	EG020A-T: Arsenic	7440-38-2	1.00 mg/L	116	----	70	130	----	----
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	109	----	70	130	----	----
		EG020A-T: Chromium	7440-47-3	1.00 mg/L	104	----	70	130	----	----
		EG020A-T: Copper	7440-50-8	1.00 mg/L	105	----	70	130	----	----
		EG020A-T: Lead	7439-92-1	1.00 mg/L	103	----	70	130	----	----
		EG020A-T: Manganese	7439-96-5	1.00 mg/L	105	----	70	130	----	----
		EG020A-T: Nickel	7440-02-0	1.00 mg/L	105	----	70	130	----	----
		EG020A-T: Zinc	7440-66-6	1.00 mg/L	112	----	70	130	----	----
EG050F: Dissolved Hexavalent Chromium (QCLot: 2691938)										
EP1300206-031	Anonymous	EG050G-F: Hexavalent Chromium	18540-29-9	0.5 mg/L	106	----	70	130	----	----
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2693256)										
EP1300261-001	Anonymous	EG035T: Mercury	7439-97-6	0.0100 mg/L	98.6	----	70	130	----	----
EP026ST: Chemical Oxygen Demand (Sealed Tube) (QCLot: 2693333)										
EP1300255-001	Anonymous	EP026ST: Chemical Oxygen Demand	----	143 mg/L	120	----	70	130	----	----
EP026ST: Chemical Oxygen Demand (Sealed Tube) (QCLot: 2693334)										
EP1300272-009	BLANK -003	EP026ST: Chemical Oxygen Demand	----	143 mg/L	123	----	70	130	----	----
EG020F: Dissolved Metals by ICP-MS (QCLot: 2693609)										
EP1300260-006	Anonymous	EG020A-F: Arsenic	7440-38-2	0.200 mg/L	110	----	70	130	----	----
		EG020A-F: Cadmium	7440-43-9	0.0500 mg/L	108	----	70	130	----	----

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Spike Concentration	Spike Recovery (%) MS	Spike Recovery (%) MSD	Recovery Limits (%) Low	Recovery Limits (%) High	RPDs (%) Value	RPDs (%) Control Limit
EG020F: Dissolved Metals by ICP-MS (QCLot: 2693609) - continued										
EP1300260-006	Anonymous	EG020A-F: Chromium	7440-47-3	0.200 mg/L	97.2	----	70	130	----	----
		EG020A-F: Manganese	7439-96-5	0.200 mg/L	97.5	----	70	130	----	----
		EG020A-F: Nickel	7440-02-0	0.200 mg/L	# Not Determined	----	70	130	----	----
		EG020A-F: Zinc	7440-66-6	0.200 mg/L	# Not Determined	----	70	130	----	----

Environmental Division

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **EP1300272**	Page	: 1 of 16
Client	: MOBILE DEWATERING	Laboratory	: Environmental Division Perth
Contact	: INFO	Contact	: Lauren Ockwell
Address	: PO BOX 239 MIDLAND WA, AUSTRALIA 6939	Address	: 10 Hod Way Malaga WA Australia 6090
E-mail	: info@environmentalservices.com.au	E-mail	: lauren.ockwell@alsenviro.com
Telephone	: +61 08 9250 4995	Telephone	: 08 9209 7606
Facsimile	: ----	Facsimile	: 08 9209 7600
Project	: E2012-31	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: WASTEROCK		
C-O-C number	: E2012-31-005	Date Samples Received	: 15-JAN-2013
Sampler	: DA/RB	Issue Date	: 24-JAN-2013
Order number	: ----		
		No. of samples received	: 9
Quote number	: EP/785/12	No. of samples analysed	: 9

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non -volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

Matrix: **WATER**

Evaluation: ✘ = Holding time breach ; ✓ = Within holding time.

Method *Container / Client Sample ID(s)*	*Sample Date*	*Extraction / Preparation* *Date extracted*	 *Due for extraction*	 *Evaluation*	*Analysis* *Date analysed*	 *Due for analysis*	 *Evaluation*
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural (EA005-P) WRMW1-003, WRMW2-003, WRMW3-003, WRMW4-003, WRMW5-003, WRMW6-003, DUP-003, RINSATE -003, BLANK -003	**15-JAN-2013**	---	15-JAN-2013	----	**17-JAN-2013**	15-JAN-2013	✘
EA010P: Conductivity by PC Titrator							
Clear Plastic Bottle - Natural (EA010-P) WRMW1-003, WRMW2-003, WRMW3-003, WRMW4-003, WRMW5-003, WRMW6-003, DUP-003, RINSATE -003, BLANK -003	**15-JAN-2013**	---	12-FEB-2013	----	**17-JAN-2013**	12-FEB-2013	✓
EA015: Total Dissolved Solids							
Clear Plastic Bottle - Natural (EA015H) WRMW1-003, WRMW2-003, WRMW3-003, WRMW4-003, WRMW5-003, WRMW6-003, DUP-003, RINSATE -003, BLANK -003	**15-JAN-2013**	---	22-JAN-2013	----	**18-JAN-2013**	22-JAN-2013	✓
EA025: Suspended Solids							
Clear Plastic Bottle - Natural (EA025H) WRMW1-003, WRMW2-003, WRMW3-003, WRMW4-003, WRMW5-003, WRMW6-003, DUP-003, RINSATE -003, BLANK -003	**15-JAN-2013**	---	22-JAN-2013	----	**18-JAN-2013**	22-JAN-2013	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA045: Turbidity								
Clear Plastic Bottle - Natural (EA045)								
WRMW1-003, WRMW3-003, WRMW5-003, DUP-003, BLANK -003	WRMW2-003, WRMW4-003, WRMW6-003, RINSATE -003,	**15-JAN-2013**	----	----	----	**16-JAN-2013**	17-JAN-2013	✓
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P)								
WRMW1-003, WRMW3-003, WRMW5-003, DUP-003, BLANK -003	WRMW2-003, WRMW4-003, WRMW6-003, RINSATE -003,	**15-JAN-2013**	---	29-JAN-2013	----	**17-JAN-2013**	29-JAN-2013	✓
ED038A: Acidity								
Clear Plastic Bottle - Natural (ED038)								
WRMW1-003, WRMW3-003, WRMW5-003, DUP-003, BLANK -003	WRMW2-003, WRMW4-003, WRMW6-003, RINSATE -003,	**15-JAN-2013**	----	----	----	**21-JAN-2013**	29-JAN-2013	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G)								
WRMW1-003, WRMW3-003, WRMW5-003, DUP-003, BLANK -003	WRMW2-003, WRMW4-003, WRMW6-003, RINSATE -003,	**15-JAN-2013**	---	12-FEB-2013	----	**15-JAN-2013**	12-FEB-2013	✓
ED045G: Chloride Discrete analyser								
Clear Plastic Bottle - Natural (ED045G)								
WRMW1-003, WRMW3-003, WRMW5-003, DUP-003, BLANK -003	WRMW2-003, WRMW4-003, WRMW6-003, RINSATE -003,	**15-JAN-2013**	---	12-FEB-2013	----	**15-JAN-2013**	12-FEB-2013	✓
EG020F: Dissolved Metals by ICP-MS								
Clear Plastic Bottle - Filtered; Lab-acidified (EG020A-F)								
WRMW1-003, WRMW3-003, WRMW5-003, DUP-003, BLANK -003	WRMW2-003, WRMW4-003, WRMW6-003, RINSATE -003,	**15-JAN-2013**	---	14-JUL-2013	----	**21-JAN-2013**	14-JUL-2013	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG020A-T) WRMW1-003, WRMW2-003, WRMW3-003, WRMW4-003, WRMW5-003, WRMW6-003, DUP-003, RINSATE -003, BLANK -003	**15-JAN-2013**	**21-JAN-2013**	14-JUL-2013	✓	**21-JAN-2013**	14-JUL-2013	✓
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG020B-T) WRMW1-003, WRMW2-003, WRMW3-003, WRMW4-003, WRMW5-003, WRMW6-003, DUP-003, RINSATE -003, BLANK -003	**15-JAN-2013**	**21-JAN-2013**	14-JUL-2013	✓	**21-JAN-2013**	14-JUL-2013	✓
EG035T: Total Recoverable Mercury by FIMS							
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG035T) WRMW1-003, WRMW2-003, WRMW3-003, WRMW4-003, WRMW5-003, WRMW6-003, DUP-003, RINSATE -003, BLANK -003	**15-JAN-2013**	**----**	----	----	**22-JAN-2013**	12-FEB-2013	✓
EG050F: Dissolved Hexavalent Chromium							
Clear Plastic Bottle - NaOH (EG050G-F) WRMW1-003, WRMW2-003, WRMW3-003, WRMW4-003, WRMW5-003, WRMW6-003, DUP-003, RINSATE -003, BLANK -003	**15-JAN-2013**	**----**	----	----	**21-JAN-2013**	12-FEB-2013	✓
EG051G: Ferrous Iron by Discrete Analyser							
Clear Plastic Bottle - HCl (EG051G) WRMW1-003, WRMW2-003, WRMW3-003, WRMW4-003, WRMW5-003, WRMW6-003, DUP-003, RINSATE -003, BLANK -003	**15-JAN-2013**	**----**	----	----	**15-JAN-2013**	16-JAN-2013	✓
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulphuric Acid (EK055G) WRMW1-003, WRMW2-003, WRMW3-003, WRMW4-003, WRMW5-003, WRMW6-003, DUP-003, RINSATE -003, BLANK -003	**15-JAN-2013**	**---**	12-FEB-2013	----	**15-JAN-2013**	12-FEB-2013	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / *Container / Client Sample ID(s)*	*Sample Date*	*Extraction / Preparation* – *Date extracted*	*Due for extraction*	*Evaluation*	*Analysis* – *Date analysed*	*Due for analysis*	*Evaluation*
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G) WRMW1-003, WRMW2-003, WRMW3-003, WRMW4-003, WRMW5-003, WRMW6-003, DUP-003, RINSATE -003, BLANK -003	**15-JAN-2013**	---	17-JAN-2013	----	**15-JAN-2013**	17-JAN-2013	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulphuric Acid (EK059G) WRMW1-003, WRMW2-003, WRMW3-003, WRMW4-003, WRMW5-003, WRMW6-003, DUP-003, RINSATE -003, BLANK -003	**15-JAN-2013**	---	12-FEB-2013	----	**15-JAN-2013**	12-FEB-2013	✓
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Clear Plastic Bottle - Sulphuric Acid (EK061G) WRMW1-003, WRMW2-003, WRMW3-003, WRMW4-003, WRMW5-003, WRMW6-003, DUP-003, RINSATE -003, BLANK -003	**15-JAN-2013**	**21-JAN-2013**	12-FEB-2013	✓	**21-JAN-2013**	12-FEB-2013	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulphuric Acid (EK067G) WRMW1-003, WRMW2-003, WRMW3-003, WRMW4-003, WRMW5-003, WRMW6-003, DUP-003, RINSATE -003, BLANK -003	**15-JAN-2013**	**21-JAN-2013**	12-FEB-2013	✓	**21-JAN-2013**	12-FEB-2013	✓
EK071G: Reactive Phosphorus as P by discrete analyser							
Clear Plastic Bottle - Natural (EK071G) WRMW1-003, WRMW2-003, WRMW3-003, WRMW4-003, WRMW5-003, WRMW6-003, DUP-003, RINSATE -003, BLANK -003	**15-JAN-2013**	---	17-JAN-2013	----	**15-JAN-2013**	17-JAN-2013	✓
EK085M: Sulfide as S2-							
Clear Plastic Bottle - Zinc Acetate/NaOH (EK085) WRMW1-003, WRMW2-003, WRMW3-003, WRMW4-003, WRMW5-003, WRMW6-003, DUP-003, RINSATE -003, BLANK -003	**15-JAN-2013**	----	----	----	**21-JAN-2013**	22-JAN-2013	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP026ST: Chemical Oxygen Demand (Sealed Tube)							
Clear Plastic Bottle - Sulfuric Acid (EP026ST) WRMW1-003, WRMW2-003, WRMW3-003, WRMW4-003, WRMW5-003, WRMW6-003, DUP-003, RINSATE -003, BLANK -003	**15-JAN-2013**	**----**	----	----	**21-JAN-2013**	12-FEB-2013	✓
EP030: Biochemical Oxygen Demand (BOD)							
Clear Plastic Bottle - Natural (EP030) WRMW1-003, WRMW2-003, WRMW3-003, WRMW4-003, WRMW5-003, WRMW6-003, DUP-003, RINSATE -003, BLANK -003	**15-JAN-2013**	**----**	----	----	**17-JAN-2013**	17-JAN-2013	✓
EP068A: Organochlorine Pesticides (OC)							
Amber Glass Bottle - Unpreserved (EP068) WRMW1-003, WRMW2-003, WRMW3-003, WRMW4-003, WRMW5-003, WRMW6-003, DUP-003, RINSATE -003, BLANK -003	**15-JAN-2013**	**18-JAN-2013**	22-JAN-2013	✓	**21-JAN-2013**	27-FEB-2013	✓
EP068B: Organophosphorus Pesticides (OP)							
Amber Glass Bottle - Unpreserved (EP068) WRMW1-003, WRMW2-003, WRMW3-003, WRMW4-003, WRMW5-003, WRMW6-003, DUP-003, RINSATE -003, BLANK -003	**15-JAN-2013**	**18-JAN-2013**	22-JAN-2013	✓	**21-JAN-2013**	27-FEB-2013	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071) WRMW1-003, WRMW2-003, WRMW3-003, WRMW4-003, WRMW5-003, WRMW6-003, DUP-003, RINSATE -003, BLANK -003	**15-JAN-2013**	**18-JAN-2013**	22-JAN-2013	✓	**21-JAN-2013**	27-FEB-2013	✓
EP074D: Fumigants							
Amber VOC Vial - Sulfuric Acid (EP074) WRMW1-003, WRMW2-003, WRMW3-003, WRMW4-003, WRMW5-003, WRMW6-003, DUP-003, RINSATE -003, BLANK -003	**15-JAN-2013**	**17-JAN-2013**	29-JAN-2013	✓	**17-JAN-2013**	29-JAN-2013	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation
EP074E: Halogenated Aliphatic Compounds							
Amber VOC Vial - Sulfuric Acid (EP074) WRMW1-003, WRMW2-003, WRMW3-003, WRMW4-003, WRMW5-003, WRMW6-003, DUP-003, RINSATE -003, BLANK -003	**15-JAN-2013**	**17-JAN-2013**	29-JAN-2013	✓	**17-JAN-2013**	29-JAN-2013	✓
EP074F: Halogenated Aromatic Compounds							
Amber VOC Vial - Sulfuric Acid (EP074) WRMW1-003, WRMW2-003, WRMW3-003, WRMW4-003, WRMW5-003, WRMW6-003, DUP-003, RINSATE -003, BLANK -003	**15-JAN-2013**	**17-JAN-2013**	29-JAN-2013	✓	**17-JAN-2013**	29-JAN-2013	✓
EP074A: Monocyclic Aromatic Hydrocarbons							
Amber VOC Vial - Sulfuric Acid (EP074) WRMW1-003, WRMW2-003, WRMW3-003, WRMW4-003, WRMW5-003, WRMW6-003, DUP-003, RINSATE -003, BLANK -003	**15-JAN-2013**	**17-JAN-2013**	29-JAN-2013	✓	**17-JAN-2013**	29-JAN-2013	✓
EP074H: Naphthalene							
Amber VOC Vial - Sulfuric Acid (EP074) WRMW1-003, WRMW2-003, WRMW3-003, WRMW4-003, WRMW5-003, WRMW6-003, DUP-003, RINSATE -003, BLANK -003	**15-JAN-2013**	**17-JAN-2013**	29-JAN-2013	✓	**17-JAN-2013**	29-JAN-2013	✓
EP074B: Oxygenated Compounds							
Amber VOC Vial - Sulfuric Acid (EP074) WRMW1-003, WRMW2-003, WRMW3-003, WRMW4-003, WRMW5-003, WRMW6-003, DUP-003, RINSATE -003, BLANK -003	**15-JAN-2013**	**17-JAN-2013**	29-JAN-2013	✓	**17-JAN-2013**	29-JAN-2013	✓
EP074C: Sulfonated Compounds							
Amber VOC Vial - Sulfuric Acid (EP074) WRMW1-003, WRMW2-003, WRMW3-003, WRMW4-003, WRMW5-003, WRMW6-003, DUP-003, RINSATE -003, BLANK -003	**15-JAN-2013**	**17-JAN-2013**	29-JAN-2013	✓	**17-JAN-2013**	29-JAN-2013	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation
EP074G: Trihalomethanes							
Amber VOC Vial - Sulfuric Acid (EP074) WRMW1-003, WRMW2-003, WRMW3-003, WRMW4-003, WRMW5-003, WRMW6-003, DUP-003, RINSATE -003, BLANK -003	**15-JAN-2013**	**17-JAN-2013**	29-JAN-2013	✓	**17-JAN-2013**	29-JAN-2013	✓
EP075(SIM)A: Phenolic Compounds							
Amber Glass Bottle - Unpreserved (EP075(SIM)) WRMW1-003, WRMW2-003, WRMW3-003, WRMW4-003, WRMW5-003, WRMW6-003, DUP-003, RINSATE -003, BLANK -003	**15-JAN-2013**	**18-JAN-2013**	22-JAN-2013	✓	**21-JAN-2013**	27-FEB-2013	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP075(SIM)) WRMW1-003, WRMW2-003, WRMW3-003, WRMW4-003, WRMW5-003, WRMW6-003, DUP-003, RINSATE -003, BLANK -003	**15-JAN-2013**	**18-JAN-2013**	22-JAN-2013	✓	**21-JAN-2013**	27-FEB-2013	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber VOC Vial - Sulfuric Acid (EP080) WRMW1-003, WRMW2-003, WRMW3-003, WRMW4-003, WRMW5-003, WRMW6-003, DUP-003, RINSATE -003, BLANK -003	**15-JAN-2013**	**17-JAN-2013**	29-JAN-2013	✓	**17-JAN-2013**	29-JAN-2013	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Acidity as Calcium Carbonate	ED038	2	16	**12.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Alkalinity by PC Titrator	ED037-P	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ammonia as N by Discrete analyser	EK055G	2	17	**11.8**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Biochemical Oxygen Demand (BOD)	EP030	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chemical Oxygen Demand (Sealed Tube)	EP026ST	4	40	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	2	17	**11.8**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	4	38	**10.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	19	**10.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ferrous Iron by Discrete Analyser	EG051G	2	19	**10.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Hexavalent Chromium by Discrete Analyser - Dissolved	EG050G-F	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	4	32	**12.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	2	18	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
pH by PC Titrator	EA005-P	4	37	**10.8**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P-By Discrete Analyser	EK071G	2	17	**11.8**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	17	**11.8**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Sulfide as S2-	EK085	2	19	**10.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	2	18	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids (High Level)	EA015H	2	17	**11.8**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	3	29	**10.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	3	21	**14.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	2	15	**13.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite B	EG020B-T	1	10	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	3	29	**10.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	10	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Turbidity	EA045	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Volatile Organic Compounds	EP074	1	10	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Acidity as Calcium Carbonate	ED038	1	16	**6.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Alkalinity by PC Titrator	ED037-P	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ammonia as N by Discrete analyser	EK055G	1	17	**5.9**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Biochemical Oxygen Demand (BOD)	EP030	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chemical Oxygen Demand (Sealed Tube)	EP026ST	4	40	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	2	17	**11.8**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	6	38	**15.8**	**15.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type / *Analytical Methods*	*Method*	*Count QC*	*Count Regular*	***Rate (%) Actual***	***Rate (%) Expected***	*Evaluation*	*Quality Control Specification*
Laboratory Control Samples (LCS) - Continued							
Ferrous Iron by Discrete Analyser	EG051G	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Hexavalent Chromium by Discrete Analyser - Dissolved	EG050G-F	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	32	**6.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	11	**9.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
pH by PC Titrator	EA005-P	4	37	**10.8**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	17	**5.9**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	17	**11.8**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Sulfide as S2-	EK085	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	2	18	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids (High Level)	EA015H	2	17	**11.8**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	4	29	**13.8**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	2	21	**9.5**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	1	15	**6.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite B	EG020B-T	1	10	**10.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	4	29	**13.8**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	11	**9.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	10	**10.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Turbidity	EA045	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Volatile Organic Compounds	EP074	1	10	**10.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ammonia as N by Discrete analyser	EK055G	1	17	**5.9**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Biochemical Oxygen Demand (BOD)	EP030	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chemical Oxygen Demand (Sealed Tube)	EP026ST	2	40	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	1	17	**5.9**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	2	38	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ferrous Iron by Discrete Analyser	EG051G	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Hexavalent Chromium by Discrete Analyser - Dissolved	EG050G-F	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	32	**6.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	11	**9.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	17	**5.9**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	17	**5.9**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Sulfide as S2-	EK085	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids (High Level)	EA015H	1	17	**5.9**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	**Actual**	**Expected**	*Evaluation*	
Method Blanks (MB) - Continued							
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	29	**6.9**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	2	21	**9.5**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	1	15	**6.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite B	EG020B-T	1	10	**10.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	2	29	**6.9**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	11	**9.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	10	**10.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Turbidity	EA045	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Volatile Organic Compounds	EP074	1	10	**10.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	17	**5.9**	**5.0**	✓	ALS QCS3 requirement
Chemical Oxygen Demand (Sealed Tube)	EP026ST	2	40	**5.0**	**5.0**	✓	ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	1	17	**5.9**	**5.0**	✓	ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	19	**5.3**	**5.0**	✓	ALS QCS3 requirement
Ferrous Iron by Discrete Analyser	EG051G	1	19	**5.3**	**5.0**	✓	ALS QCS3 requirement
Hexavalent Chromium by Discrete Analyser - Dissolved	EG050G-F	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	32	**6.3**	**5.0**	✓	ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	1	18	**5.6**	**5.0**	✓	ALS QCS3 requirement
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	17	**5.9**	**5.0**	✓	ALS QCS3 requirement
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	17	**5.9**	**5.0**	✓	ALS QCS3 requirement
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	29	**6.9**	**5.0**	✓	ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	1	15	**6.7**	**5.0**	✓	ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	2	29	**6.9**	**5.0**	✓	ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	10	**10.0**	**5.0**	✓	ALS QCS3 requirement
Volatile Organic Compounds	EP074	1	10	**10.0**	**5.0**	✓	ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	APHA 21st ed. 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Conductivity by PC Titrator	EA010-P	WATER	APHA 21st ed., 2510 B This procedure determines conductivity by automated ISE. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Dissolved Solids (High Level)	EA015H	WATER	In-House, APHA 21st ed., 2540C A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Suspended Solids (High Level)	EA025H	WATER	In-House, APHA 21st ed., 2540D A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Turbidity	EA045	WATER	APHA 21st ed., 2130 B. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Alkalinity by PC Titrator	ED037-P	WATER	APHA 21st ed., 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Acidity as Calcium Carbonate	ED038	WATER	APHA 21st ed., 2310 B Acidity is determined by titration with a standardised alkali to an end-point pH of 8.3. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	APHA 21st ed., 4500-SO4 Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Chloride by Discrete Analyser	ED045G	WATER	APHA 21st ed., 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA 21st edition seal method 2 017-1-L april 2003
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): Samples are 0.45 um filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.

Analytical Methods	Method	Matrix	Method Descriptions
Total Metals by ICP-MS - Suite B	EG020B-T	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Mercury by FIMS	EG035T	WATER	AS 3550, APHA 21st ed. 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the unfiltered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Hexavalent Chromium by Discrete Analyser - Dissolved	EG050G-F	WATER	APHA 21st ed., 3500 Cr-A & B. Samples are 0.45 um filtered prior to analysis. Hexavalent chromium is determined directly on water sample by Discrete Analyser as received by pH adjustment and colour development using dephenylcarbazide. Each run of samples is measured against a five-point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ferrous Iron by Discrete Analyser	EG051G	WATER	APHA 21st ed., 3500 Fe-B. A colorimetric determination based on the reaction between phenanthroline and ferrous iron at pH 3.2-3.3 to form an orange-red complex that is measured against a five-point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ammonia as N by Discrete analyser	EK055G	WATER	APHA 21st ed., 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrite as N by Discrete Analyser	EK057G	WATER	APHA 21st ed., 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrate as N by Discrete Analyser	EK058G	WATER	APHA 21st ed., 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	APHA 21st ed., 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	APHA 21st ed., 4500-Norg D. 25mL water samples are digested using a traditional Kjeldahl digestion followed by determination by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	APHA 21st ed., 4500-Norg / 4500-NO3-. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	APHA 21st ed., 4500-P B&F This procedure involves sulphuric acid digestion of a 100mL sample to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Reactive Phosphorus as P-By Discrete Analyser	EK071G	WATER	APHA 21st ed., 4500-P F Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Analytical Methods	Method	Matrix	Method Descriptions
Sulfide as S2-	EK085	WATER	APHA 21st ed., 4500-S2- D Sulfide species present in water samples are immediately precipitated when collected in pretreated caustic/zinc acetate preserved sample containers. After the supernatant is discarded, the resultant precipitate is then coloured using methylene blue indicator and measured using UV-VIS detection at 664nm. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Chemical Oxygen Demand (Sealed Tube)	EP026ST	WATER	(APHA 21st ed., 5220C, ALS QWI-EN/EP026) Samples are digested with a known excess of an acidic potassium dichromate solution using silver sulfate as a catalyst. The chromium is reduced from the Cr (VI) oxidation state to the Cr (III) state by the oxygen present in the organic material. The unreacted Cr (VI) can then be titrated with ferrous ammonium sulfate to determine the amount of Cr (VI) consumed. The oxidisable organic matter can be calculated in terms of oxygen equivalents.
Biochemical Oxygen Demand (BOD)	EP030	WATER	APHA 21st ed., 5210 B The 5-Day BOD test provides an empirical measure of the oxygen consumption capacity of a given water. A portion of the sample is diluted into oxygenated, nutrient rich water, and a seed added to begin biological decay. The initial dissolved oxygen content is measured, then the bottle is sealed and incubated for five days. The remaining dissolved oxygen is measured, and from the difference, the demand for oxygen, by biological decay, is determined. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Pesticides by GCMS	EP068	WATER	USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
TPH - Semivolatile Fraction	EP071	WATER	USEPA SW 846 - 8015A The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Volatile Organic Compounds	EP074	WATER	USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
TPH Volatiles/BTEX	EP080	WATER	USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Preparation Methods	Method	Matrix	Method Descriptions
Digestion for Total Recoverable Metals	EN25	WATER	USEPA SW846-3005 Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Separatory Funnel Extraction of Liquids	ORG14	WATER	USEPA SW 846 - 3510B 500 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2). ALS default excludes sediment which may be resident in the container.

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EG020F: Dissolved Metals by ICP-MS	EP1300260-006	Anonymous	**Nickel**	7440-02-0	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EG020F: Dissolved Metals by ICP-MS	EP1300260-006	Anonymous	**Zinc**	7440-66-6	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Ar	EP1300272-004	WRMW4-003	**Nitrite + Nitrate as N**	----	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**
- **For all matrices, no Laboratory Control outliers occur.**

Regular Sample Surrogates

Sub-Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Samples Submitted							
EP075(SIM)T: PAH Surrogates	EP1300272-001	WRMW1-003	**Anthracene-d10**	1719-06-8	126 %	42.7-126.5 %	**Recovery greater than upper data quality objective**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

Matrix: **WATER**

Method	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)	*Date extracted*	*Due for extraction*	***Days overdue***	*Date analysed*	*Due for analysis*	***Days overdue***
EA005P: pH by PC Titrator						
Clear Plastic Bottle - Natural WRMW1-003, WRMW2-003, WRMW3-003, WRMW4-003, WRMW5-003, WRMW6-003, DUP-003, RINSATE -003, BLANK -003	----	----	----	17-JAN-2013	15-JAN-2013	**2**

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

- **No Quality Control Sample Frequency Outliers exist.**

ALS Group

Environmental Division

Foods Environmental Pharmaceutical

ALS Life Sciences

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order : **EP1300272**

Client	: **MOBILE DEWATERING**	Laboratory	: Environmental Division Perth
Contact	: INFO	Contact	: Lauren Ockwell
Address	: PO BOX 239 MIDLAND WA, AUSTRALIA 6939	Address	: 10 Hod Way Malaga WA Australia 6090
E-mail	: info@environmentalservices.com.au	E-mail	: lauren.ockwell@alsenviro.com
Telephone	: +61 08 9250 4995	Telephone	: 08 9209 7606
Facsimile	: ----	Facsimile	: 08 9209 7600
Project	: E2012-31	Page	: 1 of 3
Order number	: ----		
C-O-C number	: E2012-31-005	Quote number	: EP2012MOBDEW0134 (EP/785/12)
Site	: WASTEROCK		
Sampler	: DA/RB	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 15-JAN-2013	Issue Date	: 15-JAN-2013 18:43
Client Requested Due Date	: 22-JAN-2013	Scheduled Reporting Date	: **22-JAN-2013**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: 8.0 - Ice present
No. of coolers/boxes	: 4 Medum Hard Eskies	No. of samples received	: 9
Security Seal	: Intact.	No. of samples analysed	: 9

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- Samples received in appropriately pretreated and preserved containers.
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- **Samples received in appropriately pretreated and preserved containers.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (SamplesPerth@alsenviro.com)
- Sample Disposal - Aqueous (14 days), Solid (90 days) from date of completion of Work Order.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exist.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process neccessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default to 15:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory for processing purposes and will be shown bracketed without a time component.

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EA005P pH (PC)	WATER - EA010P Conductivity (PC)	WATER - EA015H Total Dissolved Solids - High Level	WATER - EA025H Suspended Solids (High Level)	WATER - EA045 Turbidity	WATER - ED038 Acidity as CaCO3	WATER - EG020F Dissolved Metals by ICPMS	WATER - EG020T Total Recoverable Metals by ICPMS
EP1300272-001	[15-JAN-2013]	WRMW1-003	✓	✓	✓	✓	✓	✓	✓	✓
EP1300272-002	[15-JAN-2013]	WRMW2-003	✓	✓	✓	✓	✓	✓	✓	✓
EP1300272-003	[15-JAN-2013]	WRMW3-003	✓	✓	✓	✓	✓	✓	✓	✓
EP1300272-004	[15-JAN-2013]	WRMW4-003	✓	✓	✓	✓	✓	✓	✓	✓
EP1300272-005	[15-JAN-2013]	WRMW5-003	✓	✓	✓	✓	✓	✓	✓	✓
EP1300272-006	[15-JAN-2013]	WRMW6-003	✓	✓	✓	✓	✓	✓	✓	✓
EP1300272-007	[15-JAN-2013]	DUP-003	✓	✓	✓	✓	✓	✓	✓	✓
EP1300272-008	[15-JAN-2013]	RINSATE -003	✓	✓	✓	✓	✓	✓	✓	✓
EP1300272-009	[15-JAN-2013]	BLANK -003	✓	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EG035T Total Mercury by FIMS	WATER - EG050G-F Hexavalent Chromium by Discrete Analyser - Filtered	WATER - EG051G Ferrous Iron by Discrete Analyser	WATER - EK085M Sulfide as S 2-	WATER - EP026ST COD- Sealed Tube	WATER - EP030 BOD	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)	WATER - NT-08A Total Nitrogen + NO2 + NO3 + NH3 + Total P + Reactive P
EP1300272-001	[15-JAN-2013]	WRMW1-003	✓	✓	✓	✓	✓	✓	✓	✓
EP1300272-002	[15-JAN-2013]	WRMW2-003	✓	✓	✓	✓	✓	✓	✓	✓
EP1300272-003	[15-JAN-2013]	WRMW3-003	✓	✓	✓	✓	✓	✓	✓	✓
EP1300272-004	[15-JAN-2013]	WRMW4-003	✓	✓	✓	✓	✓	✓	✓	✓
EP1300272-005	[15-JAN-2013]	WRMW5-003	✓	✓	✓	✓	✓	✓	✓	✓
EP1300272-006	[15-JAN-2013]	WRMW6-003	✓	✓	✓	✓	✓	✓	✓	✓
EP1300272-007	[15-JAN-2013]	DUP-003	✓	✓	✓	✓	✓	✓	✓	✓
EP1300272-008	[15-JAN-2013]	RINSATE -003	✓	✓	✓	✓	✓	✓	✓	✓
EP1300272-009	[15-JAN-2013]	BLANK -003	✓	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - W-09 TPH/VOC	WATER - W-12 OC/OP Pesticides	WATER - W-14A PAH/Phenols (SIM)
EP1300272-001	[15-JAN-2013]	WRMW1-003	✓	✓	✓
EP1300272-002	[15-JAN-2013]	WRMW2-003	✓	✓	✓
EP1300272-003	[15-JAN-2013]	WRMW3-003	✓	✓	✓
EP1300272-004	[15-JAN-2013]	WRMW4-003	✓	✓	✓
EP1300272-005	[15-JAN-2013]	WRMW5-003	✓	✓	✓
EP1300272-006	[15-JAN-2013]	WRMW6-003	✓	✓	✓
EP1300272-007	[15-JAN-2013]	DUP-003	✓	✓	✓
EP1300272-008	[15-JAN-2013]	RINSATE -003	✓	✓	✓
EP1300272-009	[15-JAN-2013]	BLANK -003	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ACCOUNTS PAYABLE (WA)		
- A4 - AU Tax Invoice (INV)	Email	deb@mobiledewatering.com.au
INFO		
- *AU Certificate of Analysis - NATA (COA)	Email	info@environmentalservices.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	info@environmentalservices.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	info@environmentalservices.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	info@environmentalservices.com.au
- Chain of Custody (CoC) (COC)	Email	info@environmentalservices.com.au
- EDI Format - ENMRG (ENMRG)	Email	info@environmentalservices.com.au
- EDI Format - ESDAT (ESDAT)	Email	info@environmentalservices.com.au
- EDI Format - XTab (XTAB)	Email	info@environmentalservices.com.au

Site: ~~EZ012~~ WASTEROCK
Job #: EZ012-031
Sampler: DALE A/RHIAN B
CoC #: EZ012-031-005
Quote #: EP/784/12
Laboratory: ALS ENVIRO
Date and time delivered: 15/1 15:35
Received by: AM

ENVIRONMENTAL SERVICES
Mobile Dewatering Environmental Services
Unit 1, 22 Elmsfield Road
Midvale WA 6056
P: 08 9250 6960
F: 08 9250 8269
E: info@environmentalservices.com.au

Comments:

PLEASE FILTER FERROUS IRON & TOTAL METALS.

Analysis Detection Limits

Sample ID	Lab ID	Type	Sampling Date	Sampling Time	ASS SUITE (2)
WRMW1-003		WATER	15.1.13	0900-1330	/
WRMW2-003					/
WRMW3-003					/
WRMW4-003					/
WRMW5-003					/
WRMW6-003					/
DUP-003					/
RINSATE-003					/
BLANK-003					/

Environmental Division
Perth
Work Order
EP1300272
Telephone : +61-8-9209 7655

Condition of Sample: Cool / Ambient / Warm

Relinquished by: [signature] G.J. Watts

Environmental and Analytical Laboratory

LABORATORY REPORT

Job Number: 13-0327
Revision: 00
Date: 25 January 2013

ADDRESS: **Mobile Dewatering Environmental Services**
Unit 1, 22 Elmsfield Road
MIDVALE WA 6056

ATTENTION: Dale A

DATE RECEIVED: 15/01/2013

YOUR REFERENCE: E2012-031-004

PURCHASE ORDER: 1080

APPROVALS:

Paul Nottle
Chemist - Organics

Douglas Todd
Section Manager - Inorganics

REPORT COMMENTS:

Samples are analysed on an as received basis unless otherwise noted.

Analytical Reference Laboratory (WA) Pty. Ltd.
46-48 Banksia Road, Welshpool, Western Australia 6106 Telephone 08 6253 4444 Facsimile 08 6253 4440
www.arlwa.com.au ABN: 91 050 159 898

Environmental and Analytical Laboratory

METHOD REFERENCES:

ARL No. 007	Benzene, Toluene, Ethylbenzene and Xylenes in Water
ARL No. 005	Polycyclic Aromatic Hydrocarbons in Water
ARL No. 009	Total Petroleum Hydrocarbons (TPH) in Water
ARL No. 002	OCOP and PCB in Water
ARL No. 044	Total Phenols in Water
ARL No. 402/403	Metals in Water by ICPOES/MS
ARL No. 040	Arsenic by Hydride Atomic Absorption
ARL No. 330	Persulphate Method for Simultaneous Determination of TN & TP
ARL No. 308	Total Phosphorus in Water by Discrete Analyser
ARL No. 305	Chloride in Water by Discrete Analyser
ARL No. 309	Filterable Reactive Phosphorus in Water by Discrete Analyser
ARL No. 303	Ammonia in Water by Discrete Analyser
ARL No. 313	NOx in Water by Discrete Analyser
ARL No. 311	Nitrite in Water by Discrete Analyser
ARL No. 021	Acidity in Water
ARL No. 037	Alkalinity in Water
ARL No. 014	pH in Water
ARL No. 019	Conductivity and Salinity in Water
ARL No. 017	Total Dissolved Solids (At 105^{o}C)
ARL No. 016	Total Suspended Solids
ARL No. 045	Turbidity
ARL No. 011	Biochemical Oxygen Demand
ARL No. 020	Chemical Oxygen Demand
ARL No. 121	Ferrous Iron in Water
ARL No. 023	Sulphide in Water

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ARL
Environmental and Analytical Laboratory

LABORATORY REPORT

Mobile Dewatering Environmental Services

ARL Job No: *13-0327* *Revision:* *00* *Date:* 25 January 2013

BTEX in Water Sample No: Sample Description:	LOR	UNITS	13-0327-1 Trip-003 15/01/2013
Benzene	0.001	mg/L	<0.001
Toluene	0.001	mg/L	<0.001
Ethyl Benzene	0.001	mg/L	<0.001
Xylenes (Total)	0.003	mg/L	<0.003
a, a, a-Trifluorotoluene(SS)		%	100

PAH in Water Sample No: Sample Description:	LOR	UNITS	13-0327-1 Trip-003 15/01/2013
Naphthalene	0.1	µg/L	<0.1
2-Methylnaphthalene	0.1	µg/L	<0.1
Acenaphthylene	0.1	µg/L	<0.1
Acenaphthene	0.1	µg/L	<0.1
Fluorene	0.1	µg/L	<0.1
Phenanthrene	0.1	µg/L	<0.1
Anthracene	0.1	µg/L	<0.1
Fluoranthene	0.1	µg/L	<0.1
Pyrene	0.1	µg/L	<0.1
Benz(a)anthracene	0.1	µg/L	<0.1
Chrysene	0.1	µg/L	<0.1
Benzo(b)fluoranthene	0.1	µg/L	<0.1
Benzo(k)fluoranthene	0.1	µg/L	<0.1
Benzo(a)pyrene	0.1	µg/L	<0.1
Indeno(1,2,3-c,d)pyrene	0.1	µg/L	<0.1
Dibenz(a,h)anthracene	0.1	µg/L	<0.1
Benzo(ghi)perylene	0.1	µg/L	<0.1
2-Fluoro-1,1'-Biphenyl (SS)		%	66
p-Terphenyl-d14 (SS)		%	71

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LABORATORY REPORT

Mobile Dewatering Environmental Services

ARL Job No: *13-0327* *Revision:* *00* *Date:* 25 January 2013

Environmental and Analytical Laboratory

TPH in Water Sample No: Sample Description:	LOR	UNITS	13-0327-1 Trip-003 15/01/2013
C_{6-9}	0.02	mg/L	<0.02
C_{10-14}	0.02	mg/L	<0.02
C_{15-28}	0.04	mg/L	<0.04
C_{29-36}	0.04	mg/L	<0.04
$C_{>36}$	0.04	mg/L	<0.04

OCOP in Water Sample No: Sample Description:	LOR	UNITS	13-0327-1 Trip-003 15/01/2013
Aldrin	0.001	µg/L	<0.001
alpha-BHC (HCH)	0.001	µg/L	<0.001
beta-BHC (HCH)	0.001	µg/L	<0.001
delta-BHC (HCH)	0.001	µg/L	<0.001
Bifenthrin	0.05	µg/L	<0.05
Bromophos Ethyl	0.005	µg/L	<0.005
Chlordane	0.002	µg/L	<0.002
Chlorothalonil	0.01	µg/L	<0.01
Chlorpyrifos	0.005	µg/L	<0.005
Diazinon	0.01	µg/L	<0.01
Dieldrin	0.001	µg/L	0.041
Endosulphan I	0.001	µg/L	<0.001
Endosulphan II	0.001	µg/L	<0.001
Endosulphan Sulphate	0.001	µg/L	<0.001
Endrin	0.01	µg/L	<0.01
Ethion	0.01	µg/L	<0.01
Fenitrothion	0.01	µg/L	<0.01
Fipronil	0.02	µg/L	<0.02
Hexachlorobenzene (HCB)	0.001	µg/L	<0.001
Heptachlor Epoxide	0.001	µg/L	<0.001
Heptachlor	0.001	µg/L	<0.001
Lindane	0.001	µg/L	<0.001
Malathion	0.01	µg/L	<0.01
Methoxychlor	0.02	µg/L	<0.02
o,p-DDT	0.001	µg/L	<0.001
Oxychlordane	0.001	µg/L	<0.001
p,p-DDD	0.001	µg/L	<0.001
p,p-DDE	0.001	µg/L	<0.001
p,p-DDT	0.001	µg/L	<0.001
Parathion Ethyl	0.02	µg/L	<0.02
Parathion Methyl	0.02	µg/L	<0.02
Trifluralin	0.01	µg/L	<0.01
Vinclozolin	0.02	µg/L	<0.02
Dibutyl chlorendate (SS)		%	65
Tetrachloro-m-Xylene (SS)		%	68

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www.arlwa.com.au ABN: 91 050 159 898

LABORATORY REPORT

Mobile Dewatering Environmental Services

ARL Job No: *13-0327* *Revision:* *00* *Date:* 25 January 2013

ARL Environmental and Analytical Laboratory

Misc. Organics in Water Sample No: Sample Description:	LOR	UNITS	13-0327-1 Trip-003 15/01/2013
Total Phenols	0.05	mg/L	<0.05

Metals in Water Sample No: Sample Description:	LOR	UNITS	13-0327-1 Trip-003 15/01/2013
Aluminium - Dissolved	0.01	mg/L	0.52
Aluminium - Total	0.01	mg/L	9.3
Arsenic - Dissolved	0.001	mg/L	<0.001
Arsenic - Total	0.001	mg/L	<0.001
Cadmium - Dissolved	0.0001	mg/L	0.0002
Cadmium - Total	0.0001	mg/L	0.0005
Chromium - Dissolved	0.001	mg/L	<0.001
Chromium - Total	0.001	mg/L	0.010
Iron - Dissolved	0.01	mg/L	0.39
Iron - Total	0.01	mg/L	1.8
Manganese - Dissolved	0.01	mg/L	<0.01
Manganese - Total	0.01	mg/L	<0.01
Nickel - Dissolved	0.001	mg/L	0.013
Nickel - Total	0.001	mg/L	0.014
Selenium - Dissolved	0.001	mg/L	<0.001
Selenium - Total	0.001	mg/L	<0.001
Zinc - Dissolved	0.005	mg/L	0.096
Zinc - Total	0.005	mg/L	0.10

Total Nitrogen in Water Sample No: Sample Description:	LOR	UNITS	13-0327-1 Trip-003 15/01/2013
Total Nitrogen	0.2	mg/L	4.7
TKN	0.2	mg/L	<0.2

Total Phosporus in Water Sample No: Sample Description:	LOR	UNITS	13-0327-1 Trip-003 15/01/2013
Total Phosphorus	0.01	mg/L	<0.01

Ions by Discrete Analyser Sample No: Sample Description:	LOR	UNITS	13-0327-1 Trip-003 15/01/2013
Chloride	5	mg/L	24
Filterable Reactive Phosphorus	0.01	mg/L	<0.01

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LABORATORY REPORT

Mobile Dewatering Environmental Services

ARL Job No: *13-0327* *Revision:* *00* *Date:* 25 January 2013

Environmental and Analytical Laboratory

Ions by Discrete Analyser Sample No: Sample Description:	LOR	UNITS	13-0327-1 Trip-003 15/01/2013
Ammonia-N	0.2	mg/L	<0.2
NOx-N	0.01	mg/L	4.7
Nitrate-N	0.01	mg/L	4.7
Nitrite-N	0.01	mg/L	<0.01

Physical Parameters Sample No: Sample Description:	LOR	UNITS	13-0327-1 Trip-003 15/01/2013
Acidity	5	$mgCaCO_3/L$	19
Alkalinity	5	$mgCaCO_3/L$	<5
pH	0.1	pH units	4.8
Conductivity	0.01	mS/cm	0.15
Total Dissolved Solids	5	mg/L	150
Total Suspended Solids	5	mg/L	590
Turbidity	0.1	NTU	500

Biochemical Oxygen Demand Sample No: Sample Description:	LOR	UNITS	13-0327-1 Trip-003 15/01/2013
Biochemical Oxygen Demand	5	mg/L	<5

Misc. Inorganics in Water Sample No: Sample Description:	LOR	UNITS	13-0327-1 Trip-003 15/01/2013
Chemical Oxygen Demand	10	mg/L	<10
Ferrous Iron	0.1	mg/L	<0.1
Sulphide	0.1	mg/L	<0.1

Result Definitions

LOR Limit of Reporting
[NT] Not Tested
[ND] Not Detected at indicated Limit of Reporting
[NR] Analysis Not Requested
(SS) Surrogate Standard Compound - Used for QC purposes. Acceptance Criteria is 60-120%.

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Quality Control Report

Job Number: 13-0327
Date: 25/01/2013

ARL
Environmental and Analytical Laboratory

This Quality Control Report is issued in accordance with Section 18 of the ARL Quality Management Manual. All QC parameters are contained within the relevant ARL Method as indicated by the method reference, either on this report or the Laboratory Report.

Acceptance of Holding Times, Duplicate RPD, Spike, LCS and CRM Recoveries are determined at the time of analysis by the Signatory indicated on the Laboratory Report.

DEFINITIONS

Duplicate Analysis
A sample, chosen randomly by the analyst at the time of sample preparation, analysed in duplicate.

RPD
Relative Percent Difference is the absolute difference between the sample and a duplicate analysis compared to the average of the two analytical results. Acceptance Limits can be exceeded by matrix interference or when the result is less than 5 times the LOR.

Matrix Spike
An additional portion of sample to which known amounts of the target analytes are added before sample preparation. Acceptance Limits can be exceeded by matrix interference or when the target analytes are present in the sample.

Certified Reference Material (CRM)
A commercially available certified solution/mixture of the target analyte of known concentration.

Laboratory Control Sample (LCS)
An in-house certified solution/mixture of the target analyte of known concentration.

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Quality Control Report

Job Number: 13-0327

Date: 25/01/2013

Environmental and Analytical Laboratory

BTEX in Water

ARL007

Holding Time Criteria	Date	
Extracted	22/01/2013	
Analysed	23/01/2013	
Duplicate Analysis (13-0327-1)	**RPD (%)**	**Limits (%)**
Benzene	0	25
Toluene	0	25
Ethyl Benzene	0	25
Xylenes (Total)	0	25
Duplicate Analysis (13-0336-1)	**RPD (%)**	**Limits (%)**
Benzene	0	25
Toluene	0	25
Ethyl Benzene	0	25
Xylenes (Total)	0	25
Matrix Spike (13-0477-1)	**Recovery (%)**	**Limits (%)**
Benzene	104	60 - 120
Toluene	103	60 - 120
Ethyl Benzene	114	60 - 120
Xylenes (Total)	113	60 - 120

PAH in Water

ARL005

Holding Time Criteria	Date	
Extracted	18/01/2013	
Analysed	21/01/2013	
Matrix Spike (13-0402-4)	**Recovery (%)**	**Limits (%)**
Naphthalene	85	60 - 120
Acenaphthene	119	60 - 120
Phenanthrene	118	60 - 120
Pyrene	120	60 - 120
Chrysene	120	60 - 120
Benzo(a)pyrene	94	60 - 120

TPH in Water

ARL009

Holding Time Criteria	Date	
Extracted	17/01/2013	
Analysed	18/01/2013	
Matrix Spike (13-0327-1)	**Recovery (%)**	**Limits (%)**
C_{15-28}	106	60 - 120

Total Petroleum Hydrocarbons - Matrix Spike

A known quantity of commercially available Diesel Fuel is spiked into the sample(s) indicated. Due to the nature of petroleum hydrocarbons, the matrix spike recovery is reported in the TPH C15-28 Range.

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Quality Control Report

Job Number: 13-0327

Date: 25/01/2013

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OCOP in Water

ARL002

Holding Time Criteria	**Date**	
Extracted	17/01/2013	
Analysed	18/01/2013	
Matrix Spike (13-0327-1)	**Recovery (%)**	**Limits (%)**
Aldrin	120	60 - 120
Dieldrin	70	60 - 120
Endrin	69	60 - 120
Heptachlor	120	60 - 120
Lindane	114	60 - 120
p,p-DDT	66	60 - 120

Misc. Organics in Water

ARL044

Holding Time Criteria	**Date**	
Extracted	22/01/2013	
Analysed	22/01/2013	
Duplicate Analysis (13-0477-1)	**RPD (%)**	**Limits (%)**
Total Phenols	0	25
Matrix Spike (13-0477-1)	**Recovery (%)**	**Limits (%)**
Total Phenols	95	60 - 120
Certified Reference Material	**Recovery (%)**	**Limits (%)**
Total Phenols	105	73 - 127

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Quality Control Report

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Metals in Water

Holding Time Criteria	Date	
Analysed	18/01/2013	
Duplicate Analysis (13-0327-1)	**RPD (%)**	**Limits (%)**
Aluminium - Dissolved	2	25
Arsenic - Dissolved	0	25
Cadmium - Dissolved	0	25
Chromium - Dissolved	0	25
Iron - Dissolved	0	25
Manganese - Dissolved	0	25
Nickel - Dissolved	0	25
Zinc - Dissolved	0	25
Matrix Spike (13-0327-1)	**Recovery (%)**	**Limits (%)**
Aluminium - Dissolved	95	60 - 120
Arsenic - Dissolved	90	60 - 120
Arsenic - Total	90	60 - 120
Cadmium - Dissolved	100	60 - 120
Cadmium - Total	100	60 - 120
Chromium - Dissolved	96	60 - 120
Chromium - Total	96	60 - 120
Iron - Dissolved	84	60 - 120
Iron - Total	84	60 - 120
Manganese - Dissolved	81	60 - 120
Manganese - Total	81	60 - 120
Nickel - Dissolved	93	60 - 120
Nickel - Total	93	60 - 120
Selenium - Dissolved	85	60 - 120
Selenium - Total	85	60 - 120
Certified Reference Material	**Recovery (%)**	**Limits (%)**
Aluminium - Dissolved	103	80 - 120
Aluminium - Total	95	80 - 120
Arsenic - Dissolved	92	80 - 120
Arsenic - Total	92	80 - 120
Cadmium - Dissolved	103	80 - 120
Cadmium - Total	103	80 - 120
Chromium - Dissolved	86	80 - 120
Chromium - Total	86	80 - 120
Iron - Dissolved	95	80 - 120
Iron - Total	95	80 - 120
Manganese - Dissolved	105	80 - 120
Manganese - Total	105	80 - 120
Nickel - Dissolved	92	80 - 120

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Certified Reference Material	Recovery (%)	Limits (%)
Nickel - Total	92	80 - 120
Selenium - Dissolved	94	80 - 120
Selenium - Total	94	80 - 120
Zinc - Dissolved	100	80 - 120
Zinc - Total	100	80 - 120

Total Nitrogen in Water

Holding Time Criteria	Date	
Extracted	21/01/13	
Analysed	21/01/13	
Matrix Spike (13-0327-1)	**Recovery (%)**	**Limits (%)**
Total Nitrogen	92	60 - 120
TKN	92	60 - 120
Certified Reference Material	**Recovery (%)**	**Limits (%)**
TKN	94	80 - 120

Total Phosporus in Water

Holding Time Criteria	Date	
Extracted	23/01/13	
Analysed	23/01/13	
Matrix Spike (13-0327-1)	**Recovery (%)**	**Limits (%)**
Total Phosphorus	101	60 - 120
Certified Reference Material	**Recovery (%)**	**Limits (%)**
Total Phosphorus	95	80 - 120

Ions by Discrete Analyser

Holding Time Criteria	Date	
Analysed	17/01/2013	
Matrix Spike (13-0318-1)	**Recovery (%)**	**Limits (%)**
Chloride	120	60 - 120
Nitrate-N	81	60 - 120
Certified Reference Material	**Recovery (%)**	**Limits (%)**
Nitrite-N	104	80 - 120
Filterable Reactive Phosphorus	97	80 - 120
Ammonia-N	118	80 - 120
NOx-N	93	80 - 120
Nitrate-N	93	80 - 120
Chloride	111	80 - 120

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Quality Control Report

Job Number: 13-0327

Date: 25/01/2013

Environmental and Analytical Laboratory

Physical Parameters

Holding Time Criteria	Date	
Analysed	16/01/2013	
Duplicate Analysis (13-0315-1)	**RPD (%)**	**Limits (%)**
Total Dissolved Solids	0	25
Certified Reference Material	**Recovery (%)**	**Limits (%)**
Acidity	96	80 - 120
Total Dissolved Solids	117	80 - 120
Total Suspended Solids	97	80 - 120
Alkalinity	86	80 - 120
Conductivity	96	80 - 120
pH	99	80 - 120
Turbidity	80	80 - 120

Biochemical Oxygen Demand

Holding Time Criteria	Date	
Analysed	21/01/2013	
Certified Reference Material	**Recovery (%)**	**Limits (%)**
Biochemical Oxygen Demand	85	80 - 120

Miscellaneous Inorganic in Water

Holding Time Criteria	Date	
Analysed	17/01/2013	
Laboratory Control Sample	**Recovery (%)**	**Limits (%)**
Ferrous Iron	99	80 - 120
Certified Reference Material	**Recovery (%)**	**Limits (%)**
Chemical Oxygen Demand	97	80 - 120

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13-0327 1080

Site: WASTE ROCK	**ENVIRONMENTAL SERVICES**
Job #: E2012-031-004	**Mobile Dewatering Environmental Services**
Sampler: DALE A / RHIAN B	Unit 1, 22 Elmsfield Road
CoC #: E2012-031-006	Midvale WA 6056
Quote #:	P: 08 9250 6960
Laboratory: ARL WA	F: 08 9250 8269
Date and time delivered: 15/1/13 16:00	E: info@environmentalservices.com.au
Received by: Chris Harvey	

Comments:

PLEASE CONTACT DALE WITH ANY ISSUES (0424153646)

Analysis Detection Limits

Sample ID	Lab ID	Type	Sampling Date	Sampling Time	TAA, pH, EC, TDS, TSS	TALK, SO4/CHLORIDE	BTEX, PHENOLS, TPH	PAH, OC/OP	BOD, COD	FERROUS IRON	TURBIDITY	NH_3, TP, SRP, TKN, TN, NO_3, NO_2	TOTAL, Al, As, Cd, Cr, Fe, Mn, Ni, Se, Zn	DISS Al, As, Cd, Cr, Fe, Mn, Ni, Se, Zn
1 TRIP-003		WATER	15-1-13	1330	/	/	/	/	/	/	/	/	/	/

DATE: 15/1/13
CHECKED BY: Chris
No OF SAMPLES: 1
No OF GLASS: 9
No OF PLASTIC: 4

Condition of Sample: Cool / Ambient / Warm Relinquished by: DA

MDW

Environmental Services

Specialising in:

Acid Sulphate Soils
Contaminated Site Assessment
Air Quality Investigations
Remediation Advice and Design
Groundwater Management
Facility Maintenance

ABN 36 835 856 256

Groundwater Monitoring Event #4

Lot 20 Adelaide Street Hazelmere

PREPARED FOR:

Wasterock Pty Ltd

Mobile Dewatering Environmental Services Pty Ltd as trustee for
Mobile Dewatering Environmental Services Unit Trust
U1/22 Elmsfield Road, Midvale, Western Australia 6056
P: +61 (0) 8 9250 6960 F: +61 (0) 8 92508269
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Environmental Services

DOCUMENT DETAILS

Title:	Groundwater Monitoring Event #4
Project Address	Lot 20 Adelaide Street, Hazelmere
Client	Wasterock Pty Ltd
Job Number	E2012-031
Author:	Rhian Burnell
Project Manager	Greg Watts
Email:	greg@environmentalservices.com.au
Status:	Final v1
Synopsis:	This document and investigation has been prepared in accordance with the Contaminated Sites Act, Western Australia (2006) and Department of Environment and Conservation (DEC) Contaminated Sites Management Series guidelines. The Scope of Works lists the extent of the investigation undertaken.

DOCUMENT DISTRIBUTION

Version No	Written by Date	Reviewed by Date	Issued by Date	Distributed to	Copies
Final v1	Rhian Burnell 24/06/13	Greg Watts 13/06/2013	Greg Watts 13/06/13	Hazelland Pty Ltd	Email & Hard Copy
Signed			G. J. Watts		

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Table of Contents

1 INTRODUCTION 4
2 SCOPE OF WORK 4
2.1 Objectives 4
3 SITE IDENTIFICATION 5
4 BACKGROUND INFORMATION 7
4.1 Site History 7
4.2 Land Owner 7
4.3 Land Use 7
4.4 Site Boundary 7
4.5 Groundwater Use 7
4.6 Previous Studies 7
4.7 Contaminated Sites Database 7
5 POTENTIAL CONTAMINANTS OF CONCERN (PCOC) 9
5.1 Preferential Contaminant Pathways 9
6 SAMPLING ANALYSIS PLAN AND METHODOLOGY 10
7 QUALITY ASSURANCE / QUALITY CONTROL 11
7.1 Quality Assurance 11
7.2 Groundwater Sampling Procedure 11
7.2.1 Decontamination of Sampling Equipment 11
7.3 Laboratory 12
7.4 Laboratory QA/QC 12
7.5 Quality Control 12
7.6 Waste Disposal 13
8 ASSESSMENT CRITERIA 14
9 RESULTS 15
9.2 Historical Data 18
9.3 Groundwater Levels 18
10 DISCUSSION & RECOMMENDATIONS 22
11 REFERENCES 23

List of Tables in Report

Table A: Site Summary Form....5
Table B: Site UTM coordinates....5
Table C: Groundwater Investigation Summary....10
Table D: Summary of TPH against LOR....15
Table E: Summary of TRH against LOR....15
Table F: Groundwater Measurements....19
Table G: Groundwater Levels....20

List of Figures in Report

Figure 1 Site Location Plan....6
Figure 2 Monitoring Well Locations....8
Figure 3 Groundwater Contours....20

List of Attachments

Tables

Table 1 – Groundwater Analysis Results – WRMW1
Table 2 – Groundwater Analysis Results – WRMW2
Table 3 – Groundwater Analysis Results – WRMW3
Table 4 – Groundwater Analysis Results – WRMW4
Table 5 – Groundwater Analysis Results – WRMW5
Table 6 – Quality Control Duplicate and Triplicate Results
Table 7 – Quality Control Rinsate and Blank Results

Appendices

Appendix A – Certificate of Title
Appendix B – Groundwater Field Sheets
Appendix C – Laboratory Results and Documentation

1 INTRODUCTION

This report has been prepared to detail the sampling methodology and results from Groundwater Monitoring Event #4 (GME) completed at the Hazelland Landfill in Hazelmere, herein referred to as the Site. MDW Environmental Services (MDWES) were commissioned by Wasterock Pty Ltd to complete groundwater investigations and compile a Groundwater Investigation Report in support of Section 3.7 of the *Site Remediation Works Agreement and Site Management Plan.*

2 SCOPE OF WORK

The Scope of Work for this project is as follows:

- Collect and analyse representative samples from six groundwater monitoring wells. Samples will be analysed by a NATA accredited laboratory for:
    - Total Petroleum Hydrocarbon / Total Recoverable Hydrocarbon (TPH/TRH);
    - Monocyclic Aromatic Hydrocarbons (MAH);
    - Polynuclear Aromatic Hydrocarbons (PAH;
    - Benzene, Toluene, Ethyl Benzene and Xylene (BTEX);
    - Phenolic Compunds;
    - Dissolved and Total Metalloids (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn); and
    - Organochlorine and Organophosphorous Pesticides (OC/OP).
- Data interpretation and reporting.

2.1 Objectives

The technical objectives of the investigation are to:

- Update the directional flow of the groundwater below the site;
- Identify and determine the extent of the risk that any identified contamination may pose to human health and the environment;
- Establish groundwater data from the Site prior to the proposed remediation works;
- Determine the suitability of water abstraction from the superficial aquifer for the purposes of dust suppression and compaction.

3 SITE IDENTIFICATION

Information regarding the Site identification is presented in Table A below.

Table A: Site Summary Form

Site Location:	Lot 20 Adelaide Street, Hazelmere
Current Site Use:	Industrial
Total Site Area:	2054 m^2
Folio:	299
Certificates of Title:	20/D76128 (Appendix A)
Local Council:	City of Swan

The Site is bound by the coordinates as shown in Table B.

Table B: Site UTM coordinates

BOUNDARY CORNERS	MGA94 Zone 50	
	Easting (E)	Northing (N)
North west corner	406595	6467321
North east corner	407034	6467190
North east corner (mid)	406939	6467172
South east corner	407015	6466812
South west corner	406476	6467046
Eastern Corner	407078	6467020

Figure 1 Site Location Map

4 BACKGROUND INFORMATION

The Site (Figure 1) is located within the City of Swan, approximately 14 km east north east of Perth CBD. Situated between Talbot Road and Adelaide Street access is gained from the south of the Site off Adelaide Street. Historically the Site was occupied and used as a licenced inert waste landfill in which potentially contaminating wastes were dumped. Following investigation by Parsons Brinckerhoff (2006) the Site was classified “Contaminated – Remediation Required” by the Department of Environment and Conservation (DEC). The Parsons Brinckerhoff report contains substantial amounts of background information regarding this property and the Groundwater Investigation Report should be read in conjunction with this previously completed soil investigation.

4.1 Site History

A detailed historical investigation was not completed as part of this Groundwater Monitoring Event.

4.2 Land Owner

The Site is currently vested with Hazelland Pty Ltd and has been so since 2006, under the Land Title City of Swan, Location: Lot 20, Volume: 2054, Folio: 299. A copy of the Certificate of Title is attached in Appendix A.

4.3 Land Use

The Site has been used for collection and storage of inert demolition waste as landfill with some potentially contaminating waste.

4.4 Site Boundary

The Site is surrounded by private land to the north and south with industrial proprieties to the west and Roe Highway runs along the eastern boundary.

4.5 Groundwater Use

The site does not currently make use of groundwater.

4.6 Previous Studies

Soil investigations were completed on Site during 1992 (Dames and Moore) and 2006 (Parsons Brinckerhoff).

4.7 Contaminated Sites Database

The site is currently classified as “*Contaminated – Remediation Required*” as per DEC Contaminated Sites Database.

ENVIRONMENTAL SERVICES	Scale 0 100m	N	Figure:	Detailed Site View
	Unit 1, 22 Elmsfield Road, Midvale 6056		Project:	Hazelland Landfill
	Ph (08) 9250 6960 Fax (08) 9250 8269		Job No:	E2012-031
	www.environmentalservices.com.au		Date:	18/06/2013
			Source	Nearmap

Figure 2 Monitoring Well Locations

5 POTENTIAL CONTAMINANTS OF CONCERN (PCOC)

The land is proposed for development into industrial lots. The following list of Potential Contaminants of Concern (PCOC) is based on the proposed use, historical and current Site activities, regional soil and related issues, proximity to classified contaminated sites and off-site sources of impacts:

- Dissolved and Total Metalloids: Arsenic (As), barium (Ba), beryllium (Be), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), manganese (Mn), molybdenum (Mo), nickel (Ni), silver (Ag), selenium (Se), vanadium (V), zinc (Zn), and mercury (Hg);
- Benzene, Toluene, Ethyl Benzene, Xylene (BTEX);
- Polynuclear Aromatic Hydrocarbons (PAH);
- Monocyclic Aromatic Hydrocarbons (MAH);
- Phenolic compounds;
- Total Petroleum Hydrocarbons / Total Recoverable Hydrocarbons (TPH/TRH);
- Organochlorine and Organophosphorous Pesticides (OC/OP).

5.1 Preferential Contaminant Pathways

Many of the PCOC identified have the potential to impact soil and groundwater at the Site and surrounding areas. Listed above are the contaminants most likely to be found within the fill and most likely to present a risk to human health and the environment. The PCOC have been identified due to the wide range of inert demolition waste likely to have been deposited at the Site. The preferential contaminant pathways can be summarised as soil, air and groundwater; notwithstanding that the Scope of Works for this investigation only includes assessment of potential groundwater contamination.

6 SAMPLING ANALYSIS PLAN AND METHODOLOGY

The Monitoring Well (MW) locations (on Site) are shown in Figure 2. The groundwater monitoring field sheets are presented in Appendix B. The groundwater sampling conducted at the Site is summarised in Table C below.

The sampling and analysis of the GME was completed to determine whether imported fill on the site had adversely affected the groundwater. The results within this report will complement previous groundwater data and be used to highlight any changes in groundwater quality during the proposed site remediation works.

Table C: Groundwater Investigation Summary

Activity	Details
Date of Field Activity	3rd June 2013
Investigation	A total of five groundwater wells were sampled for continued groundwater monitoring
Sampling Method	Monitoring wells were sampled via use of a 12V GeoTech Low Flow Bladder pump coupled to YSI Quattro low flow sampler
Samples	A total of five water samples were taken (one from each monitoring well)
Calibration	YSI Quattro low flow calibrated
Decontamination Procedure	Gloves were disposed of after each sample taken.
Analysis	• Dissolved and Total Metals • Nutrients • Groundwater Parameters • OC/OP • Phenolic Compunds • PAH • TRH/TPH • BTEX
Laboratory	Samples were sent to the primary laboratory, ALS Environmental. Secondary samples were sent to ARL, both NATA Accredited.
Sample Preservation	Samples were placed in laboratory supplied bottles. Samples were stored on ice (<4°C) in an esky while on site and in transit to the laboratory.

7 QUALITY ASSURANCE / QUALITY CONTROL

The following Quality Assurance / Quality Control (QA/QC) program was implemented throughout the investigation to ensure the accuracy and precision of the data obtained. QC measures the effectiveness of the procedures of the QA program.

7.1 Quality Assurance

All procedures including staff selection, sampling methodologies, equipment, analysis methods and data transfer were based on:

- Australian Standards AS-4482.1-2005 and AS-4482.2-1999: Guides to the Sampling and Investigation of Potentially Contaminated Soil.
- Australian/New Zealand Standard AS/NZS 5667.1:1998 Water Quality-Sampling.

Particularly, the following actions applied:

- Samples were collected by a trained, experienced field technician,
- Samples were collected by the same personnel, ensuring that techniques used were consistent across the sampling program.

7.2 Groundwater Sampling Procedure

All groundwater samples were subject to the following procedures:

- Dedicated tubing was used for each well and the pump and low flow cell were decontaminated between wells;
- Samples were collected into laboratory supplied sample bottles. Preservatives (if required) were provided by the laboratory in the appropriate sample bottle;
- Samples were filled to the top to ensure no headspace remained;
- All samples were marked in the field using permanent marker with a label showing sample location, date and job number;
- Samples were immediately placed on ice within an esky for transport to the laboratory.

Laboratory certificates of analysis including sample receipt notification, chain of custody and laboratory quality control are available in Appendix C.

7.2.1 Decontamination of Sampling Equipment

All sampling equipment was decontaminated prior to use and between each sample location. Decontamination was completed using the following procedure:

- Equipment washed in water;
- Equipment thoroughly scrubbed in water with Decon90;
- Equipment rinsed in tap water;

- Equipment rinsed in de-ionised water.

7.3 Laboratory

Two NATA certificated laboratories were selected to analyse the samples. ALS Laboratory Group was selected as the primary laboratory. ARL WA; the secondary laboratory, was used for the analysis of replicate samples and for inter-laboratory quality control (QC).

The laboratory conducts internal quality control analysis as part of their QA/QC Procedures. Following discussions with the laboratory and a review of their laboratory certificates of analysis, the following laboratory QC protocols occur:

- At least 10% of samples are split into internal laboratory duplicate samples. These samples are homogenised prior to splitting into sub samples;
- At least 5% of samples are run with Matrix Spikes of known additions;
- Laboratory Control Samples (LCS) are run at the required rate (minimum 1 LCS per batch of samples). The LCS results are reported in the laboratory certificates named 'Interpretive Quality Control Report' and the 'Quality Control Report'.

Chain of Custody forms (CoC), laboratory sample receipt notification (SRN), laboratory certificates of analysis and QC analysis are provided in Appendix C.

Laboratory QC was analysed and outliers are described below:

7.4 Laboratory QA/QC

- For all matrices, no Method Blank value outliers occur;
- Breaches of holding times occurred in particular for pH analysis; however, levels were confirmed via MDWES field analysis.

If further information is required, refer to the ALS Interpretive Quality Control report in Appendix C

7.5 Quality Control

To ensure the quality of the sampling method and laboratory analysis Quality Control (QC) samples were collected consisting of one (1) Rinsate Blank, one (1) Field Blank, one (1) set of duplicate and triplicate samples of a groundwater sample.

- A rinsate sample was collected for each day of field sampling (QC7);
- A field blank was collected for each day of field sampling (QC6);
- WRMW4-004 was used as the QC4 (duplicate) and QC5 (triplicate).

Laboratory certificates of analysis including sample receipt notification, chain of custody, and laboratory quality control are available in Appendix C.

The reproducibility of the sampling and analytical methodology is measured as precision. Laboratory and field precision is measured using the Relative Percent Difference (RPD) between the sample and its duplicates. For those RPD values which exceed a generally acceptable 30% - 50% (Australian Standard AS 4482.1), data precision is considered poor, however, consideration needs to be given to sample homogeneity and the concentrations detected. Therefore, the acceptable ranges adopted for the RPDs are based on the laboratories RPD acceptance criteria and are dependent on the magnitude of results in comparison to the limits of reporting (LOR) as follows:

Result < 10 times LOR = No limit

Result 10 – 20 times LOR = 0% - 50%

Result > 20 times LOR = 0% - 20%

Where values are reported below the laboratory LOR, RPDs will not be calculated.

Groundwater QC results (Table 6) found three RPD outside the acceptable criteria within the duplicate (QC4) and triplicate (QC5) samples for turbidity (QC4 & QC5), total aluminium (QC5) and total iron (QC5). However, no analyte levels recorded exceed any of the adopted assessment criteria and ultimately are not expected to affect environmental conditions.

It is MDWES opinion that the variances noted between the primary, duplicate and triplicate sample could be due to differing sample and laboratory techniques. In addition, small variance within the results reported can exaggerate RPD.

ALS Laboratory Group QC documentation (Appendix C) indicate that the lab's internal QC program was observed.

Laboratory analysis of QA samples indicates pH levels below that of the lower assessment level of the ADWG AV and Long-term Irrigation criteria for QC6 (blank) and QC7 (rinsate) respectively. Detailed results are available in Table 7.

7.6 Waste Disposal

Sampling was completed in consultation with MDWES Standard Operating Procedure and all waste was disposed of appropriately as to not impose a risk or cause contamination

8 ASSESSMENT CRITERIA

Laboratory analyses of groundwater samples undertaken onsite are presented in Table 1 through to Table 5. To assess the groundwater quality at the Site, water quality results were compared against the criteria outlined within the DEC's *Contaminated Site Management Series - Assessment Levels for Soil, Sediment and Water* (DEC, 2010). Laboratory results were compared against the following criteria:

- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* prepared by the Australian and New Zealand Environment and Conservation Council (ANZECC 2000) as reproduced in the DEC's *Contaminated Site Management Series - Assessment Levels for Soil, Sediment and Water* (DEC 2010):
    - Freshwater Ecosystems
    - Marine Ecosystems
    - Short-term Irrigation Water
    - Long-term Irrigation Water
- Department of Health *Contaminated Sites Reporting Guideline for Chemicals in Groundwater*, (DoH 2006):
    - Domestic Non-Potable groundwater use
- National Health and Medical Research Council and Agriculture and Resource Management Council of Australia and New Zealand *Australian Drinking Water Guidelines* (NHMRC & ARMCANZ 2004):
    - Drinking Water Health Value
    - Drinking Water Aesthetic Value

9 RESULTS

Laboratory results for the GME conducted by MDWES in June 2013 are presented in Tables 1 to Table 5. The groundwater monitoring field sheets are presented in Appendix B. Laboratory analysis and certificates for the groundwater sampling event are available in Appendix C.

The following notes are the summaries of laboratory results and the comparison to assessment criteria.

9.1.1 Total Petroleum Hydrocarbons (TPH)

Each of the TPH fractions analysed were generally below the laboratory LOR. The following TPH fractions, indicated in Table D below, were above the LOR. However, none of the TPH analysed identified concentrations above the assessment criteria adopted.

Table D: Summary of TPH against LOR

Analytes	LOR	Location and depth of analytes above the LOR concentration
C_{15} – C_{28}	100	**WRMW1** (200µg/L)**, WRMW3** (110µg/L)
C_{29} – C_{36}	50	**WRMW3** (100µg/L)
C_{10} – C_{36} (sum)	50	**WRMW1** (200µg/L)**, WRMW3** (210µg/L)

9.1.2 Total Recoverable Hydrocarbons (TRH)

Each of the TRH fractions analysed were generally below the laboratory LOR. The following TRH fractions within Table E below were above the LOR. However, none of the TRH analysed identified concentrations above the assessment criteria adopted.

Table E: Summary of TRH against LOR

Analytes	LOR	Location and depth of analytes above the LOR concentration
>C_{16} – C_{34}	100	**WRMW1** (220µg/L)**, WRMW3** (180µg/L)
>C_{10} – C_{40} (sum)	100	**WRMW1** (220µg/L)**, WRMW3** (180µg/L)

9.1.3 Monocyclic Aromatic Hydrocarbons (MAH)

Each of the speciated MAH analysed were below the LOR. Furthermore, there were no elevated concentrations above the assessment criteria adopted.

9.1.4 Polycyclic Aromatic Hydrocarbons (PAH)

Each of the speciated PAH analysed were below the LOR. Furthermore, there were no elevated concentrations above the assessment criteria adopted.

9.1.5 Phenolic Compounds

Each of the speciated phenolic compounds analysed were below the LOR. Furthermore, there were no elevated concentrations above the assessment criteria adopted.

9.1.6 Benzene, Toluene, Ethyl Benzene, Xylene (BTEX)

Each of the speciated BTEX analytes analysed were below the LOR. Furthermore, there were no elevated concentrations above the assessment criteria adopted.

9.1.7 Metals

The following dissolved metals exceedances were detected:

- Dissolved aluminium exceeded the following assessment criteria at the associated locations:
    - WRMW4 and WRMW5 exceeded Fresh Waters assessment criteria.
- Dissolved zinc exceeded the following assessment criteria at the associated locations:
    - WRMW1, WRMW2, WRMW3, WRMW4 and WRMW5 exceeded Fresh Waters and Marine Waters assessment criteria.
- Dissolved iron exceeded the following assessment criteria at the associated locations:
    - WRMW1 exceeded Fresh Waters, Marine Waters and the Long-term Irrigation Water assessment criteria;
    - WRMW2 exceeded Fresh Waters, Marine Waters, Long-term Irrigation Water, and ADWG AV assessment criteria.

The following total metals exceedances were detected:

- Total aluminium exceeded the following assessment criteria at the associated locations:
    - WRMW4 exceeded Fresh Waters and ADWG AV assessment criteria;
    - WRMW2 and WRMW5 exceeded Fresh Waters, ADWG AV and DoH assessment criteria;
    - WRMW1 exceeded Fresh Waters, ADWG AV, DoH and Long-term Irrigation Water assessment criteria;
    - WRMW3 exceeded all assessment criteria.
- Total copper exceeded the Fresh Water assessment criteria for all locations.
- Total lead exceeded the following assessment criteria at the associated locations:
    - WRMW2 exceeded Fresh Waters and Marine Waters assessment criteria;
    - WRMW1 and WRMW5 exceeded Fresh Waters, Marine Waters and ADWG HV assessment criteria.
    - WRMW3 exceeded Fresh Waters, Marine Waters, ADWG HV and DoH assessment criteria.
- Total manganese exceeded ADWG AV assessment criteria within WRMW3
- Total nickel exceeded Fresh Waters, Marine Waters and ADWG HV assessment criteria within WRMW3.
- Total zinc exceeded the following assessment criteria at the associated locations:
    - WRMW1, WRMW2, WRMW, WRMW4 exceeded Fresh Waters and Marine Waters assessment criteria;
    - WRMW5 exceeded Fresh Waters assessment criteria.
- Total iron exceeded the following assessment criteria at the associated locations:
    - WRMW1 and WRMW2 exceeded Long-term Irrigation Waters, Fresh Waters, Marine Waters and ADWG AV assessment criteria;
    - WRMW3 exceeded Long-term Irrigation Water, Fresh Waters, Marine Waters, ADWG AV, DoH and Short-term term irrigation Water assessment criteria.

9.1.8 Organochlorine Pesticides (OC)

Each of the speciated OC analysed were below the LOR. Furthermore, there were no elevated concentrations above the assessment criteria adopted.

9.1.9 Organophosphorus Pesticides (OP)

Each of the speciated OP analysed were below the LOR. Furthermore, there were no elevated concentrations above the assessment criteria adopted.

9.1.10 Major Anions and Cations

There were no elevated concentrations of the major anions and cations above the assessment criteria adopted.

9.1.11 Nutrients

Total Nitrogen exceeded Fresh Waters assessment criteria at WRMW4 and WRMW5.
Total Phosphorus exceeded Fresh Waters assessment criteria at WRMW3.

9.2 Historical Data

Laboratory analyses of samples completed for GME#4 are tabulated against historical monitoring events to identify changes in groundwater quality (attached Table 1 to Table 5). The following points are comparisons of current results from GME#4 against historical data.

- Laboratory results of MW1 samples indicate an increase in pH, Total Aluminium, Total Lead, Total Zinc, Total Lead, TRH (<C_{16} – C_{34} Fraction), and TPH (C_{15} – C_{28} Fraction). Decreases in levels were observed for Dissolved Aluminium, Total Zinc, and Total Nitrogen. All other analytes remained relatively similar throughout monitoring events.
- MW2 laboratory results indicate that pH, Suspended Solids (SS), Turbidity, Dissolved and Total Iron and Total Aluminium have increased between monitoring events. Dissolved Aluminium, Dissolved Zinc, Dissolved Nickel, Total Copper and Total Nitorgen have decreased, whilst all other analytes have remained similar.
- Results for MW3 show that Dissolved Aluminium, Dissolved Manganese, Dissolved Iron, Total Nitrogen and Total Phosphorus have decreased. Turbidity, SS, Acidity, Dissolved Zinc, Total Aluminium, Total Copper, Total Lead, Total Manganese, Total Nickel, Total Zinc, Total Iron, TPH (C_{15} – C_{28} Fraction and C_{29} – C_{36} Fraction), and TRH (>C_{16} – C_{34} Fraction) have increased. All other analytes remained similar throughout all monitoring events.
- Laboratory results of MW4 indicate a decrease in SS, Turbidity, Chloride, Dissolved Aluminium, Dissolved Nickel, Dissolved Zinc, Total Aluminium, Total Copper, Total Lead, Total Nickel, Total Zinc, Total Iron, Total Nitrogen and Total Phosphorus. An increase was only evident in TDS. All other analytes remained relatively similar over the monitoring events.
- Comparisons of MW5 results indicate a decrease in TDS, Dissolved Aluminium, Dissolved Zinc, Total Aluminium, Total Copper, Total Lead, Total Zinc and Total Iron, whilst increases were evident in pH, Acidity and Total Nitrogen. All other analytes remained relatively similar throughout previous monitoring events.
- MW6 was not sampled due to the well being dry.

9.3 Groundwater Levels

The depth to groundwater was measured during the GME on the 3rd June 2013 and tabulated with historical data (Table F). Commencement of monthly depth to groundwater measurements has also occurred with groundwater depths presented in Table G.

An interface meter was used to verify the presence / absence of free phase hydrocarbon products over the groundwater with no free phase products detected. Groundwater is intercepted between 18.9 RL mAHD (Relative Level metres Australian Height Datum) and 23.3 RL mAHD.

Plotting the water table values enable determination of groundwater direction. Figure 3 identifies a groundwater flux towards in north-north west direction.

Table F: Groundwater Measurements

Groundwater Well I.D.	Date	Top of Casing	Water Level		
		RL mAHD	mBGL	RL mAHD	Change mm
WRMW1	18/05/2012	27.281	3.700	23.581	N/A
	30/08/2012		3.455	23.826	-245
	11/10/2012		3.130	24.151	-325
	15/01/2013		3.646	23.635	516
	3/06/2013		3.987	23.294	341
WRMW2	18/05/2012	30.607	7.666	22.941	N/A
	30/08/2012		7.26	23.347	-406
	11/10/2012		7.316	23.291	56
	15/01/2013		7.682	22.925	366
	3/06/2013		7.924	22.683	242
WRMW3	18/05/2012	34.622	11.846	22.776	N/A
	30/08/2012		11.725	22.897	-121
	11/10/2012		11.794	22.828	69
	15/01/2013		11.858	22.764	64
	3/06/2013		12.197	22.425	339
WRMW4	18/05/2012	27.751	8.509	19.242	N/A
	30/08/2012		7.79	19.961	-719
	11/10/2012		7.753	19.998	-37
	15/01/2013		8.289	19.462	536
	3/06/2013		8.872	18.879	583
WRMW5	18/05/2012	29.034	8.836	20.198	N/A
	30/08/2012		8.28	20.754	-556
	11/10/2012		8.170	20.864	-110
	15/01/2013		8.641	20.393	471
	3/06/2013		9.322	19.712	681
WRMW6	18/05/2012	31.611	8.759	22.852	N/A
	30/08/2012		9.215	22.396	456
	11/10/2012		8.998	22.613	-217
	15/01/2013		9.312	22.299	314
	3/06/2013		9.917	21.694	605

Table G: Groundwater Levels

SAMPLE LOCATION		MW1			MW2			MW3			MW4			MW5			MW6		
		Standpipe (m):	0.45	Ground (RL mAHD):	Standpipe (m):	0.68	Ground (RL mAHD):	Standpipe (m):	0.51	Ground (RL mAHD):	Standpipe (m):	0.45	Ground (RL mAHD):	Standpipe (m):	0.68	Ground (RL mAHD):	Standpipe (m):	0.51	Ground (RL mAHD):
Date	**Day**	**Water Level (mm TOC)**	**Water Level Change (mm)**	**Water Level (mbgl)**	**Water Level (mm TOC)**	**Water Level Change (mm)**	**Water Level (mbgl)**	**Water Level (mm TOC)**	**Water Level Change (mm)**	**Water Level (mbgl)**	**Water Level (mm TOC)**	**Water Level Change (mm)**	**Water Level (mbgl)**	**Water Level (mm TOC)**	**Water Level Change (mm)**	**Water Level (mbgl)**	**Water Level (mm TOC)**	**Water Level Change (mm)**	**Water Level (mbgl)**
Trigger Level													0.45			0.68			0.51
18/5/12	Fri	-3700	-3700	-3.25	-7666	-7666	-6.99	-11846	-11846	-11.34	-8509	-8509	-8.06	-8836	-8836	-8.16	-8759	-8759	-8.25
30/8/12	Thu	-3455	245	-3.01	-7260	406	-6.58	-11725	121	-11.22	-7790	719	-7.34	-8280	556	-7.60	-9215	-456	-8.71
15/1/13	Tue	-3646	-191	-3.20	-7682	-422	-7.00	-11858	-133	-11.35	-8289	-499	-7.84	-8641	-361	-7.96	-9312	-97	-8.80
21/3/13	Thu	-3870	-224	-3.42	-7530	152	-6.85	-12110	-252	-11.60	-8830	-541	-8.38	-9130	-489	-8.45	-9710	-398	-9.20
23/4/13	Tue	-4000	-130	-3.55	-7600	-70	-6.92				-8960	-130	-8.51	-9310	-180	-8.63	-9865	-155	-9.36
3/6/13	Mon	-3987	13	-3.54	-7924	-324	-7.24	-12197	-87	-11.69	-8872	88	-8.42	-9322	-12	-8.64	-9917	-52	-9.41
18/6/13	Tue	-4045	-58	-3.60	-7570	354	-6.89	-12230	-33	-11.72	-8865	7	-8.42	-9310	12	-8.63	-9917	0	-9.41

NOTES: 1. MW3 inaccessible 23/4/13

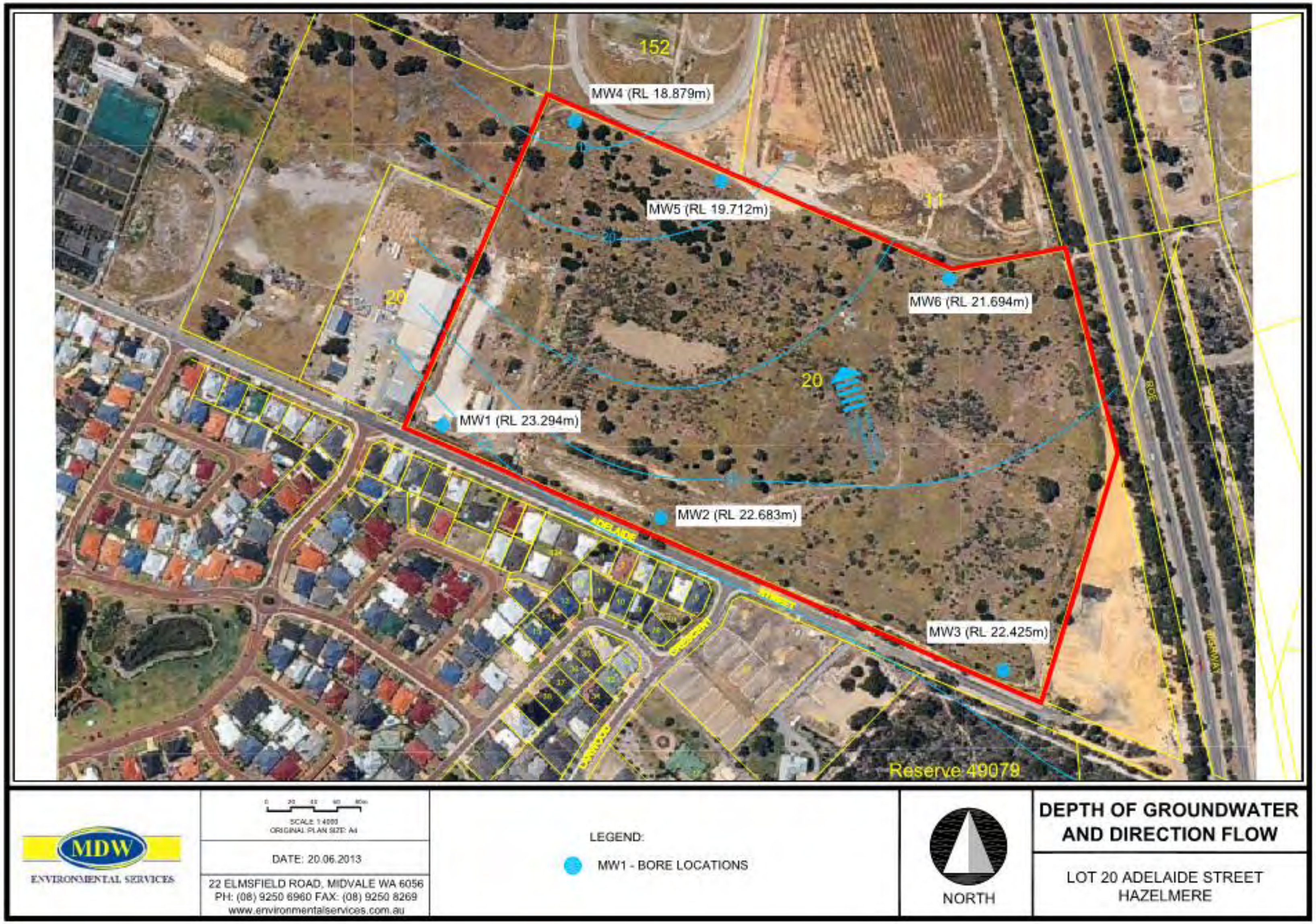

Figure 3 Groundwater Contours

10 DISCUSSION & RECOMMENDATIONS

Standing water level measurements recorded by MDWES during the GME sampling indicate that groundwater is encountered between RL 18.9 mAHD and 23.3 mAHD beneath the Site. Based upon current redevelopment plans, groundwater will not be intercepted during the proposed remediation work.

Laboratory results indicate that the groundwater beneath the site is fresh and mildly acidic to brackish with pH ranging from 5.57 to 7.79. This is an acceptable range of pH for groundwater within this locality.

Contamination of the groundwater from material previously deposited on the Site appears to be minimal. With the exception of metalloids, nutrients and low levels of TPH in WRMW1 and WRMW3, all other PCOC were below laboratory detection limits.

Metalloid results could be considered higher than expected for background waters within this locality, however, elevated levels of suspended solids within majority of the samples could have contributed to artificially increasing the results. Dissolved metals analysed are significantly lower than the total metals results and are more indicative of the quality of water that would be abstracted for use for dust suppression and compaction.

Although nutrient levels in WRMW3, WRMW4 and WRMW5 were slightly elevated above ANZECC criteria, surface waters are not located in the immediate vicinity of the site and downstream receptors are likely to be more significantly impacted upon by land uses to the north of the site including rendering facilities.

Comparison of historical data indicates that concentrations of TPH, a contaminant of high concern is currently present in WRMW3. Referring to the historical data, it is apparent that TPH has an intermittent presence in the groundwater at WRMW3. As the well is not in any landfill, it is likely that seasonal infiltration of rainfall from surface landfill material is the influential factor.

MDWES are of the opinion that the contamination of the groundwater from material previously deposited on the Site is minimal and the Site does not appear to be a source for contamination external to the site boundaries. Groundwater flux appears to be in a northwest direction and if the properties to the north of the site are to be included in the redevelopment proposal for this site, it is recommended that groundwater investigations be continued on the property to ensure sufficient data is collected.

It is continued recommendation that groundwater gauging be completed on a monthly basis and laboratory analysis be completed on a quarterly basis until the remediation commence to gather additional groundwater data prior to the inert wastes being disturbed during remediation earthmoving activities.

11 REFERENCES

ANZECC (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.* Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ).

DEC (2010) *Assessment Levels for Soil, Sediment and Water*, Contaminated Sites Management Series, Contaminated Sites Branch

DEP (2004) Potentially Contaminating Activities, Industries and Land Uses, Contaminated Sites Management Series

DoH (2006) *Contaminated Sites Reporting Guideline for Chemicals in Groundwater*

DEP (2001) *Reporting on Site Assessments*, Contaminated Sites Management Series.

TABLES

Table 1
WRMW1 Laboratory Results
E2012-031

Analyte grouping/Analyte	Units	ANZECC & ARMCANZ Fresh Waters	ANZECC & ARMCANZ Marine Waters	ADWG Drinking Water Health Value (HV)	ADWG Drinking Water Aesthetic Value (AV)	DoH Domestic non-potable groundwater use	ANZECC & ARMCANZ Short-term Irrigation Water	ANZECC & ARMCANZ Long-term Irrigation Water	18/05/2012 WRMW1	30/08/2012 WRMW1	15/01/2013 WRMW1	4/06/2013 WRMW1
pH Value	pH Unit	6.5-8.5	8.0-8.4		6.5-8.5			6.0-8.5	6.58	6.77	6.17	6.69
Electrical Conductivity	µS/cm								635	716	788	882
Total Dissolved Solids	mg/L								434	474	562	500
Suspended Solids	mg/L								582	950	138	604
Turbidity	NTU								166	202	62.8	203
Total Alkalinity $CaCO_3$	mg/L								43	36	35	34
Acidity as $CaCO_3$	mg/L								15	35	40	42
Sulfate as SO_4^{2-}	mg/L			500	250	5000			105	123	108	94
Chloride	mg/L				250	2500			134	138	157	182
Dissolved Metals												
Aluminium	mg/L	0.055			0.2	2	20	5	0.04	0.09	0.11	0.04
Arsenic	mg/L	0.013		0.01		0.07	2	0.1	<0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	0.0002	0.0007	0.00		0.02	0.05	0.01	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	mg/L						1	0.1	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	1.9		0.50	0.1	5	10	0.2	0.005	0.004	0.002	0.004
Nickel	mg/L	0.011	0.02	0.02		0.2	2	0.2	<0.001	0.002	0.007	0.003
Selenium	mg/L	0.005		0.01		0.1	0.05	0.02	<0.01	<0.01	<0.01	<0.01
Zinc	mg/L	0.008	0.015		3	30	5	2	0.005	0.013	0.045	0.047
Iron	mg/L	0.3	1.0 / 0.3[5]		0.33	3	10	0.2	<0.05	0.52	0.07	0.27
Ferrous Iron	mg/L								<0.05	0.34	0.11	0.25
Chromium VI	mg/L	0.001	0.0044	0.05		0.5			<0.010	<0.010	<0.01	<0.01
Total Metals												
Aluminium	mg/L	0.055			0.2	2	20	5	11.1	7.69	4.69	7.43
Arsenic	mg/L	0.013		0.01		0.07	2	0.1	<0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	0.0002	0.0007	0.002		0.02	0.05	0.01	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	mg/L						1	0.1	0.007	0.005	0.003	0.006
Copper	mg/L	0.0014	0.0013	2	1	20	5	0.2	0.004	0.002	0.005	0.004
Lead	mg/L	0.0034	0.0044	0.01		0.1	5	2	0.013	0.015	0.004	0.012
Manganese	mg/L	1.9		0.5	0.1	5	10	0.2	0.006	0.004	0.003	0.003
Molybdenum	mg/L			0.05		0.5	0.05	0.01	<0.001	<0.001	<0.001	<0.001
Nickel	mg/L	0.011	0.02	0.02		0.2	2	0.2	0.002	0.003	0.007	0.004
Selenium	mg/L	0.005		0.01		0.1	0.05	0.02	<0.01	<0.01	<0.01	<0.01
Silver	mg/L	0.00005	0.0014	0.1		1			<0.001	<0.001	<0.001	<0.001
Zinc	mg/L	0.008	0.015		3	30	5	2	0.008	0.007	0.044	0.024
Iron	mg/L	0.3	1.0 / 0.35		0.33	3	10	0.2	0.29	0.21	0.23	0.54
Mercury	mg/L	0.00006	0.0001	0.001		0.01	0.002	0.002	0.0001	0.0001	<0.0001	<0.0001
Nutrients												
Ammonia as N	mg/L	0.9	0.91						0.06	0.03	0.02	0.06
Nitrite as N	mg/L			3.0		30			0.03	0.02	0.01	<0.01
Nitrate as N	mg/L			50		500			5.15	4.91	1.86	0.32
Kjeldhal Nitrogen	mg/L								0.5	1.4	0.5	0.5
Total Nitrogen	mg/L	1.0 / 2.0[1]							5.7	6.3	2.4	0.8
Total Phosphorus	mg/L	0.1 / 0.2[1]							0.01	0.19	<0.01	0.04
Reactive Phosphorus	mg/L								<0.01	<0.01	<0.01	<0.01
Sulfide	mg/L	0.001							0.1	<0.1	<0.1	<0.1
COD	mg/L								18	14	13	18
BOD	mg/L								<2	<2	<2	<2
Organochlorine Pesticides (OC)												
alpha-BHC	µg/L								<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene (HCB)	µg/L								<0.5	<0.5	<0.5	<0.5
beta-BHC	µg/L								<0.5	<0.5	<0.5	<0.5
gamma-BHC	µg/L								<0.5	<0.5	<0.5	<0.5
delta-BHC	µg/L								<0.5	<0.5	<0.5	<0.5
Heptachlor	µg/L	0.01							<0.5	<0.5	<0.5	<0.5
Aldrin	µg/L								<0.5	<0.5	<0.5	<0.5
Heptachlor epoxide	µg/L			0.05	0.3	3			<0.5	<0.5	<0.5	<0.5
trans-Chlordane	µg/L	0.03[2]		0.01	1	10			<0.5	<0.5	<0.5	<0.5
alpha-Endosulfan	µg/L	0.03[3]	0.005[3]	0.05	30	30			<0.5	<0.5	<0.5	<0.5
cis-Chlordane	µg/L	0.03[2]		0.01	1	10			<0.5	<0.5	<0.5	<0.5
Dieldrin	µg/L								<0.5	<0.5	<0.5	<0.5
4.4`-DDE	µg/L								<0.5	<0.5	<0.5	<0.5
Endrin	µg/L	0.01	0.004						<0.5	<0.5	<0.5	<0.5
beta-Endosulfan	µg/L	0.03[3]	0.005[3]						<0.5	<0.5	<0.5	<0.5
4.4`-DDD	µg/L								<0.5	<0.5	<0.5	<0.5
Endrin aldehyde	µg/L								<0.5	<0.5	<0.5	<0.5
Endosulfan sulfate	µg/L								<0.5	<0.5	<0.5	<0.5
4.4`-DDT	µg/L	0.006		0.06	30	0.1			<2	<2	<2.0	<2.0
Endrin ketone	µg/L								<0.5	<0.5	<0.5	<0.5
Methoxychlor	µg/L								<2	<2	<2.0	<2.0
Aldrin plus dieldrin	µg/L			0.010	0.3	3			<1	<0.5	<1.0	<0.5
Organophosphorus Pesticides (OP)												
Dichlorvos	µg/L								<0.5	<0.5	<0.5	<0.5
Demeton-S-methyl	µg/L								<0.5	<0.5	<0.5	<0.5
Monocrotophos	µg/L								<2	<2	<2.0	<2.0
Dimethoate	µg/L	0.15			50	50			<0.5	<0.5	<0.5	<0.5
Diazinon	µg/L	0.01		1	3	1			<0.5	<0.5	<0.5	<0.5
Chlorpyrifos-methyl	µg/L	0.01	0.009		10	100			<0.5	<0.5	<0.5	<0.5
Parathion-methyl	µg/L								<2	<2	<2.0	<2.0
Malathion	µg/L	0.05							<0.5	<0.5	<0.5	<0.5
Fenthion	µg/L								<0.5	<0.5	<0.5	<0.5
Chlorpyrifos	µg/L	0.01	0.009						<0.5	<0.5	<0.5	<0.5
Parathion	µg/L	0.004			10	10			<2	<2	<2.0	<2.0
Pirimphos-ethyl	µg/L								<0.5	<0.5	<0.5	<0.5
Chlorfenvinphos	µg/L								<0.5	<0.5	<0.5	<0.5
Bromophos-ethyl	µg/L								<0.5	<0.5	<0.5	<0.5
Fenamiphos	µg/L								<0.5	<0.5	<0.5	<0.5
Prothiofos	µg/L								<0.5	<0.5	<0.5	<0.5
Ethion	µg/L								<0.5	<0.5	<0.5	<0.5
Carbophenothion	µg/L								<0.5	<0.5	<0.5	<0.5
Azinphos Methyl	µg/L	0.02							<0.5	<0.5	<0.5	<0.5
Monocyclic Aromatic Hydrocarbons												
Benzene	µg/L	0.95	0.5	0.001		0.01			-	-	<1	-
Toluene	µg/L			0.80	0.025	0.025			-	-	<2	-
Ethylbenzene	µg/L			0.30	0.003	0.003			-	-	<2	-
meta- & para-Xylene	µg/L	200							-	-	<2	-
Styrene	µg/L			0.03	0.004	0.004			<5	<5	<5	<5
ortho-Xylene	µg/L	350							-	-	<2	-
Isopropylbenzene	µg/L								<5	<5	<5	<5
n-Propylbenzene	µg/L								<5	<5	<5	<5
1.3.5-Trimethylbenzene	µg/L								<5	<5	<5	<5
sec-Butylbenzene	µg/L								<5	<5	<5	<5
1.2.4-Trimethylbenzene	µg/L								<5	<5	<5	<5
tert-Butylbenzene	µg/L								<5	<5	<5	<5
p-Isopropyltoluene	µg/L								<5	<5	<5	<5
n-Butylbenzene	µg/L								<5	<5	<5	<5
Oxygenated Compounds												
Vinyl Acetate	µg/L								<50	<50	<50	<50
2-Butanone (MEK)	µg/L								<50	<50	<50	<50
4-Methyl-2-pentanone (MIBK)	µg/L								<50	<50	<50	<50
2-Hexanone (MBK)	µg/L								<50	<50	<50	<50
Sulfonated Compounds												
Carbon disulfide	µg/L								<5	<5	<5	<5
Fumigants												
2.2-Dichloropropane	µg/L								<5	<5	<5	<5
1.2-Dichloropropane	µg/L								<5	<5	<5	<5
cis-1.3-Dichloropropylene	µg/L								<5	<5	<5	<5
trans-1.3-Dichloropropylene	µg/L								<5	<5	<5	<5
1.2-Dibromoethane (EDB)	µg/L								<5	<5	<5	<5
Halogenated Aliphatic Compounds												
Dichlorodifluoromethane	µg/L								<50	<50	<50	<50

Table 1
WRMW1 Laboratory Results
E2012-031

Analyte grouping/Analyte	Units	Fresh Waters	Marine Waters	Drinking Water Health Value (HV)	Drinking Water Aesthetic Value (AV)	Domestic non-potable groundwater use	Short-term Irrigation Water	Long-term Irrigation Water	18/05/2012 WRMW1	30/08/2012 WRMW1	15/01/2013 WRMW1	4/06/2013 WRMW1
Chloromethane	µg/L								<50	<50	<50	<50
Vinyl chloride	µg/L			0.0003		0.003			<50	<50	<50	<50
Bromomethane	µg/L								<50	<50	<50	<50
Chloroethane	µg/L								<50	<50	<50	<50
Trichlorofluoromethane	µg/L								<50	<50	<50	<50
1.1-Dichloroethene	µg/L			0.03		0.3			<5	<5	<5	<5
Iodomethane	µg/L								<5	<5	<5	<5
trans-1.2-Dichloroethene	µg/L								<5	<5	<5	<5
1.1-Dichloroethane	µg/L								<5	<5	<5	<5
cis-1.2-Dichloroethene	µg/L								<5	<5	<5	<5
1.1.1-Trichloroethane	µg/L								<5	<5	<5	<5
1.1-Dichloropropylene	µg/L								<5	<5	<5	<5
Carbon Tetrachloride	µg/L								<5	<5	<5	<5
1.2-Dichloroethane	µg/L			0.003		0.03			<5	<5	<5	<5
Trichloroethene	µg/L								<5	<5	<5	<5
Dibromomethane	µg/L								<5	<5	<5	<5
1.1.2-Trichloroethane	µg/L	6500	1900						<5	<5	<5	<5
1.3-Dichloropropane	µg/L								<5	<5	<5	<5
Tetrachloroethene	µg/L			0.05		0.5			<5	<5	<5	<5
1.1.1.2-Tetrachloroethane	µg/L								<5	<5	<5	<5
trans-1.4-Dichloro-2-butene	µg/L								<5	<5	<5	<5
cis-1.4-Dichloro-2-butene	µg/L								<5	<5	<5	<5
1.1.2.2-Tetrachloroethane	µg/L								<5	<5	<5	<5
1.2.3-Trichloropropane	µg/L								<5	<5	<5	<5
Pentachloroethane	µg/L								<5	<5	<5	<5
1.2-Dibromo-3-chloropropane	µg/L								<5	<5	<5	<5
Hexachlorobutadiene	µg/L								<5	<5	<5	<5
Halogenated Aromatic Compounds												
Chlorobenzene	µg/L			0.30	0.01	0.01			<5	<5	<5	<5
Bromobenzene	µg/L								<5	<5	<5	<5
2-Chlorotoluene	µg/L								<5	<5	<5	<5
4-Chlorotoluene	µg/L								<5	<5	<5	<5
1.3-Dichlorobenzene	µg/L	0.26			0.02	0.02			<5	<5	<5	<5
1.4-Dichlorobenzene	µg/L	0.06		0.04	0.003	0.003			<5	<5	<5	<5
1.2-Dichlorobenzene	µg/L	0.16		1.5	0.001	0.001			<5	<5	<5	<5
1.2.4-Trichlorobenzene	µg/L	0.085	80	0.03	0.005	0.005			<5	<5	<5	<5
1.2.3-Trichlorobenzene	µg/L	0.003		0.03	0.005	0.005			<5	<5	<5	<5
Trihalomethanes												
Chloroform	µg/L								<5	<5	<5	<5
Bromodichloromethane	µg/L								<5	<5	<5	<5
Dibromochloromethane	µg/L								<5	<5	<5	<5
Bromoform	µg/L								<5	<5	<5	<5
Phenolic Compounds												
Phenol	µg/L	320	400						<1.0	<1.0	<1.0	<1.0
2-Chlorophenol	µg/L	340		300	0.1	3000			<1.0	<1.0	<1.0	<1.0
2-Methylphenol	µg/L								<1.0	<1.0	<1.0	<1.0
3- & 4-Methylphenol	µg/L								<2.0	<2.0	<2.0	<2.0
2-Nitrophenol	µg/L								<1.0	<1.0	<1.0	<1.0
2.4-Dimethylphenol	µg/L								<1.0	<1.0	<1.0	<1.0
2.4-Dichlorophenol	µg/L	120		200	0.3	2000			<1.0	<1.0	<1.0	<1.0
2.6-Dichlorophenol	µg/L								<1.0	<1.0	<1.0	<1.0
4-Chloro-3-Methylphenol	µg/L								<1.0	<1.0	<1.0	<1.0
2.4.6-Trichlorophenol	µg/L	3		20	2	200			<1.0	<1.0	<1.0	<1.0
2.4.5-Trichlorophenol	µg/L								<1.0	<1.0	<1.0	<1.0
Pentachlorophenol	µg/L	3.6	11						<2.0	<2.0	<2.0	<2.0
Polynuclear Aromatic Hydrocarbons												
Naphthalene	µg/L	16	50						<1.0	<1.0	<1.0	<1.0
Acenaphthylene	µg/L								<1.0	<1.0	<1.0	<1.0
Acenaphthene	µg/L								<1.0	<1.0	<1.0	<1.0
Fluorene	µg/L								<1.0	<1.0	<1.0	<1.0
Phenanthrene	µg/L								<1.0	<1.0	<1.0	<1.0
Anthracene	µg/L								<1.0	<1.0	<1.0	<1.0
Fluoranthene	µg/L								<1.0	<1.0	<1.0	<1.0
Pyrene	µg/L								<1.0	<1.0	<1.0	<1.0
Benz(a)anthracene	µg/L								<1.0	<1.0	<1.0	<1.0
Chrysene	µg/L								<1.0	<1.0	<1.0	<1.0
Benzo(b)fluoranthene	µg/L								<1.0	<1.0	<1.0	<1.0
Benzo(k)fluoranthene	µg/L								<1.0	<1.0	<1.0	<1.0
Benzo(a)pyrene	µg/L			0.01		0.1			<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L								<1.0	<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	µg/L								<1.0	<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	µg/L								<1.0	<1.0	<1.0	<1.0
Total Petroleum Hydrocarbons												
C6 - C9 Fraction	µg/L								<20	<20	<20	<20
C10 - C14 Fraction	µg/L								<50	<50	<50	<50
C15 - C28 Fraction	µg/L								<100	<100	<100	200
C29 - C36 Fraction	µg/L								<50	<50	<50	<50
C10 - C36 Fraction (sum)	µg/L	600 [4]							<50	<50	<50	200
Total Recoverable Hydrocarbons												
C6 - C10 Fraction	µg/L								-	-	-	<20
C6 - C10 Fraction minus BTEX (F	µg/L								-	-	-	<20
>C10 - C16 Fraction	µg/L											<100
>C16 - C34 Fraction	µg/L								-	-	-	220
>C34 - C40 Fraction	µg/L								-	-	-	<100
>C10 - C40 Fraction (sum)	µg/L								-	-	-	220
BTEX												
Benzene	µg/L	0.95	0.5	0.001		0.01			-	-	-	<1
Toluene	µg/L			0.80	0.025	0.025			-	-	-	<2
Ethylbenzene	µg/L			0.30	0.003	0.003			-	-	-	<2
meta- & para-Xylene	µg/L	0.2		0.60	0.02	0.02			-	-	-	<2
ortho-Xylene	µg/L	0.3		0.60	0.02	0.02			-	-	-	<2
Total Xylenes	µg/L								-	-	-	<2
Sum of BTEX	µg/L								-	-	-	<1
Naphthalene	µg/L	0.016	0.015						-	-	-	<5

NOTES:
1. SRT Healthy Rivers Action Plan Long Term / Short Term Targets
2. ANZECC 99% protection level for Chlordane
3. ANZECC 99% protection level for Endosulfan
4. Dutch intervention values (2000).
5. pH > 6 / pH < 6
6. ASS disturbance indicators
7. Effluent treatment triggers

Table 2
WRMW2 Laboratory Results
E2012-031

Analyte grouping/Analyte	Units	ANZECC & ARMCANZ		ADWG		DoH	ANZECC & ARMCANZ		18/05/2012	30/08/2012	15/01/2013	4/06/2013
		Fresh Waters	Marine Waters	Drinking Water Health Value	Drinking Water Aesthetic	Domestic non-potable groundwate	Short-term Irrigation Water	Long-term Irrigation Water	WRMW2	WRMW2	WRMW2	WRMW2
pH Value	pH Unit	6.5-8.5	8.0-8.4		6.5-8.5			6.0-8.5	6.14	5.72	5.21	5.57
Electrical Conductivity	µS/cm								307	292	347	371
Total Dissolved Solids	mg/L								244	169	290	221
Suspended Solids	mg/L								292	106	75	154
Turbidity	NTU								236	32	54.7	96.6
Total Alkalinity $CaCO_3$	mg/L								17	3	2	<1
Acidity as $CaCO_3$	mg/L								26	42	39	32
Sulfate as SO_4^{2-}	mg/L			500	250	5000			13	11	9	10
Chloride	mg/L				250	2500			80	82	88	89
Dissolved Metals												
Aluminium	mg/L	0.055			0.2	2	20	5	0.02	0.03	0.1	0.03
Arsenic	mg/L	0.013		0.01		0.07	2	0.1	0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	0.0002	0.0007	0.00		0.02	0.05	0.01	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	mg/L						1	0.1	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	1.9		0.50	0.1	5	10	0.2	0.022	0.003	0.001	0.002
Nickel	mg/L	0.011	0.02	0.02		0.2	2	0.2	0.002	0.006	0.008	0.003
Selenium	mg/L	0.005		0.01		0.1	0.05	0.02	<0.01	<0.01	<0.01	<0.01
Zinc	mg/L	0.008	0.015		3	30	5	2	0.048	0.025	0.066	0.047
Iron	mg/L	0.3	1.0 / 0.3[5]		0.33	3	10	0.2	0.68	0.75	0.12	0.44
Ferrous Iron	mg/L								0.43	0.76	0.12	0.44
Chromium VI	mg/L	0.001	0.0044	0.05		0.5			<0.010	<0.010	<0.01	<0.01
Total Metals												
Aluminium	mg/L	0.055			0.2	2	20	5	16.2	3.15	3.3	4.27
Arsenic	mg/L	0.013		0.01		0.07	2	0.1	<0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	0.0002	0.0007	0.002		0.02	0.05	0.01	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	mg/L						1	0.1	0.016	0.003	0.003	0.005
Copper	mg/L	0.0014	0.0013	2	1	20	5	0.2	0.07	0.005	0.011	0.007
Lead	mg/L	0.0034	0.0044	0.01		0.1	5	2	0.017	0.003	0.005	0.005
Manganese	mg/L	1.9		0.5	0.1	5	10	0.2	0.026	0.004	0.002	0.001
Molybdenum	mg/L			0.05		0.5	0.05	0.01	<0.001	<0.001	<0.001	<0.001
Nickel	mg/L	0.011	0.02	0.02		0.2	2	0.2	0.005	0.006	0.009	0.003
Selenium	mg/L	0.005		0.01		0.1	0.05	0.02	<0.01	<0.01	<0.01	<0.01
Silver	mg/L	0.00005	0.0014	0.1		1			<0.001	<0.001	<0.001	<0.001
Zinc	mg/L	0.008	0.015		3	30	5	2	0.08	0.079	0.07	0.046
Iron	mg/L	0.3	1.0 / 0.35		0.33	3	10	0.2	4.82	2.12	1.37	1.97
Mercury	mg/L	0.00006	0.0001	0.001		0.01	0.002	0.002	0.0001	<0.0001	<0.0001	<0.0001
Nutrients												
Ammonia as N	mg/L	0.9	0.91						0.36	0.03	0.01	0.02
Nitrite as N	mg/L			3.0		30			0.02	0.01	<0.01	<0.01
Nitrate as N	mg/L			50		500			0.62	1.09	1.24	0.84
Kjeldhal Nitrogen	mg/L								0.5	0.3	0.2	0.2
Total Nitrogen	mg/L	1.0 / 2.0[1]							1.1	1.4	1.4	1
Total Phosphorus	mg/L	0.1 / 0.2[1]							0.15	0.03	0.04	0.07
Reactive Phosphorus	mg/L								<0.01	<0.01	<0.01	<0.01
Sulfide	mg/L	0.001							<0.1	<0.1	<0.1	<0.1
COD	mg/L								16	<5	<5	<5
BOD	mg/L								3	<2	<2	<2
Organochlorine Pesticides (OC)												
alpha-BHC	µg/L								<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene (HCB)	µg/L								<0.5	<0.5	<0.5	<0.5
beta-BHC	µg/L								<0.5	<0.5	<0.5	<0.5
gamma-BHC	µg/L								<0.5	<0.5	<0.5	<0.5
delta-BHC	µg/L								<0.5	<0.5	<0.5	<0.5
Heptachlor	µg/L	0.01							<0.5	<0.5	<0.5	<0.5
Aldrin	µg/L								<0.5	<0.5	<0.5	<0.5
Heptachlor epoxide	µg/L			0.05	0.3	3			<0.5	<0.5	<0.5	<0.5
trans-Chlordane	µg/L	0.03 [2]		0.01	1	10			<0.5	<0.5	<0.5	<0.5
alpha-Endosulfan	µg/L	0.03 [3]	0.005 [3]	0.05	30	30			<0.5	<0.5	<0.5	<0.5
cis-Chlordane	µg/L	0.03 [2]		0.01	1	10			<0.5	<0.5	<0.5	<0.5
Dieldrin	µg/L								<0.5	<0.5	<0.5	<0.5
4.4`-DDE	µg/L								<0.5	<0.5	<0.5	<0.5
Endrin	µg/L	0.01	0.004						<0.5	<0.5	<0.5	<0.5
beta-Endosulfan	µg/L	0.03 [3]	0.005 [3]						<0.5	<0.5	<0.5	<0.5
4.4`-DDD	µg/L								<0.5	<0.5	<0.5	<0.5
Endrin aldehyde	µg/L								<0.5	<0.5	<0.5	<0.5
Endosulfan sulfate	µg/L								<0.5	<0.5	<0.5	<0.5
4.4`-DDT	µg/L	0.006		0.06	30	0.1			<2	<2	<2.0	<2.0
Endrin ketone	µg/L								<0.5	<0.5	<0.5	<0.5
Methoxychlor	µg/L								<2	<2	<2.0	<2.0
Aldrin plus dieldrin	µg/L			0.010	0.3	3			<1	<0.5	<1.0	<0.5
Organophosphorus Pesticides (OP)												
Dichlorvos	µg/L								<0.5	<0.5	<0.5	<0.5
Demeton-S-methyl	µg/L								<0.5	<0.5	<0.5	<0.5
Monocrotophos	µg/L								<2	<2	<2.0	<2.0
Dimethoate	µg/L	0.15			50	50			<0.5	<0.5	<0.5	<0.5
Diazinon	µg/L	0.01		1	3	1			<0.5	<0.5	<0.5	<0.5
Chlorpyrifos-methyl	µg/L	0.01	0.009		10	100			<0.5	<0.5	<0.5	<0.5
Parathion-methyl	µg/L								<2	<2	<2.0	<2.0
Malathion	µg/L	0.05							<0.5	<0.5	<0.5	<0.5
Fenthion	µg/L								<0.5	<0.5	<0.5	<0.5
Chlorpyrifos	µg/L	0.01	0.009						<0.5	<0.5	<0.5	<0.5
Parathion	µg/L	0.004			10	10			<2	<2	<2.0	<2.0
Pirimphos-ethyl	µg/L								<0.5	<0.5	<0.5	<0.5
Chlorfenvinphos	µg/L								<0.5	<0.5	<0.5	<0.5
Bromophos-ethyl	µg/L								<0.5	<0.5	<0.5	<0.5
Fenamiphos	µg/L								<0.5	<0.5	<0.5	<0.5
Prothiofos	µg/L								<0.5	<0.5	<0.5	<0.5
Ethion	µg/L								<0.5	<0.5	<0.5	<0.5
Carbophenothion	µg/L								<0.5	<0.5	<0.5	<0.5
Azinphos Methyl	µg/L	0.02							<0.5	<0.5	<0.5	<0.5

Table 2
WRMW2 Laboratory Results
E2012-031

Analyte grouping/Analyte	Units	Fresh Waters	Marine Waters	Drinking Water Health Value	Drinking Water Aesthetic	Domestic non-potable groundwate	Short-term Irrigation Water	Long-term Irrigation Water	18/05/2012 WRMW2	30/08/2012 WRMW2	15/01/2013 WRMW2	4/06/2013 WRMW2
Monocyclic Aromatic Hydrocarbons												
Benzene	µg/L	0.95	0.5	0.001		0.01			-	-	<1	-
Toluene	µg/L			0.80	0.025	0.025			-	-	<2	-
Ethylbenzene	µg/L			0.30	0.003	0.003			-	-	<2	-
meta- & para-Xylene	µg/L	200							-	-	<2	-
Styrene	µg/L			0.03	0.004	0.004			<5	<5	<5	<5
ortho-Xylene	µg/L	350							-	-	<2	-
Isopropylbenzene	µg/L								<5	<5	<5	<5
n-Propylbenzene	µg/L								<5	<5	<5	<5
1.3.5-Trimethylbenzene	µg/L								<5	<5	<5	<5
sec-Butylbenzene	µg/L								<5	<5	<5	<5
1.2.4-Trimethylbenzene	µg/L								<5	<5	<5	<5
tert-Butylbenzene	µg/L								<5	<5	<5	<5
p-Isopropyltoluene	µg/L								<5	<5	<5	<5
n-Butylbenzene	µg/L								<5	<5	<5	<5
Oxygenated Compounds												
Vinyl Acetate	µg/L								<50	<50	<50	<50
2-Butanone (MEK)	µg/L								<50	<50	<50	<50
4-Methyl-2-pentanone (MIBK)	µg/L								<50	<50	<50	<50
2-Hexanone (MBK)	µg/L								<50	<50	<50	<50
Sulfonated Compounds												
Carbon disulfide	µg/L								<5	<5	<5	<5
Fumigants												
2.2-Dichloropropane	µg/L								<5	<5	<5	<5
1.2-Dichloropropane	µg/L								<5	<5	<5	<5
cis-1.3-Dichloropropylene	µg/L								<5	<5	<5	<5
trans-1.3-Dichloropropylene	µg/L								<5	<5	<5	<5
1.2-Dibromoethane (EDB)	µg/L								<5	<5	<5	<5
Halogenated Aliphatic Compounds												
Dichlorodifluoromethane	µg/L								<50	<50	<50	<50
Chloromethane	µg/L								<50	<50	<50	<50
Vinyl chloride	µg/L			0.0003		0.003			<50	<50	<50	<50
Bromomethane	µg/L								<50	<50	<50	<50
Chloroethane	µg/L								<50	<50	<50	<50
Trichlorofluoromethane	µg/L								<50	<50	<50	<50
1.1-Dichloroethene	µg/L			0.03		0.3			<5	<5	<5	<5
Iodomethane	µg/L								<5	<5	<5	<5
trans-1.2-Dichloroethene	µg/L								<5	<5	<5	<5
1.1-Dichloroethane	µg/L								<5	<5	<5	<5
cis-1.2-Dichloroethene	µg/L								<5	<5	<5	<5
1.1.1-Trichloroethane	µg/L								<5	<5	<5	<5
1.1-Dichloropropylene	µg/L								<5	<5	<5	<5
Carbon Tetrachloride	µg/L								<5	<5	<5	<5
1.2-Dichloroethane	µg/L			0.003		0.03			<5	<5	<5	<5
Trichloroethene	µg/L								<5	<5	<5	<5
Dibromomethane	µg/L								<5	<5	<5	<5
1.1.2-Trichloroethane	µg/L	6500	1900						<5	<5	<5	<5
1.3-Dichloropropane	µg/L								<5	<5	<5	<5
Tetrachloroethene	µg/L			0.05		0.5			<5	<5	<5	<5
1.1.1.2-Tetrachloroethane	µg/L								<5	<5	<5	<5
trans-1.4-Dichloro-2-butene	µg/L								<5	<5	<5	<5
cis-1.4-Dichloro-2-butene	µg/L								<5	<5	<5	<5
1.1.2.2-Tetrachloroethane	µg/L								<5	<5	<5	<5
1.2.3-Trichloropropane	µg/L								<5	<5	<5	<5
Pentachloroethane	µg/L								<5	<5	<5	<5
1.2-Dibromo-3-chloropropane	µg/L								<5	<5	<5	<5
Hexachlorobutadiene	µg/L								<5	<5	<5	<5
Halogenated Aromatic Compounds												
Chlorobenzene	µg/L			0.30	0.01	0.01			<5	<5	<5	<5
Bromobenzene	µg/L								<5	<5	<5	<5
2-Chlorotoluene	µg/L								<5	<5	<5	<5
4-Chlorotoluene	µg/L								<5	<5	<5	<5
1.3-Dichlorobenzene	µg/L	0.26			0.02	0.02			<5	<5	<5	<5
1.4-Dichlorobenzene	µg/L	0.06		0.04	0.003	0.003			<5	<5	<5	<5
1.2-Dichlorobenzene	µg/L	0.16		1.5	0.001	0.001			<5	<5	<5	<5
1.2.4-Trichlorobenzene	µg/L	0.085	80	0.03	0.005	0.005			<5	<5	<5	<5
1.2.3-Trichlorobenzene	µg/L	0.003		0.03	0.005	0.005			<5	<5	<5	<5
Trihalomethanes												
Chloroform	µg/L								<5	<5	<5	<5
Bromodichloromethane	µg/L								<5	<5	<5	<5
Dibromochloromethane	µg/L								<5	<5	<5	<5
Bromoform	µg/L								<5	<5	<5	<5
Phenolic Compounds												
Phenol	µg/L	320	400						<1.0	<1.0	<1.0	<1.0
2-Chlorophenol	µg/L	340		300	0.1	3000			<1.0	<1.0	<1.0	<1.0
2-Methylphenol	µg/L								<1.0	<1.0	<1.0	<1.0
3- & 4-Methylphenol	µg/L								**2.6**	<2.0	<2.0	<2.0
2-Nitrophenol	µg/L								<1.0	<1.0	<1.0	<1.0
2.4-Dimethylphenol	µg/L								<1.0	<1.0	<1.0	<1.0
2.4-Dichlorophenol	µg/L	120		200	0.3	2000			<1.0	<1.0	<1.0	<1.0
2.6-Dichlorophenol	µg/L								<1.0	<1.0	<1.0	<1.0
4-Chloro-3-Methylphenol	µg/L								<1.0	<1.0	<1.0	<1.0
2.4.6-Trichlorophenol	µg/L	3		20	2	200			<1.0	<1.0	<1.0	<1.0
2.4.5-Trichlorophenol	µg/L								<1.0	<1.0	<1.0	<1.0
Pentachlorophenol	µg/L	3.6	11						<2.0	<2.0	<2.0	<2.0
Polynuclear Aromatic Hydrocarbons												
Naphthalene	µg/L	16	50						<1.0	<1.0	<1.0	<1.0
Acenaphthylene	µg/L								<1.0	<1.0	<1.0	<1.0
Acenaphthene	µg/L								<1.0	<1.0	<1.0	<1.0
Fluorene	µg/L								<1.0	<1.0	<1.0	<1.0
Phenanthrene	µg/L								<1.0	<1.0	<1.0	<1.0

Table 2
WRMW2 Laboratory Results
E2012-031

Analyte grouping/Analyte	Units	Fresh Waters	Marine Waters	Drinking Water Health Value	Drinking Water Aesthetic	Domestic non-potable groundwate	Short-term Irrigation Water	Long-term Irrigation Water	18/05/2012 WRMW2	30/08/2012 WRMW2	15/01/2013 WRMW2	4/06/2013 WRMW2
Anthracene	µg/L								<1.0	<1.0	<1.0	<1.0
Fluoranthene	µg/L								<1.0	<1.0	<1.0	<1.0
Pyrene	µg/L								<1.0	<1.0	<1.0	<1.0
Benz(a)anthracene	µg/L								<1.0	<1.0	<1.0	<1.0
Chrysene	µg/L								<1.0	<1.0	<1.0	<1.0
Benzo(b)fluoranthene	µg/L								<1.0	<1.0	<1.0	<1.0
Benzo(k)fluoranthene	µg/L								<1.0	<1.0	<1.0	<1.0
Benzo(a)pyrene	µg/L			0.01		0.1			<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L								<1.0	<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	µg/L								<1.0	<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	µg/L								<1.0	<1.0	<1.0	<1.0
Total Petroleum Hydrocarbons												
C6 - C9 Fraction	µg/L								<20	<20	<20	<20
C10 - C14 Fraction	µg/L								<50	<50	<50	<50
C15 - C28 Fraction	µg/L								<100	<100	<100	<100
C29 - C36 Fraction	µg/L								<50	<50	<50	<50
C10 - C36 Fraction (sum)	µg/L	600 [4]							<50	<50	<50	<50
Total Recoverable Hydrocarbons												
C6 - C10 Fraction	µg/L								-	-	-	<20
C6 - C10 Fraction minus BTEX (F	µg/L								-	-	-	<20
>C10 - C16 Fraction	µg/L											<100
>C16 - C34 Fraction	µg/L								-	-	-	<100
>C34 - C40 Fraction	µg/L								-	-	-	<100
>C10 - C40 Fraction (sum)	µg/L								-	-	-	<100
BTEX												
Benzene	µg/L	0.95	0.5	0.001		0.01			-	-	-	<1
Toluene	µg/L			0.80	0.025	0.025			-	-	-	<2
Ethylbenzene	µg/L			0.30	0.003	0.003			-	-	-	<2
meta- & para-Xylene	µg/L	0.2		0.60	0.02	0.02			-	-	-	<2
ortho-Xylene	µg/L	0.3		0.60	0.02	0.02			-	-	-	<2
Total Xylenes	µg/L								-	-	-	<2
Sum of BTEX	µg/L								-	-	-	<1
Naphthalene	µg/L	0.016	0.015						-	-	-	<5

NOTES:
1. SRT Healthy Rivers Action Plan Long Term / Short Term Targets
2. ANZECC 99% protection level for Chlordane
3. ANZECC 99% protection level for Endosulfan
4. Dutch intervention values (2000).
5. pH > 6 / pH < 6
6. ASS disturbance indicators
7. Effluent treatment triggers

Table 3
WRMW3 Laboratory Results
E2012-031

Analyte grouping/Analyte	Units	ANZECC & ARMCANZ Fresh Waters	ANZECC & ARMCANZ Marine Waters	ADWG Drinking Water Health Value (HV)	ADWG Drinking Water Aesthetic Value (AV)	DoH Domestic non-potable groundwater use	ANZECC & ARMCANZ Short-term Irrigation Water	ANZECC & ARMCANZ Long-term Irrigation Water	18/05/2012 WRMW3	30/08/2012 WRMW3	15/01/2013 WRMW3	4/06/2013 WRMW3
pH Value	pH Unit	6.5-8.5	8.0-8.4		6.5-8.5			6.0-8.5	7.41	7.83	7.13	7.79
Electrical Conductivity	µS/cm								1070	901	906	886
Total Dissolved Solids	mg/L								704	567	598	640
Suspended Solids	mg/L								425	1610	287	5340
Turbidity	NTU								383	1120	900	9210
Total Alkalinity $CaCO_3$	mg/L								292	157	130	136
Acidity as $CaCO_3$	mg/L								16	18	8	16
Sulfate as SO_4^{2-}	mg/L			500	250	5000			40	18	41	44
Chloride	mg/L				250	2500			216	219	184	155
Dissolved Metals												
Aluminium	mg/L	0.055			0.2	2	20	5	<0.01	0.02	0.61	0.03
Arsenic	mg/L	0.013		0.01		0.07	2	0.1	0.004	0.002	0.002	0.001
Cadmium	mg/L	0.0002	0.0007	0.00		0.02	0.05	0.01	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	mg/L						1	0.1	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	1.9		0.50	0.1	5	10	0.2	0.182	0.108	0.082	0.056
Nickel	mg/L	0.011	0.02	0.02		0.2	2	0.2	0.001	0.003	0.003	0.002
Selenium	mg/L	0.005		0.01		0.1	0.05	0.02	<0.01	<0.01	<0.01	<0.01
Zinc	mg/L	0.008	0.015		3	30	5	2	0.005	0.006	0.011	0.017
Iron	mg/L	0.3	1.0 / 0.3[5]		0.33	3	10	0.2	2.16	<0.05	1.17	<0.05
Ferrous Iron	mg/L								2.28	<0.05	0.61	<0.05
Chromium VI	mg/L	0.001	0.0044	0.05		0.5			<0.010	<0.010	<0.01	<0.01
Total Metals												
Aluminium	mg/L	0.055			0.2	2	20	5	34.4	24.9	21.5	44.2
Arsenic	mg/L	0.013		0.01		0.07	2	0.1	0.01	0.007	0.006	0.007
Cadmium	mg/L	0.0002	0.0007	0.002		0.02	0.05	0.01	0.0001	0.0002	<0.0001	0.0002
Chromium	mg/L						1	0.1	0.047	0.044	0.03	0.071
Copper	mg/L	0.0014	0.0013	2	1	20	5	0.2	0.032	0.036	0.022	0.072
Lead	mg/L	0.0034	0.0044	0.01		0.1	5	2	0.087	0.079	0.052	0.156
Manganese	mg/L	1.9		0.5	0.1	5	10	0.2	0.191	0.129	0.094	0.11
Molybdenum	mg/L			0.05		0.5	0.05	0.01	<0.001	0.001	<0.001	<0.001
Nickel	mg/L	0.011	0.02	0.02		0.2	2	0.2	0.014	0.019	0.011	0.024
Selenium	mg/L	0.005		0.01		0.1	0.05	0.02	<0.01	<0.01	<0.01	<0.01
Silver	mg/L	0.00005	0.0014	0.1		1			<0.001	<0.001	<0.001	<0.001
Zinc	mg/L	0.008	0.015		3	30	5	2	0.068	0.079	0.061	0.188
Iron	mg/L	0.3	1.0 / 0.35		0.33	3	10	0.2	11.9	12.4	9.35	18
Mercury	mg/L	0.00006	0.0001	0.001		0.01	0.002	0.002	<0.0001	<0.0001	<0.0001	0.0001
Nutrients												
Ammonia as N	mg/L	0.9	0.91						0.03	0.45	0.1	0.11
Nitrite as N	mg/L			3.0		30			<0.01	0.02	<0.01	<0.01
Nitrate as N	mg/L			50		500			0.17	0.31	0.24	0.18
Kjeldhal Nitrogen	mg/L								0.3	1.4	0.9	0.6
Total Nitrogen	mg/L	1.0 / 2.0[1]							0.5	1.7	1.1	0.8
Total Phosphorus	mg/L	0.1 / 0.2[1]							0.24	0.51	0.63	0.38
Reactive Phosphorus	mg/L								<0.01	<0.01	<0.01	<0.01
Sulfide	mg/L	0.001							<0.1	<0.1	<0.1	<0.1
COD	mg/L								155	21	11	18
BOD	mg/L								69	5	2	6
Organochlorine Pesticides (OC)												
alpha-BHC	µg/L								<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene (HCB)	µg/L								<0.5	<0.5	<0.5	<0.5
beta-BHC	µg/L								<0.5	<0.5	<0.5	<0.5
gamma-BHC	µg/L								<0.5	<0.5	<0.5	<0.5
delta-BHC	µg/L								<0.5	<0.5	<0.5	<0.5
Heptachlor	µg/L	0.01							<0.5	<0.5	<0.5	<0.5
Aldrin	µg/L								<0.5	<0.5	<0.5	<0.5
Heptachlor epoxide	µg/L			0.05	0.3	3			<0.5	<0.5	<0.5	<0.5
trans-Chlordane	µg/L	0.03[2]		0.01	1	10			<0.5	<0.5	<0.5	<0.5
alpha-Endosulfan	µg/L	0.03[3]	0.005[3]	0.05	30	30			<0.5	<0.5	<0.5	<0.5
cis-Chlordane	µg/L	0.03[2]		0.01	1	10			<0.5	<0.5	<0.5	<0.5
Dieldrin	µg/L								<0.5	<0.5	<0.5	<0.5
4.4`-DDE	µg/L								<0.5	<0.5	<0.5	<0.5
Endrin	µg/L	0.01	0.004						<0.5	<0.5	<0.5	<0.5
beta-Endosulfan	µg/L	0.03[3]	0.005[3]						<0.5	<0.5	<0.5	<0.5
4.4`-DDD	µg/L								<0.5	<0.5	<0.5	<0.5
Endrin aldehyde	µg/L								<0.5	<0.5	<0.5	<0.5
Endosulfan sulfate	µg/L								<0.5	<0.5	<0.5	<0.5
4.4`-DDT	µg/L	0.006		0.06	30	0.1			<2	<2	<2.0	<2.0
Endrin ketone	µg/L								<0.5	<0.5	<0.5	<0.5
Methoxychlor	µg/L								<2	<2	<2.0	<2.0
Aldrin plus dieldrin	µg/L			0.010	0.3	3			<1	<0.5	<1.0	<0.5
Organophosphorus Pesticides (OP)												
Dichlorvos	µg/L								<0.5	<0.5	<0.5	<0.5
Demeton-S-methyl	µg/L								<0.5	<0.5	<0.5	<0.5
Monocrotophos	µg/L								<2	<2	<2.0	<2.0
Dimethoate	µg/L	0.15			50	50			<0.5	<0.5	<0.5	<0.5
Diazinon	µg/L	0.01		1	3	1			<0.5	<0.5	<0.5	<0.5
Chlorpyrifos-methyl	µg/L	0.01	0.009		10	100			<0.5	<0.5	<0.5	<0.5
Parathion-methyl	µg/L								<2	<2	<2.0	<2.0
Malathion	µg/L	0.05							<0.5	<0.5	<0.5	<0.5
Fenthion	µg/L								<0.5	<0.5	<0.5	<0.5
Chlorpyrifos	µg/L	0.01	0.009						<0.5	<0.5	<0.5	<0.5
Parathion	µg/L	0.004			10	10			<2	<2	<2.0	<2.0
Pirimphos-ethyl	µg/L								<0.5	<0.5	<0.5	<0.5
Chlorfenvinphos	µg/L								<0.5	<0.5	<0.5	<0.5
Bromophos-ethyl	µg/L								<0.5	<0.5	<0.5	<0.5
Fenamiphos	µg/L								<0.5	<0.5	<0.5	<0.5
Prothiofos	µg/L								<0.5	<0.5	<0.5	<0.5
Ethion	µg/L								<0.5	<0.5	<0.5	<0.5
Carbophenothion	µg/L								<0.5	<0.5	<0.5	<0.5
Azinphos Methyl	µg/L	0.02							<0.5	<0.5	<0.5	<0.5
Monocyclic Aromatic Hydrocarbons												
Benzene	µg/L	0.95	0.5	0.001		0.01			-	-	<1	-
Toluene	µg/L			0.80	0.025	0.025			-	-	<2	-
Ethylbenzene	µg/L			0.30	0.003	0.003			-	-	<2	-
meta- & para-Xylene	µg/L	200							-	-	<2	-
Styrene	µg/L			0.03	0.004	0.004			<5	<5	<5	<5
ortho-Xylene	µg/L	350							-	-	<2	-
Isopropylbenzene	µg/L								<5	<5	<5	<5
n-Propylbenzene	µg/L								<5	<5	<5	<5
1.3.5-Trimethylbenzene	µg/L								<5	<5	<5	<5
sec-Butylbenzene	µg/L								<5	<5	<5	<5
1.2.4-Trimethylbenzene	µg/L								<5	<5	<5	<5
tert-Butylbenzene	µg/L								<5	<5	<5	<5
p-Isopropyltoluene	µg/L								<5	<5	<5	<5
n-Butylbenzene	µg/L								<5	<5	<5	<5
Oxygenated Compounds												
Vinyl Acetate	µg/L								<50	<50	<50	<50
2-Butanone (MEK)	µg/L								<50	<50	<50	<50
4-Methyl-2-pentanone (MIBK)	µg/L								<50	<50	<50	<50
2-Hexanone (MBK)	µg/L								<50	<50	<50	<50
Sulfonated Compounds												
Carbon disulfide	µg/L								<5	<5	<5	<5
Fumigants												
2.2-Dichloropropane	µg/L								<5	<5	<5	<5
1.2-Dichloropropane	µg/L								<5	<5	<5	<5
cis-1.3-Dichloropropylene	µg/L								<5	<5	<5	<5
trans-1.3-Dichloropropylene	µg/L								<5	<5	<5	<5
1.2-Dibromoethane (EDB)	µg/L								<5	<5	<5	<5
Halogenated Aliphatic Compounds												
Dichlorodifluoromethane	µg/L								<50	<50	<50	<50
Chloromethane	µg/L								<50	<50	<50	<50

Table 3
WRMW3 Laboratory Results
E2012-031

Analyte grouping/Analyte	Units	Fresh Waters	Marine Waters	Drinking Water Health Value (HV)	Drinking Water Aesthetic Value (AV)	Domestic non-potable groundwater use	Short-term Irrigation Water	Long-term Irrigation Water	18/05/2012 WRMW3	30/08/2012 WRMW3	15/01/2013 WRMW3	4/06/2013 WRMW3
Vinyl chloride	µg/L			0.0003		0.003			<50	<50	<50	<50
Bromomethane	µg/L								<50	<50	<50	<50
Chloroethane	µg/L								<50	<50	<50	<50
Trichlorofluoromethane	µg/L								<50	<50	<50	<50
1.1-Dichloroethene	µg/L			0.03		0.3			<5	<5	<5	<5
Iodomethane	µg/L								<5	<5	<5	<5
trans-1.2-Dichloroethene	µg/L								<5	<5	<5	<5
1.1-Dichloroethane	µg/L								<5	<5	<5	<5
cis-1.2-Dichloroethene	µg/L								<5	<5	<5	<5
1.1.1-Trichloroethane	µg/L								<5	<5	<5	<5
1.1-Dichloropropylene	µg/L								<5	<5	<5	<5
Carbon Tetrachloride	µg/L								<5	<5	<5	<5
1.2-Dichloroethane	µg/L			0.003		0.03			<5	<5	<5	<5
Trichloroethene	µg/L								<5	<5	<5	<5
Dibromomethane	µg/L								<5	<5	<5	<5
1.1.2-Trichloroethane	µg/L	6500	1900						<5	<5	<5	<5
1.3-Dichloropropane	µg/L								<5	<5	<5	<5
Tetrachloroethene	µg/L			0.05		0.5			<5	<5	<5	<5
1.1.1.2-Tetrachloroethane	µg/L								<5	<5	<5	<5
trans-1.4-Dichloro-2-butene	µg/L								<5	<5	<5	<5
cis-1.4-Dichloro-2-butene	µg/L								<5	<5	<5	<5
1.1.2.2-Tetrachloroethane	µg/L								<5	<5	<5	<5
1.2.3-Trichloropropane	µg/L								<5	<5	<5	<5
Pentachloroethane	µg/L								<5	<5	<5	<5
1.2-Dibromo-3-chloropropane	µg/L								<5	<5	<5	<5
Hexachlorobutadiene	µg/L								<5	<5	<5	<5
Halogenated Aromatic Compounds												
Chlorobenzene	µg/L			0.30	0.01	0.01			<5	<5	<5	<5
Bromobenzene	µg/L								<5	<5	<5	<5
2-Chlorotoluene	µg/L								<5	<5	<5	<5
4-Chlorotoluene	µg/L								<5	<5	<5	<5
1.3-Dichlorobenzene	µg/L	0.26			0.02	0.02			<5	<5	<5	<5
1.4-Dichlorobenzene	µg/L	0.06		0.04	0.003	0.003			<5	<5	<5	<5
1.2-Dichlorobenzene	µg/L	0.16		1.5	0.001	0.001			<5	<5	<5	<5
1.2.4-Trichlorobenzene	µg/L	0.085	80	0.03	0.005	0.005			<5	<5	<5	<5
1.2.3-Trichlorobenzene	µg/L	0.003		0.03	0.005	0.005			<5	<5	<5	<5
Trihalomethanes												
Chloroform	µg/L								<5	<5	<5	<5
Bromodichloromethane	µg/L								<5	<5	<5	<5
Dibromochloromethane	µg/L								<5	<5	<5	<5
Bromoform	µg/L								<5	<5	<5	<5
Phenolic Compounds												
Phenol	µg/L	320	400						<1.0	<1.0	<1.0	<1.0
2-Chlorophenol	µg/L	340		300	0.1	3000			<1.0	<1.0	<1.0	<1.0
2-Methylphenol	µg/L								<1.0	<1.0	<1.0	<1.0
3- & 4-Methylphenol	µg/L								<2.0	**3.3**	**<2.0**	**<2.0**
2-Nitrophenol	µg/L								<1.0	<1.0	<1.0	<1.0
2.4-Dimethylphenol	µg/L								<1.0	<1.0	<1.0	<1.0
2.4-Dichlorophenol	µg/L	120		200	0.3	2000			<1.0	<1.0	<1.0	<1.0
2.6-Dichlorophenol	µg/L								<1.0	<1.0	<1.0	<1.0
4-Chloro-3-Methylphenol	µg/L								<1.0	<1.0	<1.0	<1.0
2.4.6-Trichlorophenol	µg/L	3		20	2	200			<1.0	<1.0	<1.0	<1.0
2.4.5-Trichlorophenol	µg/L								<1.0	<1.0	<1.0	<1.0
Pentachlorophenol	µg/L	3.6	11						<2.0	<2.0	<2.0	<2.0
Polynuclear Aromatic Hydrocarbons												
Naphthalene	µg/L	16	50						<1.0	<1.0	<1.0	<1.0
Acenaphthylene	µg/L								<1.0	<1.0	<1.0	<1.0
Acenaphthene	µg/L								<1.0	<1.0	<1.0	<1.0
Fluorene	µg/L								<1.0	<1.0	<1.0	<1.0
Phenanthrene	µg/L								<1.0	<1.0	<1.0	<1.0
Anthracene	µg/L								<1.0	<1.0	<1.0	<1.0
Fluoranthene	µg/L								<1.0	<1.0	<1.0	<1.0
Pyrene	µg/L								<1.0	<1.0	<1.0	<1.0
Benz(a)anthracene	µg/L								<1.0	<1.0	<1.0	<1.0
Chrysene	µg/L								<1.0	<1.0	<1.0	<1.0
Benzo(b)fluoranthene	µg/L								<1.0	<1.0	<1.0	<1.0
Benzo(k)fluoranthene	µg/L								<1.0	<1.0	<1.0	<1.0
Benzo(a)pyrene	µg/L			0.01		0.1			<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L								<1.0	<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	µg/L								<1.0	<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	µg/L								<1.0	<1.0	<1.0	<1.0
Total Petroleum Hydrocarbons												
C6 - C9 Fraction	µg/L								<20	<20	<20	<20
C10 - C14 Fraction	µg/L								<50	<50	<50	<50
C15 - C28 Fraction	µg/L								<100	<100	<100	110
C29 - C36 Fraction	µg/L								**270**	<50	<50	100
C10 - C36 Fraction (sum)	µg/L	600 [4]							**270**	<50	<50	210
Total Recoverable Hydrocarbons												
C6 - C10 Fraction	µg/L								-	-	-	<20
C6 - C10 Fraction minus BTEX (F	µg/L								-	-	-	<20
>C10 - C16 Fraction	µg/L											<100
>C16 - C34 Fraction	µg/L								-	-	-	180
>C34 - C40 Fraction	µg/L								-	-	-	<100
>C10 - C40 Fraction (sum)	µg/L								-	-	-	180
BTEX												
Benzene	µg/L	0.95	0.5	0.001		0.01			-	-	-	<1
Toluene	µg/L			0.80	0.025	0.025			-	-	-	<2
Ethylbenzene	µg/L			0.30	0.003	0.003			-	-	-	<2
meta- & para-Xylene	µg/L	0.2		0.60	0.02	0.02			-	-	-	<2
ortho-Xylene	µg/L	0.3		0.60	0.02	0.02			-	-	-	<2
Total Xylenes	µg/L								-	-	-	<2
Sum of BTEX	µg/L								-	-	-	<1
Naphthalene	µg/L	0.016	0.015						-	-	-	<5

NOTES: 1. SRT Healthy Rivers Action Plan Long Term / Short Term Targets
2. ANZECC 99% protection level for Chlordane
3. ANZECC 99% protection level for Endosulfan
4. Dutch intervention values (2000).
5. pH > 6 / pH < 6
6. ASS disturbance indicators
7. Effluent treatment triggers

Table 4
WRMW4 Laboratory Results
E2012-031

		ANZECC & ARMCANZ		ADWG		DoH	ANZECC & ARMCANZ					
Analyte grouping/Analyte	**Units**	**Fresh Waters**	**Marine Waters**	**Drinking Water Health Value (HV)**	**Drinking Water Aesthetic Value (AV)**	**Domestic non-potable groundwater use**	**Short-term Irrigation Water**	**Long-term Irrigation Water**	**18/05/2012 WRMW4**	**30/08/2012 WRMW4**	**15/01/2013 WRMW4**	**4/06/2013 WRMW4**
pH Value	pH Unit	6.5-8.5	8.0-8.4		6.5-8.5			6.0-8.5	6.04	5.96	5.61	5.64
Electrical Conductivity	µS/cm								354	144	118	117
Total Dissolved Solids	mg/L								226	83	74	96
Suspended Solids	mg/L								144	9	313	6
Turbidity	NTU								86.9	10.8	81.8	6.5
Total Alkalinity $CaCO_3$	mg/L								5	1	2	<1
Acidity as $CaCO_3$	mg/L								8	21	16	20
Sulfate as SO_4^{2-}	mg/L			500	250	5000			17	2	2	1
Chloride	mg/L				250	2500			89	30	23	17
Dissolved Metals												
Aluminium	mg/L	0.055			0.2	2	20	5	0.02	0.06	0.34	0.11
Arsenic	mg/L	0.013		0.01		0.07	2	0.1	<0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	0.0002	0.0007	0.00		0.02	0.05	0.01	<0.0001	0.0001	<0.0001	<0.0001
Chromium	mg/L						1	0.1	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	1.9		0.50	0.1	5	10	0.2	0.013	0.005	0.005	0.003
Nickel	mg/L	0.011	0.02	0.02		0.2	2	0.2	<0.001	0.003	0.012	0.003
Selenium	mg/L	0.005		0.01		0.1	0.05	0.02	<0.01	<0.01	<0.01	<0.01
Zinc	mg/L	0.008	0.015		3	30	5	2	0.01	0.01	0.072	0.027
Iron	mg/L	0.3	1.0 / 0.3[5]		0.33	3	10	0.2	0.11	<0.05	0.31	<0.05
Ferrous Iron	mg/L								<0.05	<0.05	0.09	<0.05
Chromium VI	mg/L	0.001	0.0044	0.05		0.5			<0.010	<0.01	<0.01	<0.01
Total Metals												
Aluminium	mg/L	0.055			0.2	2	20	5	4.3	1.61	13.9	0.48
Arsenic	mg/L	0.013		0.01		0.07	2	0.1	0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	0.0002	0.0007	0.002		0.02	0.05	0.01	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	mg/L						1	0.1	0.004	0.001	0.008	<0.001
Copper	mg/L	0.0014	0.0013	2	1	20	5	0.2	0.005	0.003	0.025	0.003
Lead	mg/L	0.0034	0.0044	0.01		0.1	5	2	0.011	0.005	0.012	<0.001
Manganese	mg/L	1.9		0.5	0.1	5	10	0.2	0.016	0.006	0.007	0.001
Molybdenum	mg/L			0.05		0.5	0.05	0.01	<0.001	<0.001	<0.001	<0.001
Nickel	mg/L	0.011	0.02	0.02		0.2	2	0.2	0.001	0.003	0.016	0.002
Selenium	mg/L	0.005		0.01		0.1	0.05	0.02	<0.01	<0.01	<0.01	<0.01
Silver	mg/L	0.00005	0.0014	0.1		1			<0.001	<0.001	<0.001	<0.001
Zinc	mg/L	0.008	0.015		3	30	5	2	0.017	0.011	0.11	0.021
Iron	mg/L	0.3	1.0 / 0.35		0.33	3	10	0.2	0.88	0.4	1.5	0.07
Mercury	mg/L	0.00006	0.0001	0.001		0.01	0.002	0.002	<0.0001	<0.0001	<0.0001	<0.0001
Nutrients												
Ammonia as N	mg/L	0.9	0.91						0.11	0.05	0.03	0.02
Nitrite as N	mg/L			3.0		30			0.01	<0.01	<0.01	<0.01
Nitrate as N	mg/L			50		500			3.75	4.92	4.38	4.91
Kjeldhal Nitrogen	mg/L								0.5	1.1	0.7	<0.5
Total Nitrogen	mg/L	1.0 / 2.0[1]							4.3	6	5.1	4.9
Total Phosphorus	mg/L	0.1 / 0.2[1]							0.04	0.12	0.06	<0.01
Reactive Phosphorus	mg/L								<0.01	<0.01	<0.01	<0.01
Sulfide	mg/L	0.001							<0.1	<0.1	<0.1	<0.1
COD	mg/L								11	7	16	<5
BOD	mg/L								4	<2	4	<2
Organochlorine Pesticides (OC)												
alpha-BHC	µg/L								<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene (HCB)	µg/L								<0.5	<0.5	<0.5	<0.5
beta-BHC	µg/L								<0.5	<0.5	<0.5	<0.5
gamma-BHC	µg/L								<0.5	<0.5	<0.5	<0.5
delta-BHC	µg/L								<0.5	<0.5	<0.5	<0.5
Heptachlor	µg/L	0.01							<0.5	<0.5	<0.5	<0.5
Aldrin	µg/L								<0.5	<0.5	<0.5	<0.5
Heptachlor epoxide	µg/L			0.05	0.3	3			<0.5	<0.5	<0.5	<0.5
trans-Chlordane	µg/L	0.03[2]		0.01	1	10			<0.5	<0.5	<0.5	<0.5
alpha-Endosulfan	µg/L	0.03[3]	0.005[3]	0.05	30	30			<0.5	<0.5	<0.5	<0.5
cis-Chlordane	µg/L	0.03[2]		0.01	1	10			<0.5	<0.5	<0.5	<0.5
Dieldrin	µg/L								<0.5	<0.5	<0.5	<0.5
4.4`-DDE	µg/L								<0.5	<0.5	<0.5	<0.5
Endrin	µg/L	0.01	0.004						<0.5	<0.5	<0.5	<0.5
beta-Endosulfan	µg/L	0.03[3]	0.005[3]						<0.5	<0.5	<0.5	<0.5
4.4`-DDD	µg/L								<0.5	<0.5	<0.5	<0.5
Endrin aldehyde	µg/L								<0.5	<0.5	<0.5	<0.5
Endosulfan sulfate	µg/L								<0.5	<0.5	<0.5	<0.5
4.4`-DDT	µg/L	0.006		0.06	30	0.1			<2	<2	<2.0	<2.0
Endrin ketone	µg/L								<0.5	<0.5	<0.5	<0.5
Methoxychlor	µg/L								<2	<2	<2.0	<2.0
Aldrin plus dieldrin	µg/L			0.010	0.3	3			<1	<0.5	<1.0	<0.5
Organophosphorus Pesticides (OP)												
Dichlorvos	µg/L								<0.5	<0.5	<0.5	<0.5
Demeton-S-methyl	µg/L								<0.5	<0.5	<0.5	<0.5
Monocrotophos	µg/L								<2	<2	<2.0	<2.0
Dimethoate	µg/L	0.15			50	50			<0.5	<0.5	<0.5	<0.5
Diazinon	µg/L	0.01		1	3	1			<0.5	<0.5	<0.5	<0.5
Chlorpyrifos-methyl	µg/L	0.01	0.009		10	100			<0.5	<0.5	<0.5	<0.5
Parathion-methyl	µg/L								<2	<2	<2.0	<2.0
Malathion	µg/L	0.05							<0.5	<0.5	<0.5	<0.5
Fenthion	µg/L								<0.5	<0.5	<0.5	<0.5
Chlorpyrifos	µg/L	0.01	0.009						<0.5	<0.5	<0.5	<0.5
Parathion	µg/L	0.004			10	10			<2	<2	<2.0	<2.0
Pirimphos-ethyl	µg/L								<0.5	<0.5	<0.5	<0.5
Chlorfenvinphos	µg/L								<0.5	<0.5	<0.5	<0.5
Bromophos-ethyl	µg/L								<0.5	<0.5	<0.5	<0.5
Fenamiphos	µg/L								<0.5	<0.5	<0.5	<0.5
Prothiofos	µg/L								<0.5	<0.5	<0.5	<0.5
Ethion	µg/L								<0.5	<0.5	<0.5	<0.5
Carbophenothion	µg/L								<0.5	<0.5	<0.5	<0.5
Azinphos Methyl	µg/L	0.02							<0.5	<0.5	<0.5	<0.5
Monocyclic Aromatic Hydrocarbons												
Benzene	µg/L	0.95	0.5	0.001		0.01			-	-	<1	-
Toluene	µg/L			0.80	0.025	0.025			-	-	<2	-
Ethylbenzene	µg/L			0.30	0.003	0.003			-	-	<2	-
meta- & para-Xylene	µg/L	200							-	-	<2	-
Styrene	µg/L			0.03	0.004	0.004			<5	<5	<5	<5
ortho-Xylene	µg/L	350							-	-	<2	-
Isopropylbenzene	µg/L								<5	<5	<5	<5
n-Propylbenzene	µg/L								<5	<5	<5	<5
1.3.5-Trimethylbenzene	µg/L								<5	<5	<5	<5
sec-Butylbenzene	µg/L								<5	<5	<5	<5
1.2.4-Trimethylbenzene	µg/L								<5	<5	<5	<5
tert-Butylbenzene	µg/L								<5	<5	<5	<5
p-Isopropyltoluene	µg/L								<5	<5	<5	<5
n-Butylbenzene	µg/L								<5	<5	<5	<5
Oxygenated Compounds												
Vinyl Acetate	µg/L								<50	<50	<50	<50
2-Butanone (MEK)	µg/L								<50	<50	<50	<50
4-Methyl-2-pentanone (MIBK)	µg/L								<50	<50	<50	<50
2-Hexanone (MBK)	µg/L								<50	<50	<50	<50
Sulfonated Compounds												
Carbon disulfide	µg/L								<5	<5	<5	<5
Fumigants												
2.2-Dichloropropane	µg/L								<5	<5	<5	<5
1.2-Dichloropropane	µg/L								<5	<5	<5	<5
cis-1.3-Dichloropropylene	µg/L								<5	<5	<5	<5
trans-1.3-Dichloropropylene	µg/L								<5	<5	<5	<5
1.2-Dibromoethane (EDB)	µg/L								<5	<5	<5	<5
Halogenated Aliphatic Compounds												
Dichlorodifluoromethane	µg/L								<50	<50	<50	<50
Chloromethane	µg/L								<50	<50	<50	<50

Table 4

WRMW4 Laboratory Results

E2012-031

Analyte grouping/Analyte	Units	Fresh Waters	Marine Waters	Drinking Water Health Value (HV)	Drinking Water Aesthetic Value (AV)	Domestic non-potable groundwater use	Short-term Irrigation Water	Long-term Irrigation Water	18/05/2012 WRMW4	30/08/2012 WRMW4	15/01/2013 WRMW4	4/06/2013 WRMW4
Vinyl chloride	µg/L			0.0003		0.003			<50	<50	<50	<50
Bromomethane	µg/L								<50	<50	<50	<50
Chloroethane	µg/L								<50	<50	<50	<50
Trichlorofluoromethane	µg/L								<50	<50	<50	<50
1.1-Dichloroethene	µg/L			0.03		0.3			<5	<5	<5	<5
Iodomethane	µg/L								<5	<5	<5	<5
trans-1.2-Dichloroethene	µg/L								<5	<5	<5	<5
1.1-Dichloroethane	µg/L								<5	<5	<5	<5
cis-1.2-Dichloroethene	µg/L								<5	<5	<5	<5
1.1.1-Trichloroethane	µg/L								<5	<5	<5	<5
1.1-Dichloropropylene	µg/L								<5	<5	<5	<5
Carbon Tetrachloride	µg/L								<5	<5	<5	<5
1.2-Dichloroethane	µg/L			0.003		0.03			<5	<5	<5	<5
Trichloroethene	µg/L								<5	<5	<5	<5
Dibromomethane	µg/L								<5	<5	<5	<5
1.1.2-Trichloroethane	µg/L	6500	1900						<5	<5	<5	<5
1.3-Dichloropropane	µg/L								<5	<5	<5	<5
Tetrachloroethene	µg/L			0.05		0.5			<5	<5	<5	<5
1.1.1.2-Tetrachloroethane	µg/L								<5	<5	<5	<5
trans-1.4-Dichloro-2-butene	µg/L								<5	<5	<5	<5
cis-1.4-Dichloro-2-butene	µg/L								<5	<5	<5	<5
1.1.2.2-Tetrachloroethane	µg/L								<5	<5	<5	<5
1.2.3-Trichloropropane	µg/L								<5	<5	<5	<5
Pentachloroethane	µg/L								<5	<5	<5	<5
1.2-Dibromo-3-chloropropane	µg/L								<5	<5	<5	<5
Hexachlorobutadiene	µg/L								<5	<5	<5	<5
Halogenated Aromatic Compounds												
Chlorobenzene	µg/L			0.30	0.01	0.01			<5	<5	<5	<5
Bromobenzene	µg/L								<5	<5	<5	<5
2-Chlorotoluene	µg/L								<5	<5	<5	<5
4-Chlorotoluene	µg/L								<5	<5	<5	<5
1.3-Dichlorobenzene	µg/L	0.26			0.02	0.02			<5	<5	<5	<5
1.4-Dichlorobenzene	µg/L	0.06		0.04	0.003	0.003			<5	<5	<5	<5
1.2-Dichlorobenzene	µg/L	0.16		1.5	0.001	0.001			<5	<5	<5	<5
1.2.4-Trichlorobenzene	µg/L	0.085	80	0.03	0.005	0.005			<5	<5	<5	<5
1.2.3-Trichlorobenzene	µg/L	0.003		0.03	0.005	0.005			<5	<5	<5	<5
Trihalomethanes												
Chloroform	µg/L								<5	<5	<5	<5
Bromodichloromethane	µg/L								<5	<5	<5	<5
Dibromochloromethane	µg/L								**12**	<5	<5	<5
Bromoform	µg/L								**13**	<5	<5	<5
Phenolic Compounds												
Phenol	µg/L	320	400						<1.0	<1.0	<1.0	<1.0
2-Chlorophenol	µg/L	340		300	0.1	3000			<1.0	<1.0	<1.0	<1.0
2-Methylphenol	µg/L								<1.0	<1.0	<1.0	<1.0
3- & 4-Methylphenol	µg/L								<2.0	<2.0	<2.0	<2.0
2-Nitrophenol	µg/L								<1.0	<1.0	<1.0	<1.0
2.4-Dimethylphenol	µg/L								<1.0	<1.0	<1.0	<1.0
2.4-Dichlorophenol	µg/L	120		200	0.3	2000			<1.0	<1.0	<1.0	<1.0
2.6-Dichlorophenol	µg/L								<1.0	<1.0	<1.0	<1.0
4-Chloro-3-Methylphenol	µg/L								<1.0	<1.0	<1.0	<1.0
2.4.6-Trichlorophenol	µg/L	3		20	2	200			<1.0	<1.0	<1.0	<1.0
2.4.5-Trichlorophenol	µg/L								<1.0	<1.0	<1.0	<1.0
Pentachlorophenol	µg/L	3.6	11						<2.0	<2.0	<2.0	<2.0
Polynuclear Aromatic Hydrocarbons												
Naphthalene	µg/L	16	50						<1.0	<1.0	<1.0	<1.0
Acenaphthylene	µg/L								<1.0	<1.0	<1.0	<1.0
Acenaphthene	µg/L								<1.0	<1.0	<1.0	<1.0
Fluorene	µg/L								<1.0	<1.0	<1.0	<1.0
Phenanthrene	µg/L								<1.0	<1.0	<1.0	<1.0
Anthracene	µg/L								<1.0	<1.0	<1.0	<1.0
Fluoranthene	µg/L								<1.0	<1.0	<1.0	<1.0
Pyrene	µg/L								<1.0	<1.0	<1.0	<1.0
Benz(a)anthracene	µg/L								<1.0	<1.0	<1.0	<1.0
Chrysene	µg/L								<1.0	<1.0	<1.0	<1.0
Benzo(b)fluoranthene	µg/L								<1.0	<1.0	<1.0	<1.0
Benzo(k)fluoranthene	µg/L								<1.0	<1.0	<1.0	<1.0
Benzo(a)pyrene	µg/L			0.01		0.1			<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L								<1.0	<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	µg/L								<1.0	<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	µg/L								<1.0	<1.0	<1.0	<1.0
Total Petroleum Hydrocarbons												
C6 - C9 Fraction	µg/L								<20	<20	<20	<20
C10 - C14 Fraction	µg/L								<50	<50	<50	<50
C15 - C28 Fraction	µg/L								<100	<100	<100	<100
C29 - C36 Fraction	µg/L								<50	<50	<50	<50
C10 - C36 Fraction (sum)	µg/L	600 [4]							<50	<50	<50	<50
Total Recoverable Hydrocarbons												
C6 - C10 Fraction	µg/L								-	-	-	<20
C6 - C10 Fraction minus BTEX (F	µg/L								-	-	-	<20
>C10 - C16 Fraction	µg/L											<100
>C16 - C34 Fraction	µg/L								-	-	-	<100
>C34 - C40 Fraction	µg/L								-	-	-	<100
>C10 - C40 Fraction (sum)	µg/L								-	-	-	<100
BTEX												
Benzene	µg/L	0.95	0.5	0.001		0.01			-	-	-	<1
Toluene	µg/L			0.80	0.025	0.025			-	-	-	<2
Ethylbenzene	µg/L			0.30	0.003	0.003			-	-	-	<2
meta- & para-Xylene	µg/L	0.2		0.60	0.02	0.02			-	-	-	<2
ortho-Xylene	µg/L	0.3		0.60	0.02	0.02			-	-	-	<2
Total Xylenes	µg/L								-	-	-	<2
Sum of BTEX	µg/L								-	-	-	<1
Naphthalene	µg/L	0.016	0.015						-	-	-	<5

NOTES:
1. SRT Healthy Rivers Action Plan Long Term / Short Term Targets
2. ANZECC 99% protection level for Chlordane
3. ANZECC 99% protection level for Endosulfan
4. Dutch intervention values (2000).
5. pH > 6 / pH < 6
6. ASS disturbance indicators
7. Effluent treatment triggers

Table 5
WRMW5 Laboratory Results
E2012-031

Analyte grouping/Analyte	Units	ANZECC & ARMCANZ		ADWG		DoH	ANZECC & ARMCANZ					
		Fresh Waters	Marine Waters	Drinking Water Health Value (HV)	Drinking Water Aesthetic Value (AV)	Domestic non-potable groundwater use	Short-term Irrigation Water	Long-term Irrigation Water	18/05/2012	30/08/2012	15/01/2013	4/06/2013
									WRMW5	WRMW5	WRMW5	WRMW5
pH Value	pH Unit	6.5-8.5	8.0-8.4		6.5-8.5			6.0-8.5	5.86	5.72	6.07	6.19
Electrical Conductivity	µS/cm								449	97	124	134
Total Dissolved Solids	mg/L								341	56	133	118
Suspended Solids	mg/L								59	660	42	36
Turbidity	NTU								137	854	57.6	45.3
Total Alkalinity $CaCO_3$	mg/L								5	<1	3	2
Acidity as $CaCO_3$	mg/L								13	11	6	15
Sulfate as SO_4^{2-}	mg/L			500	250	5000			19	7	11	9
Chloride	mg/L				250	2500			132	17	25	25
Dissolved Metals												
Aluminium	mg/L	0.055			0.2	2	20	5	0.19	1.48	0.41	0.06
Arsenic	mg/L	0.013		0.01		0.07	2	0.1	<0.001	0.001	<0.001	<0.001
Cadmium	mg/L	0.0002	0.0007	0.00		0.02	0.05	0.01	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	mg/L						1	0.1	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	1.9		0.50	0.1	5	10	0.2	0.01	0.005	0.001	0.002
Nickel	mg/L	0.011	0.02	0.02		0.2	2	0.2	0.001	0.004	0.004	0.002
Selenium	mg/L	0.005		0.01		0.1	0.05	0.02	<0.01	<0.01	<0.01	<0.01
Zinc	mg/L	0.008	0.015		3	30	5	2	0.008	0.021	0.028	0.016
Iron	mg/L	0.3	1.0 / 0.3[5]		0.33	3	10	0.2	0.08	0.54	<0.05	<0.05
Ferrous Iron	mg/L								<0.05	0.12	<0.05	<0.05
Chromium VI	mg/L	0.001	0.0044	0.05		0.5			<0.010	<0.010	<0.01	<0.01
Total Metals												
Aluminium	mg/L	0.055			0.2	2	20	5	10	2.57	5.03	2.28
Arsenic	mg/L	0.013		0.01		0.07	2	0.1	0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	0.0002	0.0007	0.002		0.02	0.05	0.01	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	mg/L						1	0.1	0.005	0.001	0.003	0.002
Copper	mg/L	0.0014	0.0013	2	1	20	5	0.2	0.005	0.015	0.006	0.003
Lead	mg/L	0.0034	0.0044	0.01		0.1	5	2	0.015	0.002	0.005	0.003
Manganese	mg/L	1.9		0.5	0.1	5	10	0.2	0.01	0.002	0.002	<0.001
Molybdenum	mg/L			0.05		0.5	0.05	0.01	<0.001	<0.001	<0.001	<0.001
Nickel	mg/L	0.011	0.02	0.02		0.2	2	0.2	0.003	0.002	0.004	0.001
Selenium	mg/L	0.005		0.01		0.1	0.05	0.02	<0.01	<0.01	<0.01	<0.01
Silver	mg/L	0.00005	0.0014	0.1		1			<0.001	<0.001	<0.001	<0.001
Zinc	mg/L	0.008	0.015		3	30	5	2	0.011	0.007	0.025	0.012
Iron	mg/L	0.3	1.0 / 0.35		0.33	3	10	0.2	0.49	0.13	0.37	0.14
Mercury	mg/L	0.00006	0.0001	0.001		0.01	0.002	0.002	<0.0001	<0.0001	<0.0001	<0.0001
Nutrients												
Ammonia as N	mg/L	0.9	0.91						0.01	0.06	<0.01	0.02
Nitrite as N	mg/L			3.0		30			0.04	<0.01	<0.01	<0.01
Nitrate as N	mg/L			50		500			0.45	2.03	1.63	1.9
Kjeldhal Nitrogen	mg/L								0.1	1.5	0.2	0.6
Total Nitrogen	mg/L	1.0 / 2.0[1]							0.6	3.5	1.8	2.5
Total Phosphorus	mg/L	0.1 / 0.2[1]							0.02	0.23	0.02	0.02
Reactive Phosphorus	mg/L								<0.01	<0.01	<0.01	<0.01
Sulfide	mg/L	0.001							<0.1	<0.1	<0.1	<0.1
COD	mg/L								9	<5	<5	<5
BOD	mg/L								3	3	<2	<2
Organochlorine Pesticides (OC)												
alpha-BHC	µg/L								<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene (HCB)	µg/L								<0.5	<0.5	<0.5	<0.5
beta-BHC	µg/L								<0.5	<0.5	<0.5	<0.5
gamma-BHC	µg/L								<0.5	<0.5	<0.5	<0.5
delta-BHC	µg/L								<0.5	<0.5	<0.5	<0.5
Heptachlor	µg/L	0.01							<0.5	<0.5	<0.5	<0.5
Aldrin	µg/L								<0.5	<0.5	<0.5	<0.5
Heptachlor epoxide	µg/L			0.05	0.3	3			<0.5	<0.5	<0.5	<0.5
trans-Chlordane	µg/L	0.03 [2]		0.01	1	10			<0.5	<0.5	<0.5	<0.5
alpha-Endosulfan	µg/L	0.03 [3]	0.005 [3]	0.05	30	30			<0.5	<0.5	<0.5	<0.5
cis-Chlordane	µg/L	0.03 [2]		0.01	1	10			<0.5	<0.5	<0.5	<0.5
Dieldrin	µg/L								<0.5	<0.5	<0.5	<0.5
4.4`-DDE	µg/L								<0.5	<0.5	<0.5	<0.5
Endrin	µg/L	0.01	0.004						<0.5	<0.5	<0.5	<0.5
beta-Endosulfan	µg/L	0.03 [3]	0.005 [3]						<0.5	<0.5	<0.5	<0.5
4.4`-DDD	µg/L								<0.5	<0.5	<0.5	<0.5
Endrin aldehyde	µg/L								<0.5	<0.5	<0.5	<0.5
Endosulfan sulfate	µg/L								<0.5	<0.5	<0.5	<0.5
4.4`-DDT	µg/L	0.006		0.06	30	0.1			<2	<2	<2.0	<2.0
Endrin ketone	µg/L								<0.5	<0.5	<0.5	<0.5
Methoxychlor	µg/L								<2	<2	<2.0	<2.0
Aldrin plus dieldrin	µg/L			0.010	0.3	3			<1	<0.5	<1.0	<0.5
Organophosphorus Pesticides (OP)												
Dichlorvos	µg/L								<0.5	<0.5	<0.5	<0.5
Demeton-S-methyl	µg/L								<0.5	<0.5	<0.5	<0.5
Monocrotophos	µg/L								<2	<2	<2.0	<2.0
Dimethoate	µg/L	0.15			50	50			<0.5	<0.5	<0.5	<0.5
Diazinon	µg/L	0.01		1	3	1			<0.5	<0.5	<0.5	<0.5
Chlorpyrifos-methyl	µg/L	0.01	0.009		10	100			<0.5	<0.5	<0.5	<0.5
Parathion-methyl	µg/L								<2	<2	<2.0	<2.0
Malathion	µg/L	0.05							<0.5	<0.5	<0.5	<0.5
Fenthion	µg/L								<0.5	<0.5	<0.5	<0.5
Chlorpyrifos	µg/L	0.01	0.009						<0.5	<0.5	<0.5	<0.5
Parathion	µg/L	0.004			10	10			<2	<2	<2.0	<2.0
Pirimphos-ethyl	µg/L								<0.5	<0.5	<0.5	<0.5
Chlorfenvinphos	µg/L								<0.5	<0.5	<0.5	<0.5
Bromophos-ethyl	µg/L								<0.5	<0.5	<0.5	<0.5
Fenamiphos	µg/L								<0.5	<0.5	<0.5	<0.5
Prothiofos	µg/L								<0.5	<0.5	<0.5	<0.5
Ethion	µg/L								<0.5	<0.5	<0.5	<0.5
Carbophenothion	µg/L								<0.5	<0.5	<0.5	<0.5
Azinphos Methyl	µg/L	0.02							<0.5	<0.5	<0.5	<0.5
Monocyclic Aromatic Hydrocarbons												
Benzene	µg/L	0.95	0.5	0.001		0.01			-	-	<1	-
Toluene	µg/L			0.80	0.025	0.025			-	-	<2	-
Ethylbenzene	µg/L			0.30	0.003	0.003			-	-	<2	-
meta- & para-Xylene	µg/L	200							-	-	<2	-
Styrene	µg/L			0.03	0.004	0.004			<5	<5	<5	<5
ortho-Xylene	µg/L	350							-	-	<2	-
Isopropylbenzene	µg/L								<5	<5	<5	<5
n-Propylbenzene	µg/L								<5	<5	<5	<5
1.3.5-Trimethylbenzene	µg/L								<5	<5	<5	<5
sec-Butylbenzene	µg/L								<5	<5	<5	<5
1.2.4-Trimethylbenzene	µg/L								<5	<5	<5	<5
tert-Butylbenzene	µg/L								<5	<5	<5	<5
p-Isopropyltoluene	µg/L								<5	<5	<5	<5
n-Butylbenzene	µg/L								<5	<5	<5	<5
Oxygenated Compounds												
Vinyl Acetate	µg/L								<50	<50	<50	<50
2-Butanone (MEK)	µg/L								<50	<50	<50	<50
4-Methyl-2-pentanone (MIBK)	µg/L								<50	<50	<50	<50
2-Hexanone (MBK)	µg/L								<50	<50	<50	<50
Sulfonated Compounds												
Carbon disulfide	µg/L								<5	<5	<5	<5
Fumigants												
2.2-Dichloropropane	µg/L								<5	<5	<5	<5
1.2-Dichloropropane	µg/L								<5	<5	<5	<5
cis-1.3-Dichloropropylene	µg/L								<5	<5	<5	<5
trans-1.3-Dichloropropylene	µg/L								<5	<5	<5	<5
1.2-Dibromoethane (EDB)	µg/L								<5	<5	<5	<5
Halogenated Aliphatic Compounds												
Dichlorodifluoromethane	µg/L								<50	<50	<50	<50
Chloromethane	µg/L								<50	<50	<50	<50

Table 5
WRMW5 Laboratory Results
E2012-031

Analyte grouping/Analyte	Units	Fresh Waters	Marine Waters	Drinking Water Health Value (HV)	Drinking Water Aesthetic Value (AV)	Domestic non-potable groundwater use	Short-term Irrigation Water	Long-term Irrigation Water	18/05/2012	30/08/2012	15/01/2013	4/06/2013
									WRMW5	WRMW5	WRMW5	WRMW5
Vinyl chloride	µg/L			0.0003		0.003			<50	<50	<50	<50
Bromomethane	µg/L								<50	<50	<50	<50
Chloroethane	µg/L								<50	<50	<50	<50
Trichlorofluoromethane	µg/L								<50	<50	<50	<50
1.1-Dichloroethene	µg/L			0.03		0.3			<5	<5	<5	<5
Iodomethane	µg/L								<5	<5	<5	<5
trans-1.2-Dichloroethene	µg/L								<5	<5	<5	<5
1.1-Dichloroethane	µg/L								<5	<5	<5	<5
cis-1.2-Dichloroethene	µg/L								<5	<5	<5	<5
1.1.1-Trichloroethane	µg/L								<5	<5	<5	<5
1.1-Dichloropropylene	µg/L								<5	<5	<5	<5
Carbon Tetrachloride	µg/L								<5	<5	<5	<5
1.2-Dichloroethane	µg/L			0.003		0.03			<5	<5	<5	<5
Trichloroethene	µg/L								<5	<5	<5	<5
Dibromomethane	µg/L								<5	<5	<5	<5
1.1.2-Trichloroethane	µg/L	6500	1900						<5	<5	<5	<5
1.3-Dichloropropane	µg/L								<5	<5	<5	<5
Tetrachloroethene	µg/L			0.05		0.5			<5	<5	<5	<5
1.1.1.2-Tetrachloroethane	µg/L								<5	<5	<5	<5
trans-1.4-Dichloro-2-butene	µg/L								<5	<5	<5	<5
cis-1.4-Dichloro-2-butene	µg/L								<5	<5	<5	<5
1.1.2.2-Tetrachloroethane	µg/L								<5	<5	<5	<5
1.2.3-Trichloropropane	µg/L								<5	<5	<5	<5
Pentachloroethane	µg/L								<5	<5	<5	<5
1.2-Dibromo-3-chloropropane	µg/L								<5	<5	<5	<5
Hexachlorobutadiene	µg/L								<5	<5	<5	<5
Halogenated Aromatic Compounds												
Chlorobenzene	µg/L			0.30	0.01	0.01			<5	<5	<5	<5
Bromobenzene	µg/L								<5	<5	<5	<5
2-Chlorotoluene	µg/L								<5	<5	<5	<5
4-Chlorotoluene	µg/L								<5	<5	<5	<5
1.3-Dichlorobenzene	µg/L	0.26			0.02	0.02			<5	<5	<5	<5
1.4-Dichlorobenzene	µg/L	0.06		0.04	0.003	0.003			<5	<5	<5	<5
1.2-Dichlorobenzene	µg/L	0.16		1.5	0.001	0.001			<5	<5	<5	<5
1.2.4-Trichlorobenzene	µg/L	0.085	80	0.03	0.005	0.005			<5	<5	<5	<5
1.2.3-Trichlorobenzene	µg/L	0.003		0.03	0.005	0.005			<5	<5	<5	<5
Trihalomethanes												
Chloroform	µg/L								<5	<5	<5	<5
Bromodichloromethane	µg/L								5	<5	<5	<5
Dibromochloromethane	µg/L								**20**	<5	<5	<5
Bromoform	µg/L								**22**	<5	<5	<5
Phenolic Compounds												
Phenol	µg/L	320	400						<1.0	<1.0	<1.0	<1.0
2-Chlorophenol	µg/L	340		300	0.1	3000			<1.0	<1.0	<1.0	<1.0
2-Methylphenol	µg/L								<1.0	<1.0	<1.0	<1.0
3- & 4-Methylphenol	µg/L								<2.0	<2.0	<2.0	<2.0
2-Nitrophenol	µg/L								<1.0	<1.0	<1.0	<1.0
2.4-Dimethylphenol	µg/L								<1.0	<1.0	<1.0	<1.0
2.4-Dichlorophenol	µg/L	120		200	0.3	2000			<1.0	<1.0	<1.0	<1.0
2.6-Dichlorophenol	µg/L								<1.0	<1.0	<1.0	<1.0
4-Chloro-3-Methylphenol	µg/L								<1.0	<1.0	<1.0	<1.0
2.4.6-Trichlorophenol	µg/L	3		20	2	200			<1.0	<1.0	<1.0	<1.0
2.4.5-Trichlorophenol	µg/L								<1.0	<1.0	<1.0	<1.0
Pentachlorophenol	µg/L	3.6	11						<2.0	<2.0	<2.0	<2.0
Polynuclear Aromatic Hydrocarbons												
Naphthalene	µg/L	16	50						<1.0	<1.0	<1.0	<1.0
Acenaphthylene	µg/L								<1.0	<1.0	<1.0	<1.0
Acenaphthene	µg/L								<1.0	<1.0	<1.0	<1.0
Fluorene	µg/L								<1.0	<1.0	<1.0	<1.0
Phenanthrene	µg/L								<1.0	<1.0	<1.0	<1.0
Anthracene	µg/L								<1.0	<1.0	<1.0	<1.0
Fluoranthene	µg/L								<1.0	<1.0	<1.0	<1.0
Pyrene	µg/L								<1.0	<1.0	<1.0	<1.0
Benz(a)anthracene	µg/L								<1.0	<1.0	<1.0	<1.0
Chrysene	µg/L								<1.0	<1.0	<1.0	<1.0
Benzo(b)fluoranthene	µg/L								<1.0	<1.0	<1.0	<1.0
Benzo(k)fluoranthene	µg/L								<1.0	<1.0	<1.0	<1.0
Benzo(a)pyrene	µg/L			0.01		0.1			<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L								<1.0	<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	µg/L								<1.0	<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	µg/L								<1.0	<1.0	<1.0	<1.0
Total Petroleum Hydrocarbons												
C6 - C9 Fraction	µg/L								<20	<20	<20	<20
C10 - C14 Fraction	µg/L								<50	<50	<50	<50
C15 - C28 Fraction	µg/L								<100	<100	<100	<100
C29 - C36 Fraction	µg/L								<50	<50	<50	<50
C10 - C36 Fraction (sum)	µg/L	600 [4]							<50	<50	<50	<50
Total Recoverable Hydrocarbons												
C6 - C10 Fraction	µg/L								-	-	-	<20
C6 - C10 Fraction minus BTEX (F	µg/L								-	-	-	<20
>C10 - C16 Fraction	µg/L											<100
>C16 - C34 Fraction	µg/L								-	-	-	<100
>C34 - C40 Fraction	µg/L								-	-	-	<100
>C10 - C40 Fraction (sum)	µg/L								-	-	-	<100
BTEX												
Benzene	µg/L	0.95	0.5	0.001		0.01			-	-	-	<1
Toluene	µg/L			0.80	0.025	0.025			-	-	-	<2
Ethylbenzene	µg/L			0.30	0.003	0.003			-	-	-	<2
meta- & para-Xylene	µg/L	0.2		0.60	0.02	0.02			-	-	-	<2
ortho-Xylene	µg/L	0.3		0.60	0.02	0.02			-	-	-	<2
Total Xylenes	µg/L								-	-	-	<2
Sum of BTEX	µg/L								-	-	-	<1
Naphthalene	µg/L	0.016	0.015						-	-	-	<5

NOTES:
1. SRT Healthy Rivers Action Plan Long Term / Short Term Targets
2. ANZECC 99% protection level for Chlordane
3. ANZECC 99% protection level for Endosulfan
4. Dutch intervention values (2000).
5. pH > 6 / pH < 6
6. ASS disturbance indicators
7. Effluent treatment triggers

Table 6
Quality Control Duplicate and Triplicate Results
E2012-031

Analyte grouping/Analyte	Units	WRMW4	QC4 (DUP)	DUP RL (%)	DUP RPD (%)	QC5 (TRIP)	TRIP RL (%)	TRIP RPD
pH Value	pH Unit	5.64	5.15	0-20	8.69	5.2	0-20	7.80
Electrical Conductivity	µS/cm	117	120	0-20	2.50	130	0-50	10.00
Total Dissolved Solids	mg/L	96	74	0-50	22.92	78	0-20	18.75
Suspended Solids	mg/L	6	7	0-20	14.29	<5	N/L	-
Turbidity	NTU	6.5	4.6	0-20	29.23	16	0-20	59.38
Total Alkalinity $CaCO_3$	mg/L	<1	<1	N/L	-	<5	N/L	-
Acidity as $CaCO_3$	mg/L	20	17	N/L	15.00	26	N/L	23.08
Sulfate as SO_4^{2-}	mg/L	1	2	N/L	50.00	-	-	-
Chloride	mg/L	17	18	0-50	5.56	36	N/L	52.78
Dissolved Metals								
Aluminium	mg/L	0.11	0.11	0-50	0.00	0.1	N/L	9.09
Arsenic	mg/L	<0.001	<0.001	N/L	-	<0.001	N/L	-
Cadmium	mg/L	<0.0001	<0.0001	N/L	-	<0.0001	N/L	-
Chromium	mg/L	<0.001	<0.001	N/L	-	0.019	N/L	-
Manganese	mg/L	0.003	0.002	N/L	33.33	<0.01	N/L	-
Nickel	mg/L	0.003	0.002	N/L	33.33	0.003	N/L	0.00
Selenium	mg/L	<0.01	<0.01	N/L	-	<0.001	N/L	-
Zinc	mg/L	0.027	0.03	N/L	10.00	0.021	N/L	22.22
Iron	mg/L	<0.05	<0.05	N/L	-	0.13	N/L	-
Ferrous Iron	mg/L	<0.05	<0.05	N/L	-	<0.1	N/L	-
Chromium VI	mg/L	<0.01	<0.01	N/L	-	-	-	-
Total Metals								
Aluminium	mg/L	0.48	0.48	0-20	0.00	0.23	0-20	52.08
Arsenic	mg/L	<0.001	0.001	N/L	-	<0.001	N/L	-
Cadmium	mg/L	<0.0001	0.0002	N/L	-	<0.0001	N/L	-
Chromium	mg/L	<0.001	<0.001	N/L	-	0.14	N/L	-
Copper	mg/L	0.003	0.004	N/L	25.00	-	-	-
Lead	mg/L	<0.001	<0.001	N/L	-	-	-	-
Manganese	mg/L	0.001	0.002	N/L	50.00	<0.01	N/L	-
Molybdenum	mg/L	<0.001	<0.001	N/L	-	-	-	-
Nickel	mg/L	0.002	0.002	N/L	0.00	0.003	N/L	33.33
Selenium	mg/L	<0.01	<0.01	N/L	-	<0.001	N/L	-
Silver	mg/L	<0.001	<0.001	N/L	-	-	-	-
Zinc	mg/L	0.021	0.02	N/L	4.76	0.021	N/L	0.00
Iron	mg/L	0.07	0.06	N/L	14.29	0.34	0-20	79.41
Mercury	mg/L	<0.0001	<0.0001	N/L	-	-	-	-
Nutrients								
Ammonia as N	mg/L	0.02	0.02	N/L	0.00	<0.2	N/L	-
Nitrite as N	mg/L	<0.01	<0.01	N/L	-	<0.01	N/L	-
Nitrate as N	mg/L	4.91	4.9	0-20	0.20	5.2	0-20	5.58
Kjeldhal Nitrogen	mg/L	<0.5	<0.5	N/L	-	-	-	-
Total Nitrogen	mg/L	4.9	4.9	0-20	0.00	5.2	0-20	5.77
Total Phosphorus	mg/L	<0.01	<0.01	N/L	-	0.02	NL	-
Reactive Phosphorus	mg/L	<0.01	<0.01	N/L	-	<0.01	N/L	-
Sulfide	mg/L	<0.1	<0.1	N/L	-	0.5	N/L	-
COD	mg/L	<5	<5	N/L	-	20	N/L	-
BOD	mg/L	<2	3	N/L	-	<5	N/L	-
Organochlorine Pesticides (OC)								
alpha-BHC	µg/L	<0.5	<0.5	N/L	-	-	-	-
Hexachlorobenzene (HCB)	µg/L	<0.5	<0.5	N/L	-	-	-	-
beta-BHC	µg/L	<0.5	<0.5	N/L	-	-	-	-
gamma-BHC	µg/L	<0.5	<0.5	N/L	-	-	-	-
delta-BHC	µg/L	<0.5	<0.5	N/L	-	-	-	-
Heptachlor	µg/L	<0.5	<0.5	N/L	-	-	-	-
Aldrin	µg/L	<0.5	<0.5	N/L	-	-	-	-
Heptachlor epoxide	µg/L	<0.5	<0.5	N/L	-	-	-	-
trans-Chlordane	µg/L	<0.5	<0.5	N/L	-	-	-	-
alpha-Endosulfan	µg/L	<0.5	<0.5	N/L	-	-	-	-
cis-Chlordane	µg/L	<0.5	<0.5	N/L	-	-	-	-
Dieldrin	µg/L	<0.5	<0.5	N/L	-	-	-	-
4.4`-DDE	µg/L	<0.5	<0.5	N/L	-	-	-	-
Endrin	µg/L	<0.5	<0.5	N/L	-	-	-	-
beta-Endosulfan	µg/L	<0.5	<0.5	N/L	-	-	-	-
4.4`-DDD	µg/L	<0.5	<0.5	N/L	-	-	-	-
Endrin aldehyde	µg/L	<0.5	<0.5	N/L	-	-	-	-
Endosulfan sulfate	µg/L	<0.5	<0.5	N/L	-	-	-	-
4.4`-DDT	µg/L	<2.0	<2.0	N/L	-	-	-	-
Endrin ketone	µg/L	<0.5	<0.5	N/L	-	-	-	-
Methoxychlor	µg/L	<2.0	<2.0	N/L	-	-	-	-
Organophosphorus Pesticides (OP)								
Dichlorvos	µg/L	<0.5	<0.5	N/L	-	-	-	-
Demeton-S-methyl	µg/L	<0.5	<0.5	N/L	-	-	-	-
Monocrotophos	µg/L	<2.0	<2.0	N/L	-	-	-	-
Dimethoate	µg/L	<0.5	<0.5	N/L	-	-	-	-
Diazinon	µg/L	<0.5	<0.5	N/L	-	-	-	-
Chlorpyrifos-methyl	µg/L	<0.5	<0.5	N/L	-	-	-	-
Parathion-methyl	µg/L	<2.0	<2.0	N/L	-	-	-	-
Malathion	µg/L	<0.5	<0.5	N/L	-	-	-	-
Fenthion	µg/L	<0.5	<0.5	N/L	-	-	-	-
Chlorpyrifos	µg/L	<0.5	<0.5	N/L	-	-	-	-
Parathion	µg/L	<2.0	<2.0	N/L	-	-	-	-
Pirimphos-ethyl	µg/L	<0.5	<0.5	N/L	-	-	-	-
Chlorfenvinphos	µg/L	<0.5	<0.5	N/L	-	-	-	-
Bromophos-ethyl	µg/L	<0.5	<0.5	N/L	-	-	-	-
Fenamiphos	µg/L	<0.5	<0.5	N/L	-	-	-	-
Prothiofos	µg/L	<0.5	<0.5	N/L	-	-	-	-
Ethion	µg/L	<0.5	<0.5	N/L	-	-	-	-
Carbophenothion	µg/L	<0.5	<0.5	N/L	-	-	-	-
Azinphos Methyl	µg/L	<0.5	<0.5	N/L	-	-	-	-
Monocyclic Aromatic Hydrocarbons								
Benzene	µg/L	-	-	N/L	-	-	-	-
Toluene	µg/L	-	-	N/L	-	-	-	-

Table 6
Quality Control Duplicate and Triplicate Results
E2012-031

Analyte grouping/Analyte	Units	WRMW4	QC4 (DUP)	DUP RL (%)	DUP RPD (%)	QC5 (TRIP)	TRIP RL (%)	TRIP RPD
Ethylbenzene	µg/L	-	-	N/L	-	-	-	-
meta- & para-Xylene	µg/L	-	-	N/L	-	-	-	-
Styrene	µg/L	<5	<5	N/L	-	-	-	-
ortho-Xylene	µg/L	-	-	N/L	-	-	-	-
Isopropylbenzene	µg/L	<5	<5	N/L	-	-	-	-
n-Propylbenzene	µg/L	<5	<5	N/L	-	-	-	-
1.3.5-Trimethylbenzene	µg/L	<5	<5	N/L	-	-	-	-
sec-Butylbenzene	µg/L	<5	<5	N/L	-	-	-	-
1.2.4-Trimethylbenzene	µg/L	<5	<5	N/L	-	-	-	-
tert-Butylbenzene	µg/L	<5	<5	N/L	-	-	-	-
p-Isopropyltoluene	µg/L	<5	<5	N/L	-	-	-	-
n-Butylbenzene	µg/L	<5	<5	N/L	-	-	-	-
Oxygenated Compounds								
Vinyl Acetate	µg/L	<50	<50	N/L	-	-	-	-
2-Butanone (MEK)	µg/L	<50	<50	N/L	-	-	-	-
4-Methyl-2-pentanone (MIBK)	µg/L	<50	<50	N/L	-	-	-	-
2-Hexanone (MBK)	µg/L	<50	<50	N/L	-	-	-	-
Sulfonated Compounds								
Carbon disulfide	µg/L	<5	<5	N/L	-	-	-	-
Fumigants								
2.2-Dichloropropane	µg/L	<5	<5	N/L	-	-	-	-
1.2-Dichloropropane	µg/L	<5	<5	N/L	-	-	-	-
cis-1.3-Dichloropropylene	µg/L	<5	<5	N/L	-	-	-	-
trans-1.3-Dichloropropylene	µg/L	<5	<5	N/L	-	-	-	-
1.2-Dibromoethane (EDB)	µg/L	<5	<5	N/L	-	-	-	-
Halogenated Aliphatic Compounds								
Dichlorodifluoromethane	µg/L	<50	<50	N/L	-	-	-	-
Chloromethane	µg/L	<50	<50	N/L	-	-	-	-
Vinyl chloride	µg/L	<50	<50	N/L	-	-	-	-
Bromomethane	µg/L	<50	<50	N/L	-	-	-	-
Chloroethane	µg/L	<50	<50	N/L	-	-	-	-
Trichlorofluoromethane	µg/L	<50	<50	N/L	-	-	-	-
1.1-Dichloroethene	µg/L	<5	<5	N/L	-	-	-	-
Iodomethane	µg/L	<5	<5	N/L	-	-	-	-
trans-1.2-Dichloroethene	µg/L	<5	<5	N/L	-	-	-	-
1.1-Dichloroethane	µg/L	<5	<5	N/L	-	-	-	-
cis-1.2-Dichloroethene	µg/L	<5	<5	N/L	-	-	-	-
1.1.1-Trichloroethane	µg/L	<5	<5	N/L	-	-	-	-
1.1-Dichloropropylene	µg/L	<5	<5	N/L	-	-	-	-
Carbon Tetrachloride	µg/L	<5	<5	N/L	-	-	-	-
1.2-Dichloroethane	µg/L	<5	<5	N/L	-	-	-	-
Trichloroethene	µg/L	<5	<5	N/L	-	-	-	-
Dibromomethane	µg/L	<5	<5	N/L	-	-	-	-
1.1.2-Trichloroethane	µg/L	<5	<5	N/L	-	-	-	-
1.3-Dichloropropane	µg/L	<5	<5	N/L	-	-	-	-
Tetrachloroethene	µg/L	<5	<5	N/L	-	-	-	-
1.1.1.2-Tetrachloroethane	µg/L	<5	<5	N/L	-	-	-	-
trans-1.4-Dichloro-2-butene	µg/L	<5	<5	N/L	-	-	-	-
cis-1.4-Dichloro-2-butene	µg/L	<5	<5	N/L	-	-	-	-
1.1.2.2-Tetrachloroethane	µg/L	<5	<5	N/L	-	-	-	-
1.2.3-Trichloropropane	µg/L	<5	<5	N/L	-	-	-	-
Pentachloroethane	µg/L	<5	<5	N/L	-	-	-	-
1.2-Dibromo-3-chloropropane	µg/L	<5	<5	N/L	-	-	-	-
Hexachlorobutadiene	µg/L	<5	<5	N/L	-	-	-	-
Halogenated Aromatic Compounds								
Chlorobenzene	µg/L	<5	<5	N/L	-	-	-	-
Bromobenzene	µg/L	<5	<5	N/L	-	-	-	-
2-Chlorotoluene	µg/L	<5	<5	N/L	-	-	-	-
4-Chlorotoluene	µg/L	<5	<5	N/L	-	-	-	-
1.3-Dichlorobenzene	µg/L	<5	<5	N/L	-	-	-	-
1.4-Dichlorobenzene	µg/L	<5	<5	N/L	-	-	-	-
1.2-Dichlorobenzene	µg/L	<5	<5	N/L	-	-	-	-
1.2.4-Trichlorobenzene	µg/L	<5	<5	N/L	-	-	-	-
1.2.3-Trichlorobenzene	µg/L	<5	<5	N/L	-	-	-	-
Trihalomethanes								
Chloroform	µg/L	<5	<5	N/L	-	-	-	-
Bromodichloromethane	µg/L	<5	<5	N/L	-	-	-	-
Dibromochloromethane	µg/L	<5	<5	N/L	-	-	-	-
Bromoform	µg/L	<5	<5	N/L	-	-	-	-
Phenolic Compounds								
Phenol	µg/L	<1.0	<1.0	N/L	-	-	-	-
2-Chlorophenol	µg/L	<1.0	<1.0	N/L	-	-	-	-
2-Methylphenol	µg/L	<1.0	<1.0	N/L	-	-	-	-
3- & 4-Methylphenol	µg/L	<2.0	<2.0	N/L	-	-	-	-
2-Nitrophenol	µg/L	<1.0	<1.0	N/L	-	-	-	-
2.4-Dimethylphenol	µg/L	<1.0	<1.0	N/L	-	-	-	-
2.4-Dichlorophenol	µg/L	<1.0	<1.0	N/L	-	-	-	-
2.6-Dichlorophenol	µg/L	<1.0	<1.0	N/L	-	-	-	-
4-Chloro-3-Methylphenol	µg/L	<1.0	<1.0	N/L	-	-	-	-
2.4.6-Trichlorophenol	µg/L	<1.0	<1.0	N/L	-	-	-	-
2.4.5-Trichlorophenol	µg/L	<1.0	<1.0	N/L	-	-	-	-
Pentachlorophenol	µg/L	<2.0	<2.0	N/L	-	-	-	-
Polynuclear Aromatic Hydrocarbons								
Naphthalene	µg/L	<1.0	<1.0	N/L	-	-	-	-
Acenaphthylene	µg/L	<1.0	<1.0	N/L	-	-	-	-
Acenaphthene	µg/L	<1.0	<1.0	N/L	-	-	-	-
Fluorene	µg/L	<1.0	<1.0	N/L	-	-	-	-
Phenanthrene	µg/L	<1.0	<1.0	N/L	-	-	-	-
Anthracene	µg/L	<1.0	<1.0	N/L	-	-	-	-
Fluoranthene	µg/L	<1.0	<1.0	N/L	-	-	-	-
Pyrene	µg/L	<1.0	<1.0	N/L	-	-	-	-
Benz(a)anthracene	µg/L	<1.0	<1.0	N/L	-	-	-	-

Table 6
Quality Control Duplicate and Triplicate Results
E2012-031

Analyte grouping/Analyte	Units	WRMW4	QC4 (DUP)	DUP RL (%)	*DUP RPD (%)*	QC5 (TRIP)	TRIP RL (%)	*TRIP RPD*
Chrysene	µg/L	<1.0	<1.0	N/L	-	-	-	-
Benzo(b)fluoranthene	µg/L	<1.0	<1.0	N/L	-	-	-	-
Benzo(k)fluoranthene	µg/L	<1.0	<1.0	N/L	-	-	-	-
Benzo(a)pyrene	µg/L	<0.5	<0.5	N/L	-	-	-	-
Indeno(1.2.3.cd)pyrene	µg/L	<1.0	<1.0	N/L	-	-	-	-
Dibenz(a.h)anthracene	µg/L	<1.0	<1.0	N/L	-	-	-	-
Benzo(g.h.i)perylene	µg/L	<1.0	<1.0	N/L	-	-	-	-
Total Petroleum Hydrocarbons								
C6 - C9 Fraction	µg/L	<20	<20	N/L	-	<0.02	N/L	-
C10 - C14 Fraction	µg/L	<50	<50	N/L	-	<0.02	N/L	-
C15 - C28 Fraction	µg/L	<100	<100	N/L	-	<0.04	N/L	-
C29 - C36 Fraction	µg/L	<50	<50	N/L	-	<0.04	N/L	-
C10 - C36 Fraction (sum)	µg/L	<50	<50	N/L	-	<0.04	N/L	-
Total Recoverable Hydrocarbons								
C6 - C10 Fraction	µg/L	<20	<20	N/L	-	-	-	-
C6 - C10 Fraction minus BTEX	µg/L	<20	<20	N/L	-	-	-	-
>C10 - C16 Fraction	µg/L	<100	<100	N/L	-	-	-	-
>C16 - C34 Fraction	µg/L	<100	<100	N/L	-	-	-	-
>C34 - C40 Fraction	µg/L	<100	<100	N/L	-	-	-	-
>C10 - C40 Fraction (sum)	µg/L	<100	<100	N/L	-	-	-	-
BTEX								
Benzene	µg/L	<1	<1	N/L	-	<0.001	N/L	-
Toluene	µg/L	<2	<2	N/L	-	<0.001	N/L	-
Ethylbenzene	µg/L	<2	<2	N/L	-	<0.001	N/L	-
meta- & para-Xylene	µg/L	<2	<2	N/L	-	-	-	-
ortho-Xylene	µg/L	<2	<2	N/L	-	-	-	-
Total Xylenes	µg/L	<2	<2	N/L	-	<0.003	N/L	-
Sum of BTEX	µg/L	<1	<1	N/L	-	-	-	-
Naphthalene	µg/L	<5	<5	N/L	-	-	-	-

NOTES:
1. SRT Healthy Rivers Action Plan Long Term / Short Term Targets
2. ANZECC 99% protection level for Chlordane
3. ANZECC 99% protection level for Endosulfan
4. Dutch intervention values (2000).
5. pH > 6 / pH < 6
6. ASS disturbance indicators
7. Effluent treatment triggers

Table 7
Quality Control Rinsate and Blank Results
E2012-031

Analyte grouping/Analyte	Units	ANZECC & ARMCANZ (2000)[1]		ADWG (2004)[2]		DOH (2006)[3]	ANZECC & ARMCANZ (2000)[1]		4/06/2013	
		Fresh Waters[4]	Marine Waters[4]	Drinking Water Health Value	Drinking Water Aesthetic Value	Domestic non-potable	Short-term Irrigation Water	Long-term Irrigation	QC6	QC7
pH Value	pH Unit	6.5-8.5	8.0-8.4		6.5-8.5			6.0-8.5	6.13	5.85
Electrical Conductivity	µS/cm								12	11
Total Dissolved Solids	mg/L								18	16
Suspended Solids	mg/L								<5	<5
Turbidity	NTU								0.3	<0.1
Total Alkalinity $CaCO_3$	mg/L								<1	<1
Acidity as $CaCO_3$	mg/L								4	4
Sulfate as SO_4^{2-}	mg/L								<1	<1
Chloride	mg/L								5	5
Sulfate : Chloride	ratio				250	2500			0.20	0.20
Dissolved Metals										
Aluminium	mg/L	0.055			0.2	2	20	5	<0.01	<0.01
Arsenic	mg/L	0.013		0.01		0.07	2	0.1	<0.001	<0.001
Cadmium	mg/L	0.0002	0.0007	0.00		0.02	0.05	0.01	<0.0001	<0.0001
Chromium	mg/L						1	0.1	<0.001	<0.001
Manganese	mg/L	1.9		0.50	0.1	5	10	0.2	<0.001	<0.001
Nickel	mg/L	0.011	0.02	0.02		0.2	2	0.2	<0.001	<0.001
Selenium	mg/L	0.005		0.01		0.1	0.05	0.02	<0.01	<0.01
Zinc	mg/L	0.008	0.015		3	30	5	2	<0.005	<0.005
Iron	mg/L	0.3	1.0 / 0.3[5]		0.33	3	10	0.2	<0.05	<0.05
Ferrous Iron	mg/L								<0.05	<0.05
Chromium VI	mg/L	0.001	0.0044	0.05		0.5			<0.01	<0.01
Total Metals										
Aluminium	mg/L	0.055			0.2	2	20	5	<0.01	<0.01
Arsenic	mg/L	0.013		0.01		0.07	2	0.1	<0.001	<0.001
Cadmium	mg/L	0.0002	0.0007	0.002		0.02	0.05	0.01	<0.0001	<0.0001
Chromium	mg/L						1	0.1	<0.001	<0.001
Copper	mg/L	0.0014	0.0013	2	1	20	5	0.2	<0.001	<0.001
Lead	mg/L	0.0034	0.0044	0.01		0.1	5	2	<0.001	<0.001
Manganese	mg/L	1.9		0.5	0.1	5	10	0.2	<0.001	<0.001
Molybdenum	mg/L			0.05		0.5	0.05	0.01	<0.001	<0.001
Nickel	mg/L	0.011	0.02	0.02		0.2	2	0.2	<0.001	<0.001
Selenium	mg/L	0.005		0.01		0.1	0.05	0.02	<0.01	<0.01
Silver	mg/L	0.00005	0.0014	0.1		1			<0.001	<0.001
Zinc	mg/L	0.008	0.015		3	30	5	2	<0.005	<0.005
Iron	mg/L	0.3	1.0 / 0.35		0.33	3	10	0.2	<0.05	<0.05
Mercury	mg/L	0.00006	0.0001	0.001		0.01	0.002	0.002	<0.0001	<0.0001
Nutrients										
Ammonia as N	mg/L	0.9	0.91						<0.01	<0.01
Nitrite as N	mg/L			3.0		30			<0.01	<0.01
Nitrate as N	mg/L			50		500			<0.01	<0.01
Kjeldhal Nitrogen	mg/L								<0.1	<0.1
Total Nitrogen	mg/L	1.0 / 2.0[1]							<0.1	<0.1
Total Phosphorus	mg/L	0.1 / 0.2[1]							<0.01	<0.01
Reactive Phosphorus	mg/L								<0.01	<0.01
Sulfide	mg/L	0.001							<0.1	<0.1
COD	mg/L								<5	<5
BOD	mg/L								<2	<2
Organochlorine Pesticides (OC)										
alpha-BHC	µg/L								<0.5	<0.5
Hexachlorobenzene (HCB)	µg/L								<0.5	<0.5
beta-BHC	µg/L								<0.5	<0.5
gamma-BHC	µg/L								<0.5	<0.5
delta-BHC	µg/L								<0.5	<0.5
Heptachlor	µg/L	0.01							<0.5	<0.5
Aldrin	µg/L								<0.5	<0.5
Heptachlor epoxide	µg/L			0.05	0.3	3			<0.5	<0.5
trans-Chlordane	µg/L	0.03[2]		0.01	1	10			<0.5	<0.5
alpha-Endosulfan	µg/L	0.03[3]	0.005[3]	0.05	30	30			<0.5	<0.5
cis-Chlordane	µg/L	0.03[2]		0.01	1	10			<0.5	<0.5
Dieldrin	µg/L								<0.5	<0.5
4.4`-DDE	µg/L								<0.5	<0.5
Endrin	µg/L	0.01	0.004						<0.5	<0.5
beta-Endosulfan	µg/L	0.03[3]	0.005[3]						<0.5	<0.5
4.4`-DDD	µg/L								<0.5	<0.5
Endrin aldehyde	µg/L								<0.5	<0.5
Endosulfan sulfate	µg/L								<0.5	<0.5
4.4`-DDT	µg/L	0.006		0.06	30	0.1			<2.0	<2.0
Endrin ketone	µg/L								<0.5	<0.5
Methoxychlor	µg/L								<2.0	<2.0
Organophosphorus Pesticides (OP)										
Dichlorvos	µg/L								<0.5	<0.5
Demeton-S-methyl	µg/L								<0.5	<0.5
Monocrotophos	µg/L								<2.0	<2.0
Dimethoate	µg/L	0.15			50	50			<0.5	<0.5
Diazinon	µg/L	0.01		1	3	1			<0.5	<0.5
Chlorpyrifos-methyl	µg/L	0.01	0.009		10	100			<0.5	<0.5
Parathion-methyl	µg/L								<2.0	<2.0
Malathion	µg/L	0.05							<0.5	<0.5
Fenthion	µg/L								<0.5	<0.5
Chlorpyrifos	µg/L	0.01	0.009						<0.5	<0.5
Parathion	µg/L	0.004			10	10			<2.0	<2.0
Pirimphos-ethyl	µg/L								<0.5	<0.5
Chlorfenvinphos	µg/L								<0.5	<0.5
Bromophos-ethyl	µg/L								<0.5	<0.5
Fenamiphos	µg/L								<0.5	<0.5
Prothiofos	µg/L								<0.5	<0.5
Ethion	µg/L								<0.5	<0.5
Carbophenothion	µg/L								<0.5	<0.5
Azinphos Methyl	µg/L	0.02							<0.5	<0.5
Monocyclic Aromatic Hydrocarbons										
Benzene	µg/L	0.95	0.5	0.001		0.01			-	-
Toluene	µg/L			0.80	0.025	0.025			-	-
Ethylbenzene	µg/L			0.30	0.003	0.003			-	-
meta- & para-Xylene	µg/L	200							-	-
Styrene	µg/L			0.03	0.004	0.004			<5	<5
ortho-Xylene	µg/L	350							-	-
Isopropylbenzene	µg/L								<5	<5
n-Propylbenzene	µg/L								<5	<5
1.3.5-Trimethylbenzene	µg/L								<5	<5
sec-Butylbenzene	µg/L								<5	<5
1.2.4-Trimethylbenzene	µg/L								<5	<5
tert-Butylbenzene	µg/L								<5	<5
p-Isopropyltoluene	µg/L								<5	<5
n-Butylbenzene	µg/L								<5	<5
Oxygenated Compounds										
Vinyl Acetate	µg/L								<50	<50
2-Butanone (MEK)	µg/L								<50	<50
4-Methyl-2-pentanone (MIBK)	µg/L								<50	<50
2-Hexanone (MBK)	µg/L								<50	<50
Sulfonated Compounds										
Carbon disulfide	µg/L								<5	<5
Fumigants										
2.2-Dichloropropane	µg/L								<5	<5
1.2-Dichloropropane	µg/L								<5	<5
cis-1.3-Dichloropropylene	µg/L								<5	<5
trans-1.3-Dichloropropylene	µg/L								<5	<5
1.2-Dibromoethane (EDB)	µg/L								<5	<5
Halogenated Aliphatic Compounds										
Dichlorodifluoromethane	µg/L								<50	<50
Chloromethane	µg/L								<50	<50
Vinyl chloride	µg/L			0.0003		0.003			<50	<50

Table 7
Quality Control Rinsate and Blank Results
E2012-031

Analyte grouping/Analyte	Units	ANZECC & ARMCANZ (2000)[1]		ADWG (2004)[2]		DOH (2006)[3]	ANZECC & ARMCANZ (2000)[1]		4/06/2013	
		Fresh Waters[4]	Marine Waters[4]	Drinking Water Health Value	Drinking Water Aesthetic Value	Domestic non-potable	Short-term Irrigation Water	Long-term Irrigation	QC6	QC7
Bromomethane	µg/L								<50	<50
Chloroethane	µg/L								<50	<50
Trichlorofluoromethane	µg/L								<50	<50
1.1-Dichloroethene	µg/L			0.03		0.3			<5	<5
Iodomethane	µg/L								<5	<5
trans-1.2-Dichloroethene	µg/L								<5	<5
1.1-Dichloroethane	µg/L								<5	<5
cis-1.2-Dichloroethene	µg/L								<5	<5
1.1.1-Trichloroethane	µg/L								<5	<5
1.1-Dichloropropylene	µg/L								<5	<5
Carbon Tetrachloride	µg/L								<5	<5
1.2-Dichloroethane	µg/L			0.003		0.03			<5	<5
Trichloroethene	µg/L								<5	<5
Dibromomethane	µg/L								<5	<5
1.1.2-Trichloroethane	µg/L	6500	1900						<5	<5
1.3-Dichloropropane	µg/L								<5	<5
Tetrachloroethene	µg/L			0.05		0.5			<5	<5
1.1.1.2-Tetrachloroethane	µg/L								<5	<5
trans-1.4-Dichloro-2-butene	µg/L								<5	<5
cis-1.4-Dichloro-2-butene	µg/L								<5	<5
1.1.2.2-Tetrachloroethane	µg/L								<5	<5
1.2.3-Trichloropropane	µg/L								<5	<5
Pentachloroethane	µg/L								<5	<5
1.2-Dibromo-3-chloropropane	µg/L								<5	<5
Hexachlorobutadiene	µg/L								<5	<5
Halogenated Aromatic Compounds										
Chlorobenzene	µg/L			0.30	0.01	0.01			<5	<5
Bromobenzene	µg/L								<5	<5
2-Chlorotoluene	µg/L								<5	<5
4-Chlorotoluene	µg/L								<5	<5
1.3-Dichlorobenzene	µg/L	0.26			0.02	0.02			<5	<5
1.4-Dichlorobenzene	µg/L	0.06		0.04	0.003	0.003			<5	<5
1.2-Dichlorobenzene	µg/L	0.16		1.5	0.001	0.001			<5	<5
1.2.4-Trichlorobenzene	µg/L	0.085	80	0.03	0.005	0.005			<5	<5
1.2.3-Trichlorobenzene	µg/L	0.003		0.03	0.005	0.005			<5	<5
Trihalomethanes										
Chloroform	µg/L								<5	<5
Bromodichloromethane	µg/L								<5	<5
Dibromochloromethane	µg/L								<5	<5
Bromoform	µg/L								<5	<5
Phenolic Compounds										
Phenol	µg/L	320	400						<1.0	<1.0
2-Chlorophenol	µg/L	340		300	0.1	3000			<1.0	<1.0
2-Methylphenol	µg/L								<1.0	<1.0
3- & 4-Methylphenol	µg/L								<2.0	<2.0
2-Nitrophenol	µg/L								<1.0	<1.0
2.4-Dimethylphenol	µg/L								<1.0	<1.0
2.4-Dichlorophenol	µg/L	120		200	0.3	2000			<1.0	<1.0
2.6-Dichlorophenol	µg/L								<1.0	<1.0
4-Chloro-3-Methylphenol	µg/L								<1.0	<1.0
2.4.6-Trichlorophenol	µg/L	3		20	2	200			<1.0	<1.0
2.4.5-Trichlorophenol	µg/L								<1.0	<1.0
Pentachlorophenol	µg/L	3.6	11						<2.0	<2.0
Polynuclear Aromatic Hydrocarbons										
Naphthalene	µg/L	16	50						<1.0	<1.0
Acenaphthylene	µg/L								<1.0	<1.0
Acenaphthene	µg/L								<1.0	<1.0
Fluorene	µg/L								<1.0	<1.0
Phenanthrene	µg/L								<1.0	<1.0
Anthracene	µg/L								<1.0	<1.0
Fluoranthene	µg/L								<1.0	<1.0
Pyrene	µg/L								<1.0	<1.0
Benz(a)anthracene	µg/L								<1.0	<1.0
Chrysene	µg/L								<1.0	<1.0
Benzo(b)fluoranthene	µg/L								<1.0	<1.0
Benzo(k)fluoranthene	µg/L								<1.0	<1.0
Benzo(a)pyrene	µg/L			0.01		0.1			<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L								<1.0	<1.0
Dibenz(a.h)anthracene	µg/L								<1.0	<1.0
Benzo(g.h.i)perylene	µg/L								<1.0	<1.0
Total Petroleum Hydrocarbons										
C6 - C9 Fraction	µg/L								<20	<20
C10 - C14 Fraction	µg/L								<50	<50
C15 - C28 Fraction	µg/L								<100	<100
C29 - C36 Fraction	µg/L								<50	<50
C10 - C36 Fraction (sum)	µg/L	600 [4]							<50	<50
Total Recoverable Hydrocarbons										
C6 - C10 Fraction	µg/L								<20	<20
C6 - C10 Fraction minus BTEX	µg/L								<20	<20
>C10 - C16 Fraction	µg/L								<100	<100
>C16 - C34 Fraction	µg/L								<100	<100
>C34 - C40 Fraction	µg/L								<100	<100
>C10 - C40 Fraction (sum)	µg/L								<100	<100
BTEX										
Benzene	µg/L	0.95	0.5	0.001		0.01			<1	<1
Toluene	µg/L			0.80	0.025	0.025			<2	<2
Ethylbenzene	µg/L			0.30	0.003	0.003			<2	<2
meta- & para-Xylene	µg/L	0.2		0.60	0.02	0.02			<2	<2
ortho-Xylene	µg/L	0.3		0.60	0.02	0.02			<2	<2
Total Xylenes	µg/L								<2	<2
Sum of BTEX	µg/L								<1	<1
Naphthalene	µg/L	0.016	0.015						<5	<5

NOTES: 1. SRT Healthy Rivers Action Plan Long Term / Short Term Targets
2. ANZECC 99% protection level for Chlordane
3. ANZECC 99% protection level for Endosulfan
4. Dutch intervention values (2000).
5. pH > 6 / pH < 6
6. ASS disturbance indicators
7. Effluent treatment triggers

Appendix *A*– Certificate of Title

REGISTER NUMBER	
20/D76128	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
3	**13/6/2008**

WESTERN AUSTRALIA

RECORD OF CERTIFICATE OF TITLE

VOLUME **2054** FOLIO **299**

UNDER THE TRANSFER OF LAND ACT 1893

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

REGISTRAR OF TITLES

LAND DESCRIPTION:

LOT 20 ON DIAGRAM 76128

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

HAZELLAND PTY LTD OF SUITE 5, 17 FOLEY STREET, BALCATTA
(TP K606822) REGISTERED 26 MAY 2008

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

1.	*K606823	NOTIFICATION CONTAINS FACTORS AFFECTING THE WITHIN LAND. LODGED 26.5.2008.
2.	*L520703	MEMORIAL. CONTAMINATED SITES ACT 2003 (CONTAMINATED SITE - REMEDIATION REQUIRED) REGISTERED 30.12.2010.

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

---END OF CERTIFICATE OF TITLE---

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND:	2054-299 (20/D76128).
PREVIOUS TITLE:	1697-970, 1103-577.
PROPERTY STREET ADDRESS:	LOT 20 ADELAIDE ST, HAZELMERE.
LOCAL GOVERNMENT AREA:	CITY OF SWAN.

MDW
ENVIRONMENTAL SERVICES

Appendix *B*– Groundwater Field Sheets

MDW
ENVIRONMENTAL SERVICES

Monitoring Well Field Record

Job #:______ Client: ______ Location: wasterock

Well ID: MW 1 Date: 3-6-13 Sampler: DA/BV

Monitoring Well Information

Depth to Water: 3987 (mm TOC) Depth to Bottom: 6812 (m)

Standpipe: ______(m) Monument Cover ☐

Lock: ☐ None ☐ Padlock (YL) ☐ Enviro Cap ☐ Gatic

Equipment IDs

Water Quality Meter: YSI TTA Kit: ______

Pump: Low flow TALK Kit: ______

Dipper: Consite - QC Samples: ☐Yes ☐No ID:______

Hydrocarbon Detected (Interface Meter:) ☐Yes ☑No If yes, depth of free product: ______

Sampling

Sample ID: WRMW 1-04 COC No: E2012-031-007

Time	pH	EC	DO	Temp	Redox	TTA	TALK
10.13	5.80	721	3.1	20.9	134.9		
10.17	5.80	823	3.4	21.8	129.2		
10.21	5.81	822	3.5	21.9	127.0		

Comments

MDW
ENVIRONMENTAL SERVICES

Monitoring Well Field Record

Job #:______________ Client: ________________ Location: Wasterock / Hazelmere .

Well ID: MW2 Date: 3-6-13 Sampler: OA/BV

Monitoring Well Information

Depth to Water: 7924 (mm TOC) Depth to Bottom: 11.242 (m)

Standpipe: __________(m) Monument Cover ☐

Lock: ☐ None ☐ Padlock (YL) ☐ Enviro Cap ☐ Gatic

Equipment IDs

Water Quality Meter: ______________ TTA Kit: ______________

Pump: ______________ TALK Kit: ______________

Dipper: ______________ QC Samples: ☐Yes ☐No ID:________

Hydrocarbon Detected (Interface Meter:) ☐Yes ☐No If yes, depth of free product: ________

Sampling

Sample ID: WRMW2-004 COC No: E2012-031-007

Time	pH	EC	DO	Temp	Redox	TTA	TALK
9.31	6.92	4.6	302	17.8	81.4		
9.34	4.73	403.9	1.2	20.3	171.7		
9.38	4.68	386.9	1.9	20.5	172.5		
9.39	4.67	378.2	2.3	20.5	172.5		

Comments

MDW

ENVIRONMENTAL SERVICES

Monitoring Well Field Record

Job #:____________ Client: ____________ Location: Hazelmere

Well ID: MW3 Date: 3-6-13 Sampler: DA/BV

Monitoring Well Information

Depth to Water: -12197 (mm TOC) Depth to Bottom: 15041 (m)

Standpipe: ____________(m) Monument Cover ☐

Lock: ☐ None ☐ Padlock (YL) ☐ Enviro Cap ☐ Gatic

Equipment IDs

Water Quality Meter: YSI TTA Kit: ____________

Pump: Low flow TALK Kit: ____________

Dipper: Consite. QC Samples: ☐Yes ☐No ID:________

Hydrocarbon Detected (Interface Meter:) ☐Yes ☑No If yes, depth of free product: ________

Sampling

Sample ID: WRMW3 - 04 COC No: E2012-031-007

Time	pH	EC	DO	Temp	Redox	TTA	TALK
8.50	7.44	~~2~~923	2.0	19.1	81.6		
8.55	7.07	848	3.3	20.5	36.1		
9.00	7.21	822	5.5	19.7	47.3		
902.	7.20	832	5.6	20.5	50.1		

Comments

MDW
ENVIRONMENTAL SERVICES

Monitoring Well Field Record

Job #: ______ Client: ______ Location: Westerocks / Hazelmere

Well ID: MW4 Date: 3-6-13 Sampler: BV/DA

Monitoring Well Information

Depth to Water: ~~8870~~ 8872 (mm TOC) Depth to Bottom: 11.46 (m)

Standpipe: ______ (m) Monument Cover ☑

Lock: ☐ None ☑ Padlock (YL) ☐ Enviro Cap ☐ Gatic

Equipment IDs

Water Quality Meter: YSI TTA Kit: ______

Pump: low flow TALK Kit: ______

Dipper: Con Site. QC Samples: ☑Yes ☐No ID: QC4/QC5

Hydrocarbon Detected (Interface Meter:) ☐Yes ☐No If yes, depth of free product: ______

Sampling

Sample ID: WRMW4-04 COC No: E2012-031-004

Time	pH	EC	DO	Temp	Redox	TTA	TALK
10:46	5.34	135.3	5.3	20.4	165.6		
10:54	4.62	125.6	4.8	21.1	190.7		
10:58	4.58	118.7	4.9	21.0	197.0		

Comments

QC4 (dup)
QC5 (trip)

Potential free hydrocarbon product - very minor could be less than a mil thick.

MDW
ENVIRONMENTAL SERVICES

Monitoring Well Field Record

Job #: ____________ Client: ____________ Location: WASTEROCK/HAZELMERE

Well ID: MW5 Date: 3/6/13 Sampler: DA/BV

Monitoring Well Information

Depth to Water: 9322 (mm TOC) Depth to Bottom: 12.375 (m)

Standpipe: ________ (m) Monument Cover ☐

Lock: ☐ None ☑ Padlock (YL) ☐ Enviro Cap ☐ Gatic

Equipment IDs

Water Quality Meter: WQM 1 TTA Kit: ____________

Pump: LOW FLOW TALK Kit: ____________

Dipper: CONSITES. QC Samples: ☐Yes ☐No ID: ______

Hydrocarbon Detected (Interface Meter:) ☐Yes ☐No If yes, depth of free product: ______

Sampling

Sample ID: EWRMW5-04 COC No: E2012-031-007

Time	pH	EC	DO	Temp	Redox	TTA	TALK
11:45	5.40	146.2	5.2	21.6	169.4		
11:50	5.22	147.2	3.1	21.9	170.6		
11:55	5.22	144.9	3.3	21.8	172.6		

Comments

~~lab QC~~ (2x extra glass bottles

MDW
ENVIRONMENTAL SERVICES

Monitoring Well Field Record

Job #:________ Client: ________ Location: WASTEROCK / HAZELMERE

Well ID: MW6 ~~MW6~~ Date: 3/6/13 Sampler: DA/BV

Monitoring Well Information

Depth to Water: ~~9.9~~ 9917 (mm TOC) Depth to Bottom: 9917 (m)

Standpipe: ______ (m) Monument Cover ☑

Lock: ☐ None ☑ Padlock (YL) ☐ Enviro Cap ☐ Gatic

Equipment IDs

Water Quality Meter: WQM 1 TTA Kit: ______

Pump: LOW FLOW TALK Kit: ______

Dipper: CON SITES QC Samples: ☐Yes ☑No ID:______

Hydrocarbon Detected (Interface Meter:) ☐Yes ☑No If yes, depth of free product: ______

Sampling

Sample ID: WRMW6-04 COC No: E2012-031-007

Time	pH	EC	DO	Temp	Redox	TTA	TALK

Comments

WELL DRY - NO SAMPLES COLLECTED.

MDW Environmental Services

Field Quality Control Log

Sheet: 1 of

Project No:	E2013-031
Project Name:	WASTEROCK
Date Start:	3/6/13
Date Ended:	" "
Primary + Duplicate (Laboratory)	ALS ☑ ARL ☐ Other:
Triplicte (Laboratory)	ALS ☐ ARL ☑ Other:

Field Personnel (initials): DA.

Project Manager (initials):

Matrix being Sampled

Soil ☐ Groundwater ☑ Other:

Air ☐ Surface Water ☐

Field QC Sample ID	Sampling Date	Description
QC4	3/6/13	DUP OF WRMW4-004
QC5	"	TRIP OF " "
QC6	"	BLANK
QC7	"	RINSATE.

Appendix *C*– Laboratory Results and Documentation

1433

Site: WASTEROCK	**MDW** ENVIRONMENTAL SERVICES
Job #: E2012-031	**Mobile Dewatering Environmental Services**
Sampler: DALE / BRONNIE	Unit 1, 22 Elmsfield Road
CoC #: E2012-031-007	Midvale WA 6056
Quote #: EP/784/12	P: 08 9250 6960
Laboratory: ALS ENVIRO	F: 08 9250 8269
Date and time delivered: 5/6/13 0920	E: info@environmentalservices.com.au
Received by: M Westall	

Comments:

PLEASE CONTACT DALE (0424153646) WITH ANY ISSUES.

Analysis Detection Limits

Environmental Division
Perth
Work Order
EP1304187

Telephone : +61-8-9209 7655

Sample ID	Lab ID	Type	Sampling Date	Sampling Time	ASS SUITE 2
WRMW1-004	1	WATER	3/6/13	1200	✓
WRMW2-004	2				✓
WRMW3-004	3				✓
WRMW4-004	4				✓
WRMW5-004	5				✓
QC4	6				✓
~~QC5~~					
QC6	7				✓
QC7	8				✓

Condition of Sample: Cool / Ambient / Warm

Relinquished by: DALE A

ALS Group

Environmental Division

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order : **EP1304187**

Client	: **MOBILE DEWATERING**	Laboratory	: Environmental Division Perth
Contact	: INFO	Contact	: Lauren Ockwell
Address	: PO BOX 239 MIDLAND WA, AUSTRALIA 6939	Address	: 10 Hod Way Malaga WA Australia 6090
E-mail	: info@environmentalservices.com.au	E-mail	: lauren.ockwell@alsenviro.com
Telephone	: +61 08 9250 4995	Telephone	: 08 9209 7606
Facsimile	: ----	Facsimile	: 08 9209 7600
Project	: E2012-031	Page	: 1 of 3
Order number	: ----		
C-O-C number	: E2012-031-007	Quote number	: EP2012MOBDEW0134 (EP/785/12)
Site	: WASTEROCK		
Sampler	: Dale/Bronnie	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 05-JUN-2013	Issue Date	: 05-JUN-2013 12:28
Client Requested Due Date	: 12-JUN-2013	Scheduled Reporting Date	: **12-JUN-2013**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: 3.7 - Ice present
No. of coolers/boxes	: 3 Medium Hard Esky	No. of samples received	: 8
Security Seal	: Intact.	No. of samples analysed	: 8

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- Samples received in appropriately pretreated and preserved containers.
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- **Samples received in appropriately pretreated and preserved containers.**
- **COD analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (SamplesPerth@alsenviro.com)
- Sample Disposal - Aqueous (14 days), Solid (60 days) from date of completion of Work Order.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exist.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process neccessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default to 15:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory for processing purposes and will be shown bracketed without a time component.

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EA005P pH (PC)	WATER - EA010P Conductivity (PC)	WATER - EA015H Total Dissolved Solids - High Level	WATER - EA025H Suspended Solids (High Level)	WATER - EA045 Turbidity	WATER - ED038 Acidity as CaCO3	WATER - EG020F Dissolved Metals by ICPMS	WATER - EG020T Total Recoverable Metals by ICPMS
EP1304187-001	03-JUN-2013 12:00	WRMW1-004	✓	✓	✓	✓	✓	✓	✓	✓
EP1304187-002	03-JUN-2013 12:00	WRMW2-004	✓	✓	✓	✓	✓	✓	✓	✓
EP1304187-003	03-JUN-2013 12:00	WRMW3-004	✓	✓	✓	✓	✓	✓	✓	✓
EP1304187-004	03-JUN-2013 12:00	WRMW4-004	✓	✓	✓	✓	✓	✓	✓	✓
EP1304187-005	03-JUN-2013 12:00	WRMW5-004	✓	✓	✓	✓	✓	✓	✓	✓
EP1304187-006	03-JUN-2013 12:00	QC4	✓	✓	✓	✓	✓	✓	✓	✓
EP1304187-007	03-JUN-2013 12:00	QC6	✓	✓	✓	✓	✓	✓	✓	✓
EP1304187-008	03-JUN-2013 12:00	QC7	✓	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EG035T Total Mercury by FIMS	WATER - EG050G-F Hexavalent Chromium by Discrete Analyser - Filtered	WATER - EG051G Ferrous Iron by Discrete Analyser	WATER - EK085M Sulfide as S 2-	WATER - EP026ST COD - Sealed Tube	WATER - EP030 BOD	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)	WATER - NT-08A Total Nitrogen + NO2 + NO3 + NH3 + Total P +
EP1304187-001	03-JUN-2013 12:00	WRMW1-004	✓	✓	✓	✓	✓	✓	✓	✓
EP1304187-002	03-JUN-2013 12:00	WRMW2-004	✓	✓	✓	✓	✓	✓	✓	✓
EP1304187-003	03-JUN-2013 12:00	WRMW3-004	✓	✓	✓	✓	✓	✓	✓	✓
EP1304187-004	03-JUN-2013 12:00	WRMW4-004	✓	✓	✓	✓	✓	✓	✓	✓
EP1304187-005	03-JUN-2013 12:00	WRMW5-004	✓	✓	✓	✓	✓	✓	✓	✓
EP1304187-006	03-JUN-2013 12:00	QC4	✓	✓	✓	✓	✓	✓	✓	✓
EP1304187-007	03-JUN-2013 12:00	QC6	✓	✓	✓	✓	✓	✓	✓	✓
EP1304187-008	03-JUN-2013 12:00	QC7	✓	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - W-09 TPH/VOC	WATER - W-12 OC/OP Pesticides	WATER - W-14A PAH/Phenols (SIM)
EP1304187-001	03-JUN-2013 12:00	WRMW1-004	✓	✓	✓
EP1304187-002	03-JUN-2013 12:00	WRMW2-004	✓	✓	✓
EP1304187-003	03-JUN-2013 12:00	WRMW3-004	✓	✓	✓
EP1304187-004	03-JUN-2013 12:00	WRMW4-004	✓	✓	✓
EP1304187-005	03-JUN-2013 12:00	WRMW5-004	✓	✓	✓
EP1304187-006	03-JUN-2013 12:00	QC4	✓	✓	✓
EP1304187-007	03-JUN-2013 12:00	QC6	✓	✓	✓
EP1304187-008	03-JUN-2013 12:00	QC7	✓	✓	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method		Due for extraction	Due for analysis	Samples Received		Instructions Received	
Client Sample ID(s)	Container			Date	Evaluation	Date	Evaluation
EA005-P: pH by PC Titrator							
QC4	Clear Plastic Bottle - Natural	03-JUN-2013	----	05-JUN-2013	×	----	----
QC6	Clear Plastic Bottle - Natural	03-JUN-2013	----	05-JUN-2013	×	----	----
QC7	Clear Plastic Bottle - Natural	03-JUN-2013	----	05-JUN-2013	×	----	----
WRMW1-004	Clear Plastic Bottle - Natural	03-JUN-2013	----	05-JUN-2013	×	----	----
WRMW2-004	Clear Plastic Bottle - Natural	03-JUN-2013	----	05-JUN-2013	×	----	----
WRMW3-004	Clear Plastic Bottle - Natural	03-JUN-2013	----	05-JUN-2013	×	----	----
WRMW4-004	Clear Plastic Bottle - Natural	03-JUN-2013	----	05-JUN-2013	×	----	----
WRMW5-004	Clear Plastic Bottle - Natural	03-JUN-2013	----	05-JUN-2013	×	----	----
EG050G-F: Hexavalent Chromium by Discrete Analyser - Dissolved							
QC6	Clear Plastic Bottle - Natural	----	04-JUN-2013	05-JUN-2013	×	----	----
QC7	Clear Plastic Bottle - Natural	----	04-JUN-2013	05-JUN-2013	×	----	----

Requested Deliverables

ACCOUNTS PAYABLE (WA)

- A4 - AU Tax Invoice (INV)	Email	deb@mobiledewatering.com.au

INFO

- *AU Certificate of Analysis - NATA (COA)	Email	info@environmentalservices.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	info@environmentalservices.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	info@environmentalservices.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	info@environmentalservices.com.au
- Chain of Custody (CoC) (COC)	Email	info@environmentalservices.com.au
- EDI Format - ENMRG (ENMRG)	Email	info@environmentalservices.com.au
- EDI Format - ESDAT (ESDAT)	Email	info@environmentalservices.com.au
- EDI Format - XTab (XTAB)	Email	info@environmentalservices.com.au

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **EP1304187**	Page	: 1 of 19
Client	: **MOBILE DEWATERING**	Laboratory	: Environmental Division Perth
Contact	: INFO	Contact	: Lauren Ockwell
Address	: PO BOX 239 MIDLAND WA, AUSTRALIA 6939	Address	: 10 Hod Way Malaga WA Australia 6090
E-mail	: info@environmentalservices.com.au	E-mail	: lauren.ockwell@alsenviro.com
Telephone	: +61 08 9250 4995	Telephone	: 08 9209 7606
Facsimile	: ----	Facsimile	: 08 9209 7600
Project	: E2012-031	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: E2012-031-007	Date Samples Received	: 05-JUN-2013
Sampler	: Dale/Bronnie	Issue Date	: 12-JUN-2013
Site	: WASTEROCK		
		No. of samples received	: 8
Quote number	: EP/785/12	No. of samples analysed	: 8

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **EG020: It is recognised that total concentration is less than dissolved for some metal analytes. However, the difference is within experimental variation of the methods**
- **EG035T: Poor mercury matrix spike recovery due to matrix effects.**

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Agnes Szilagyi	Senior Organic Chemist	Perth Organics
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Benjamin Nicholson	Metals Chemist	Perth Inorganics
Chas Tucker	Inorganic Chemist	Perth Inorganics Perth Inorganics Perth Inorganics
Hoa Nguyen	Senior Inorganic Chemist	Sydney Inorganics
Nancy Wang	Senior Semivolatile Instrument Chemist	Melbourne Organics
Scott James	Laboratory Manager	Perth Inorganics

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	WRMW1-004	WRMW2-004	WRMW3-004	WRMW4-004	WRMW5-004
			Client sampling date / time	04-JUN-2013 12:00	04-JUN-2013 12:00	04-JUN-2013 12:00	04-JUN-2013 12:00	04-JUN-2013 12:00
Compound	*CAS Number*	*LOR*	*Unit*	EP1304187-001	EP1304187-002	EP1304187-003	EP1304187-004	EP1304187-005
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	6.69	5.57	7.79	5.64	6.19
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	882	371	886	117	134
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	----	10	mg/L	500	221	640	96	118
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	604	154	5340	6	36
EA045: Turbidity								
Turbidity	----	0.1	NTU	203	96.6	9210	6.5	45.3
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	34	<1	136	<1	2
Total Alkalinity as CaCO3	----	1	mg/L	34	<1	136	<1	2
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	42	32	16	20	15
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	94	10	44	1	9
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	182	89	155	17	25
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.04	0.03	0.03	0.11	0.06
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	0.004	0.002	0.056	0.003	0.002
Nickel	7440-02-0	0.001	mg/L	0.003	0.003	0.002	0.003	0.002
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	0.047	0.047	0.017	0.027	0.016
Iron	7439-89-6	0.05	mg/L	0.27	0.44	<0.05	<0.05	<0.05
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	7.43	4.27	44.2	0.48	2.28
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.007	<0.001	<0.001

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	WRMW1-004	WRMW2-004	WRMW3-004	WRMW4-004	WRMW5-004
			Client sampling date / time	04-JUN-2013 12:00	04-JUN-2013 12:00	04-JUN-2013 12:00	04-JUN-2013 12:00	04-JUN-2013 12:00
Compound	CAS Number	LOR	Unit	EP1304187-001	EP1304187-002	EP1304187-003	EP1304187-004	EP1304187-005
EG020T: Total Metals by ICP-MS - Continued								
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	**0.0002**	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	**0.006**	**0.005**	**0.071**	<0.001	**0.002**
Copper	7440-50-8	0.001	mg/L	**0.004**	**0.007**	**0.072**	**0.003**	**0.003**
Lead	7439-92-1	0.001	mg/L	**0.012**	**0.005**	**0.156**	<0.001	**0.003**
Manganese	7439-96-5	0.001	mg/L	**0.003**	**0.001**	**0.110**	**0.001**	<0.001
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	**0.004**	**0.003**	**0.024**	**0.002**	**0.001**
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	**0.024**	**0.046**	**0.188**	**0.021**	**0.012**
Iron	7439-89-6	0.05	mg/L	**0.54**	**1.97**	**18.0**	**0.07**	**0.14**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	**0.0001**	<0.0001	<0.0001
EG050F: Dissolved Hexavalent Chromium								
Hexavalent Chromium	18540-29-9	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EG051G: Ferrous Iron by Discrete Analyser								
Ferrous Iron	----	0.05	mg/L	**0.25**	**0.44**	<0.05	<0.05	<0.05
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.06**	**0.02**	**0.11**	**0.02**	**0.02**
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	----	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.32**	**0.84**	**0.18**	**4.91**	**1.90**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.32**	**0.84**	**0.18**	**4.91**	**1.90**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**0.5**	**0.2**	**0.6**	<0.5	**0.6**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**0.8**	**1.0**	**0.8**	**4.9**	**2.5**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.04**	**0.07**	**0.38**	<0.01	**0.02**
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	WRMW1-004	WRMW2-004	WRMW3-004	WRMW4-004	WRMW5-004
			Client sampling date / time	04-JUN-2013 12:00	04-JUN-2013 12:00	04-JUN-2013 12:00	04-JUN-2013 12:00	04-JUN-2013 12:00
Compound	CAS Number	LOR	Unit	EP1304187-001	EP1304187-002	EP1304187-003	EP1304187-004	EP1304187-005
EK085M: Sulfide as S2-								
Sulfide as S2-	18496-25-8	0.1	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
EP026ST: Chemical Oxygen Demand (Sealed Tube)								
Chemical Oxygen Demand	----	5	mg/L	**18**	<5	**18**	<5	<5
EP030: Biochemical Oxygen Demand (BOD)								
Biochemical Oxygen Demand	----	2	mg/L	<2	<2	**6**	<2	<2
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
beta-BHC	319-85-7	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
gamma-BHC	58-89-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
delta-BHC	319-86-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Heptachlor	76-44-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Aldrin	309-00-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Dieldrin	60-57-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDE	72-55-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Endrin	72-20-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDD	72-54-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDT	50-29-3	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Endrin ketone	53494-70-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Methoxychlor	72-43-5	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
^ Total Chlordane (sum)	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of DDD + DDE + DDT	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)	Client sample ID			WRMW1-004	WRMW2-004	WRMW3-004	WRMW4-004	WRMW5-004
	Client sampling date / time			04-JUN-2013 12:00	04-JUN-2013 12:00	04-JUN-2013 12:00	04-JUN-2013 12:00	04-JUN-2013 12:00
Compound	CAS Number	LOR	Unit	EP1304187-001	EP1304187-002	EP1304187-003	EP1304187-004	EP1304187-005
EP068B: Organophosphorus Pesticides (OP) - Continued								
Monocrotophos	6923-22-4	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Dimethoate	60-51-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Diazinon	333-41-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Parathion-methyl	298-00-0	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Malathion	121-75-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Fenthion	55-38-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Parathion	56-38-2	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Fenamiphos	22224-92-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Prothiofos	34643-46-4	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Ethion	563-12-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Carbophenothion	786-19-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
EP074A: Monocyclic Aromatic Hydrocarbons								
Styrene	100-42-5	5	µg/L	<5	<5	<5	<5	<5
Isopropylbenzene	98-82-8	5	µg/L	<5	<5	<5	<5	<5
n-Propylbenzene	103-65-1	5	µg/L	<5	<5	<5	<5	<5
1.3.5-Trimethylbenzene	108-67-8	5	µg/L	<5	<5	<5	<5	<5
sec-Butylbenzene	135-98-8	5	µg/L	<5	<5	<5	<5	<5
1.2.4-Trimethylbenzene	95-63-6	5	µg/L	<5	<5	<5	<5	<5
tert-Butylbenzene	98-06-6	5	µg/L	<5	<5	<5	<5	<5
p-Isopropyltoluene	99-87-6	5	µg/L	<5	<5	<5	<5	<5
n-Butylbenzene	104-51-8	5	µg/L	<5	<5	<5	<5	<5
EP074B: Oxygenated Compounds								
Vinyl Acetate	108-05-4	50	µg/L	<50	<50	<50	<50	<50
2-Butanone (MEK)	78-93-3	50	µg/L	<50	<50	<50	<50	<50
4-Methyl-2-pentanone (MIBK)	108-10-1	50	µg/L	<50	<50	<50	<50	<50
2-Hexanone (MBK)	591-78-6	50	µg/L	<50	<50	<50	<50	<50
EP074C: Sulfonated Compounds								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Compound	CAS Number	LOR	Unit	WRMW1-004	WRMW2-004	WRMW3-004	WRMW4-004	WRMW5-004
			Client sampling date / time	04-JUN-2013 12:00	04-JUN-2013 12:00	04-JUN-2013 12:00	04-JUN-2013 12:00	04-JUN-2013 12:00
				EP1304187-001	EP1304187-002	EP1304187-003	EP1304187-004	EP1304187-005
EP074C: Sulfonated Compounds - Continued								
Carbon disulfide	75-15-0	5	µg/L	<5	<5	<5	<5	<5
EP074D: Fumigants								
2.2-Dichloropropane	594-20-7	5	µg/L	<5	<5	<5	<5	<5
1.2-Dichloropropane	78-87-5	5	µg/L	<5	<5	<5	<5	<5
cis-1.3-Dichloropropylene	10061-01-5	5	µg/L	<5	<5	<5	<5	<5
trans-1.3-Dichloropropylene	10061-02-6	5	µg/L	<5	<5	<5	<5	<5
1.2-Dibromoethane (EDB)	106-93-4	5	µg/L	<5	<5	<5	<5	<5
EP074E: Halogenated Aliphatic Compounds								
Dichlorodifluoromethane	75-71-8	50	µg/L	<50	<50	<50	<50	<50
Chloromethane	74-87-3	50	µg/L	<50	<50	<50	<50	<50
Vinyl chloride	75-01-4	50	µg/L	<50	<50	<50	<50	<50
Bromomethane	74-83-9	50	µg/L	<50	<50	<50	<50	<50
Chloroethane	75-00-3	50	µg/L	<50	<50	<50	<50	<50
Trichlorofluoromethane	75-69-4	50	µg/L	<50	<50	<50	<50	<50
1.1-Dichloroethene	75-35-4	5	µg/L	<5	<5	<5	<5	<5
Iodomethane	74-88-4	5	µg/L	<5	<5	<5	<5	<5
trans-1.2-Dichloroethene	156-60-5	5	µg/L	<5	<5	<5	<5	<5
1.1-Dichloroethane	75-34-3	5	µg/L	<5	<5	<5	<5	<5
cis-1.2-Dichloroethene	156-59-2	5	µg/L	<5	<5	<5	<5	<5
1.1.1-Trichloroethane	71-55-6	5	µg/L	<5	<5	<5	<5	<5
1.1-Dichloropropylene	563-58-6	5	µg/L	<5	<5	<5	<5	<5
Carbon Tetrachloride	56-23-5	5	µg/L	<5	<5	<5	<5	<5
1.2-Dichloroethane	107-06-2	5	µg/L	<5	<5	<5	<5	<5
Trichloroethene	79-01-6	5	µg/L	<5	<5	<5	<5	<5
Dibromomethane	74-95-3	5	µg/L	<5	<5	<5	<5	<5
1.1.2-Trichloroethane	79-00-5	5	µg/L	<5	<5	<5	<5	<5
1.3-Dichloropropane	142-28-9	5	µg/L	<5	<5	<5	<5	<5
Tetrachloroethene	127-18-4	5	µg/L	<5	<5	<5	<5	<5
1.1.1.2-Tetrachloroethane	630-20-6	5	µg/L	<5	<5	<5	<5	<5
trans-1.4-Dichloro-2-butene	110-57-6	5	µg/L	<5	<5	<5	<5	<5
cis-1.4-Dichloro-2-butene	1476-11-5	5	µg/L	<5	<5	<5	<5	<5
1.1.2.2-Tetrachloroethane	79-34-5	5	µg/L	<5	<5	<5	<5	<5
1.2.3-Trichloropropane	96-18-4	5	µg/L	<5	<5	<5	<5	<5
Pentachloroethane	76-01-7	5	µg/L	<5	<5	<5	<5	<5

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	WRMW1-004	WRMW2-004	WRMW3-004	WRMW4-004	WRMW5-004
			Client sampling date / time	04-JUN-2013 12:00	04-JUN-2013 12:00	04-JUN-2013 12:00	04-JUN-2013 12:00	04-JUN-2013 12:00
Compound	CAS Number	LOR	Unit	EP1304187-001	EP1304187-002	EP1304187-003	EP1304187-004	EP1304187-005
EP074E: Halogenated Aliphatic Compounds - Continued								
1.2-Dibromo-3-chloropropane	96-12-8	5	µg/L	<5	<5	<5	<5	<5
Hexachlorobutadiene	87-68-3	5	µg/L	<5	<5	<5	<5	<5
EP074F: Halogenated Aromatic Compounds								
Chlorobenzene	108-90-7	5	µg/L	<5	<5	<5	<5	<5
Bromobenzene	108-86-1	5	µg/L	<5	<5	<5	<5	<5
2-Chlorotoluene	95-49-8	5	µg/L	<5	<5	<5	<5	<5
4-Chlorotoluene	106-43-4	5	µg/L	<5	<5	<5	<5	<5
1.3-Dichlorobenzene	541-73-1	5	µg/L	<5	<5	<5	<5	<5
1.4-Dichlorobenzene	106-46-7	5	µg/L	<5	<5	<5	<5	<5
1.2-Dichlorobenzene	95-50-1	5	µg/L	<5	<5	<5	<5	<5
1.2.4-Trichlorobenzene	120-82-1	5	µg/L	<5	<5	<5	<5	<5
1.2.3-Trichlorobenzene	87-61-6	5	µg/L	<5	<5	<5	<5	<5
EP074G: Trihalomethanes								
Chloroform	67-66-3	5	µg/L	<5	<5	<5	<5	<5
Bromodichloromethane	75-27-4	5	µg/L	<5	<5	<5	<5	<5
Dibromochloromethane	124-48-1	5	µg/L	<5	<5	<5	<5	<5
Bromoform	75-25-2	5	µg/L	<5	<5	<5	<5	<5
EP075(SIM)A: Phenolic Compounds								
Phenol	108-95-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chlorophenol	95-57-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2-Methylphenol	95-48-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
3- & 4-Methylphenol	1319-77-3	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
2-Nitrophenol	88-75-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.4-Dimethylphenol	105-67-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.4-Dichlorophenol	120-83-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.6-Dichlorophenol	87-65-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
4-Chloro-3-Methylphenol	59-50-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.4.6-Trichlorophenol	88-06-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.4.5-Trichlorophenol	95-95-4	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Pentachlorophenol	87-86-5	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	WRMW1-004	WRMW2-004	WRMW3-004	WRMW4-004	WRMW5-004
			Client sampling date / time	04-JUN-2013 12:00	04-JUN-2013 12:00	04-JUN-2013 12:00	04-JUN-2013 12:00	04-JUN-2013 12:00
Compound	CAS Number	LOR	Unit	EP1304187-001	EP1304187-002	EP1304187-003	EP1304187-004	EP1304187-005
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(b)fluoranthene	205-99-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (WHO)	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	**200**	<100	**110**	<100	<100
C29 - C36 Fraction	----	50	µg/L	<50	<50	**100**	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L	**200**	<50	**210**	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft								
C6 - C10 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	----	20	µg/L	<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L	**220**	<100	**180**	<100	<100
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L	**220**	<100	**180**	<100	<100
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	WRMW1-004	WRMW2-004	WRMW3-004	WRMW4-004	WRMW5-004
			Client sampling date / time	04-JUN-2013 12:00	04-JUN-2013 12:00	04-JUN-2013 12:00	04-JUN-2013 12:00	04-JUN-2013 12:00
Compound	CAS Number	LOR	Unit	EP1304187-001	EP1304187-002	EP1304187-003	EP1304187-004	EP1304187-005
EP080: BTEXN - Continued								
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ Total Xylenes	1330-20-7	2	µg/L	<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.1	%	88.0	98.0	94.1	86.8	105
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.1	%	76.6	87.9	83.5	80.9	96.8
EP074S: VOC Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	101	100	91.0	87.1	102
Toluene-D8	2037-26-5	0.1	%	93.0	101	96.9	100	88.5
4-Bromofluorobenzene	460-00-4	0.1	%	88.8	92.3	91.0	86.8	88.1
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	20.7	28.4	29.9	30.1	37.5
2-Chlorophenol-D4	93951-73-6	0.1	%	58.5	75.9	71.2	79.5	97.4
2.4.6-Tribromophenol	118-79-6	0.1	%	75.9	106	114	84.1	106
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	58.1	108	76.7	88.3	81.4
Anthracene-d10	1719-06-8	0.1	%	101	79.9	86.6	86.6	106
4-Terphenyl-d14	1718-51-0	0.1	%	120	85.9	99.8	117	102
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	108	107	99.5	97.2	109
Toluene-D8	2037-26-5	0.1	%	94.4	98.8	98.2	100	92.1
4-Bromofluorobenzene	460-00-4	0.1	%	92.9	93.4	93.7	90.1	93.2

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	QC4	QC6	QC7	----	----
			Client sampling date / time	04-JUN-2013 12:00	04-JUN-2013 12:00	04-JUN-2013 12:00	----	----
Compound	CAS Number	LOR	Unit	EP1304187-006	EP1304187-007	EP1304187-008	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**5.15**	**6.13**	**5.85**	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**120**	**12**	**11**	----	----
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	----	10	mg/L	**74**	**18**	**16**	----	----
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	**7**	<5	<5	----	----
EA045: Turbidity								
Turbidity	----	0.1	NTU	**4.6**	**0.3**	<0.1	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	<1	<1	----	----
Total Alkalinity as CaCO3	----	1	mg/L	<1	<1	<1	----	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**17**	**4**	**4**	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**2**	<1	<1	----	----
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	**18**	**5**	**5**	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.11**	<0.01	<0.01	----	----
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Manganese	7439-96-5	0.001	mg/L	**0.002**	<0.001	<0.001	----	----
Nickel	7440-02-0	0.001	mg/L	**0.002**	<0.001	<0.001	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	----	----
Zinc	7440-66-6	0.005	mg/L	**0.030**	<0.005	<0.005	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	----	----
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.48**	<0.01	<0.01	----	----
Arsenic	7440-38-2	0.001	mg/L	**0.001**	<0.001	<0.001	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

			Client sample ID	QC4	QC6	QC7	----	----
			Client sampling date / time	04-JUN-2013 12:00	04-JUN-2013 12:00	04-JUN-2013 12:00	----	----
Compound	CAS Number	LOR	Unit	EP1304187-006	EP1304187-007	EP1304187-008	----	----
EG020T: Total Metals by ICP-MS - Continued								
Cadmium	7440-43-9	0.0001	mg/L	**0.0002**	<0.0001	<0.0001	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Copper	7440-50-8	0.001	mg/L	**0.004**	<0.001	<0.001	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Manganese	7439-96-5	0.001	mg/L	**0.002**	<0.001	<0.001	----	----
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Nickel	7440-02-0	0.001	mg/L	**0.002**	<0.001	<0.001	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Zinc	7440-66-6	0.005	mg/L	**0.020**	<0.005	<0.005	----	----
Iron	7439-89-6	0.05	mg/L	**0.06**	<0.05	<0.05	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----
EG050F: Dissolved Hexavalent Chromium								
Hexavalent Chromium	18540-29-9	0.01	mg/L	<0.01	<0.01	<0.01	----	----
EG051G: Ferrous Iron by Discrete Analyser								
Ferrous Iron	----	0.05	mg/L	<0.05	<0.05	<0.05	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.02**	<0.01	<0.01	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	----	0.01	mg/L	<0.01	<0.01	<0.01	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**4.90**	<0.01	<0.01	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**4.90**	<0.01	<0.01	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.5	<0.1	<0.1	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**4.9**	<0.1	<0.1	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	<0.01	<0.01	<0.01	----	----
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	<0.01	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	QC4	QC6	QC7	----	----
			Client sampling date / time	04-JUN-2013 12:00	04-JUN-2013 12:00	04-JUN-2013 12:00	----	----
Compound	CAS Number	LOR	Unit	EP1304187-006	EP1304187-007	EP1304187-008	----	----
EK085M: Sulfide as S2-								
Sulfide as S2-	18496-25-8	0.1	mg/L	<0.1	<0.1	<0.1	----	----
EP026ST: Chemical Oxygen Demand (Sealed Tube)								
Chemical Oxygen Demand	----	5	mg/L	<5	<5	<5	----	----
EP030: Biochemical Oxygen Demand (BOD)								
Biochemical Oxygen Demand	----	2	mg/L	**3**	<2	<2	----	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.5	µg/L	<0.5	<0.5	<0.5	----	----
Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	<0.5	<0.5	----	----
beta-BHC	319-85-7	0.5	µg/L	<0.5	<0.5	<0.5	----	----
gamma-BHC	58-89-9	0.5	µg/L	<0.5	<0.5	<0.5	----	----
delta-BHC	319-86-8	0.5	µg/L	<0.5	<0.5	<0.5	----	----
Heptachlor	76-44-8	0.5	µg/L	<0.5	<0.5	<0.5	----	----
Aldrin	309-00-2	0.5	µg/L	<0.5	<0.5	<0.5	----	----
Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	<0.5	<0.5	----	----
trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	<0.5	<0.5	----	----
alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	<0.5	<0.5	----	----
cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	<0.5	<0.5	----	----
Dieldrin	60-57-1	0.5	µg/L	<0.5	<0.5	<0.5	----	----
4.4`-DDE	72-55-9	0.5	µg/L	<0.5	<0.5	<0.5	----	----
Endrin	72-20-8	0.5	µg/L	<0.5	<0.5	<0.5	----	----
beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	<0.5	<0.5	----	----
4.4`-DDD	72-54-8	0.5	µg/L	<0.5	<0.5	<0.5	----	----
Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	<0.5	<0.5	----	----
Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	<0.5	<0.5	----	----
4.4`-DDT	50-29-3	2.0	µg/L	<2.0	<2.0	<2.0	----	----
Endrin ketone	53494-70-5	0.5	µg/L	<0.5	<0.5	<0.5	----	----
Methoxychlor	72-43-5	2.0	µg/L	<2.0	<2.0	<2.0	----	----
^ Total Chlordane (sum)	----	0.5	µg/L	<0.5	<0.5	<0.5	----	----
^ Sum of DDD + DDE + DDT	----	0.5	µg/L	<0.5	<0.5	<0.5	----	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.5	µg/L	<0.5	<0.5	<0.5	----	----
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.5	µg/L	<0.5	<0.5	<0.5	----	----
Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	<0.5	<0.5	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Compound	CAS Number	LOR	Unit	QC4	QC6	QC7	----	----
Client sampling date / time				04-JUN-2013 12:00	04-JUN-2013 12:00	04-JUN-2013 12:00	----	----
				EP1304187-006	EP1304187-007	EP1304187-008	----	----
EP068B: Organophosphorus Pesticides (OP) - Continued								
Monocrotophos	6923-22-4	2.0	µg/L	<2.0	<2.0	<2.0	----	----
Dimethoate	60-51-5	0.5	µg/L	<0.5	<0.5	<0.5	----	----
Diazinon	333-41-5	0.5	µg/L	<0.5	<0.5	<0.5	----	----
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	<0.5	<0.5	----	----
Parathion-methyl	298-00-0	2.0	µg/L	<2.0	<2.0	<2.0	----	----
Malathion	121-75-5	0.5	µg/L	<0.5	<0.5	<0.5	----	----
Fenthion	55-38-9	0.5	µg/L	<0.5	<0.5	<0.5	----	----
Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	<0.5	<0.5	----	----
Parathion	56-38-2	2.0	µg/L	<2.0	<2.0	<2.0	----	----
Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	<0.5	<0.5	----	----
Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	<0.5	<0.5	----	----
Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	<0.5	<0.5	----	----
Fenamiphos	22224-92-6	0.5	µg/L	<0.5	<0.5	<0.5	----	----
Prothiofos	34643-46-4	0.5	µg/L	<0.5	<0.5	<0.5	----	----
Ethion	563-12-2	0.5	µg/L	<0.5	<0.5	<0.5	----	----
Carbophenothion	786-19-6	0.5	µg/L	<0.5	<0.5	<0.5	----	----
Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	<0.5	<0.5	----	----
EP074A: Monocyclic Aromatic Hydrocarbons								
Styrene	100-42-5	5	µg/L	<5	<5	<5	----	----
Isopropylbenzene	98-82-8	5	µg/L	<5	<5	<5	----	----
n-Propylbenzene	103-65-1	5	µg/L	<5	<5	<5	----	----
1.3.5-Trimethylbenzene	108-67-8	5	µg/L	<5	<5	<5	----	----
sec-Butylbenzene	135-98-8	5	µg/L	<5	<5	<5	----	----
1.2.4-Trimethylbenzene	95-63-6	5	µg/L	<5	<5	<5	----	----
tert-Butylbenzene	98-06-6	5	µg/L	<5	<5	<5	----	----
p-Isopropyltoluene	99-87-6	5	µg/L	<5	<5	<5	----	----
n-Butylbenzene	104-51-8	5	µg/L	<5	<5	<5	----	----
EP074B: Oxygenated Compounds								
Vinyl Acetate	108-05-4	50	µg/L	<50	<50	<50	----	----
2-Butanone (MEK)	78-93-3	50	µg/L	<50	<50	<50	----	----
4-Methyl-2-pentanone (MIBK)	108-10-1	50	µg/L	<50	<50	<50	----	----
2-Hexanone (MBK)	591-78-6	50	µg/L	<50	<50	<50	----	----
EP074C: Sulfonated Compounds								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Compound	CAS Number	LOR	Unit	QC4	QC6	QC7	----	----
Client sampling date / time				04-JUN-2013 12:00	04-JUN-2013 12:00	04-JUN-2013 12:00	----	----
				EP1304187-006	EP1304187-007	EP1304187-008	----	----
EP074C: Sulfonated Compounds - Continued								
Carbon disulfide	75-15-0	5	µg/L	<5	<5	<5	----	----
EP074D: Fumigants								
2.2-Dichloropropane	594-20-7	5	µg/L	<5	<5	<5	----	----
1.2-Dichloropropane	78-87-5	5	µg/L	<5	<5	<5	----	----
cis-1.3-Dichloropropylene	10061-01-5	5	µg/L	<5	<5	<5	----	----
trans-1.3-Dichloropropylene	10061-02-6	5	µg/L	<5	<5	<5	----	----
1.2-Dibromoethane (EDB)	106-93-4	5	µg/L	<5	<5	<5	----	----
EP074E: Halogenated Aliphatic Compounds								
Dichlorodifluoromethane	75-71-8	50	µg/L	<50	<50	<50	----	----
Chloromethane	74-87-3	50	µg/L	<50	<50	<50	----	----
Vinyl chloride	75-01-4	50	µg/L	<50	<50	<50	----	----
Bromomethane	74-83-9	50	µg/L	<50	<50	<50	----	----
Chloroethane	75-00-3	50	µg/L	<50	<50	<50	----	----
Trichlorofluoromethane	75-69-4	50	µg/L	<50	<50	<50	----	----
1.1-Dichloroethene	75-35-4	5	µg/L	<5	<5	<5	----	----
Iodomethane	74-88-4	5	µg/L	<5	<5	<5	----	----
trans-1.2-Dichloroethene	156-60-5	5	µg/L	<5	<5	<5	----	----
1.1-Dichloroethane	75-34-3	5	µg/L	<5	<5	<5	----	----
cis-1.2-Dichloroethene	156-59-2	5	µg/L	<5	<5	<5	----	----
1.1.1-Trichloroethane	71-55-6	5	µg/L	<5	<5	<5	----	----
1.1-Dichloropropylene	563-58-6	5	µg/L	<5	<5	<5	----	----
Carbon Tetrachloride	56-23-5	5	µg/L	<5	<5	<5	----	----
1.2-Dichloroethane	107-06-2	5	µg/L	<5	<5	<5	----	----
Trichloroethene	79-01-6	5	µg/L	<5	<5	<5	----	----
Dibromomethane	74-95-3	5	µg/L	<5	<5	<5	----	----
1.1.2-Trichloroethane	79-00-5	5	µg/L	<5	<5	<5	----	----
1.3-Dichloropropane	142-28-9	5	µg/L	<5	<5	<5	----	----
Tetrachloroethene	127-18-4	5	µg/L	<5	<5	<5	----	----
1.1.1.2-Tetrachloroethane	630-20-6	5	µg/L	<5	<5	<5	----	----
trans-1.4-Dichloro-2-butene	110-57-6	5	µg/L	<5	<5	<5	----	----
cis-1.4-Dichloro-2-butene	1476-11-5	5	µg/L	<5	<5	<5	----	----
1.1.2.2-Tetrachloroethane	79-34-5	5	µg/L	<5	<5	<5	----	----
1.2.3-Trichloropropane	96-18-4	5	µg/L	<5	<5	<5	----	----
Pentachloroethane	76-01-7	5	µg/L	<5	<5	<5	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	QC4	QC6	QC7	----	----
			Client sampling date / time	04-JUN-2013 12:00	04-JUN-2013 12:00	04-JUN-2013 12:00	----	----
Compound	CAS Number	LOR	Unit	EP1304187-006	EP1304187-007	EP1304187-008	----	----
EP074E: Halogenated Aliphatic Compounds - Continued								
1.2-Dibromo-3-chloropropane	96-12-8	5	µg/L	<5	<5	<5	----	----
Hexachlorobutadiene	87-68-3	5	µg/L	<5	<5	<5	----	----
EP074F: Halogenated Aromatic Compounds								
Chlorobenzene	108-90-7	5	µg/L	<5	<5	<5	----	----
Bromobenzene	108-86-1	5	µg/L	<5	<5	<5	----	----
2-Chlorotoluene	95-49-8	5	µg/L	<5	<5	<5	----	----
4-Chlorotoluene	106-43-4	5	µg/L	<5	<5	<5	----	----
1.3-Dichlorobenzene	541-73-1	5	µg/L	<5	<5	<5	----	----
1.4-Dichlorobenzene	106-46-7	5	µg/L	<5	<5	<5	----	----
1.2-Dichlorobenzene	95-50-1	5	µg/L	<5	<5	<5	----	----
1.2.4-Trichlorobenzene	120-82-1	5	µg/L	<5	<5	<5	----	----
1.2.3-Trichlorobenzene	87-61-6	5	µg/L	<5	<5	<5	----	----
EP074G: Trihalomethanes								
Chloroform	67-66-3	5	µg/L	<5	<5	<5	----	----
Bromodichloromethane	75-27-4	5	µg/L	<5	<5	<5	----	----
Dibromochloromethane	124-48-1	5	µg/L	<5	<5	<5	----	----
Bromoform	75-25-2	5	µg/L	<5	<5	<5	----	----
EP075(SIM)A: Phenolic Compounds								
Phenol	108-95-2	1.0	µg/L	<1.0	<1.0	<1.0	----	----
2-Chlorophenol	95-57-8	1.0	µg/L	<1.0	<1.0	<1.0	----	----
2-Methylphenol	95-48-7	1.0	µg/L	<1.0	<1.0	<1.0	----	----
3- & 4-Methylphenol	1319-77-3	2.0	µg/L	<2.0	<2.0	<2.0	----	----
2-Nitrophenol	88-75-5	1.0	µg/L	<1.0	<1.0	<1.0	----	----
2.4-Dimethylphenol	105-67-9	1.0	µg/L	<1.0	<1.0	<1.0	----	----
2.4-Dichlorophenol	120-83-2	1.0	µg/L	<1.0	<1.0	<1.0	----	----
2.6-Dichlorophenol	87-65-0	1.0	µg/L	<1.0	<1.0	<1.0	----	----
4-Chloro-3-Methylphenol	59-50-7	1.0	µg/L	<1.0	<1.0	<1.0	----	----
2.4.6-Trichlorophenol	88-06-2	1.0	µg/L	<1.0	<1.0	<1.0	----	----
2.4.5-Trichlorophenol	95-95-4	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Pentachlorophenol	87-86-5	2.0	µg/L	<2.0	<2.0	<2.0	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	<1.0	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Compound	CAS Number	LOR	Unit	QC4	QC6	QC7	----	----
Client sampling date / time				04-JUN-2013 12:00	04-JUN-2013 12:00	04-JUN-2013 12:00	----	----
				EP1304187-006	EP1304187-007	EP1304187-008	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Benzo(b)fluoranthene	205-99-2	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	<0.5	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	<1.0	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	<0.5	<0.5	<0.5	----	----
^ Benzo(a)pyrene TEQ (WHO)	----	0.5	µg/L	<0.5	<0.5	<0.5	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	----	----
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	----	----
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	----	----
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	<50	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft								
C6 - C10 Fraction	----	20	µg/L	<20	<20	<20	----	----
^ C6 - C10 Fraction minus BTEX (F1)	----	20	µg/L	<20	<20	<20	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	----	----
Toluene	108-88-3	2	µg/L	<2	<2	<2	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	----	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	QC4	QC6	QC7	----	----
			Client sampling date / time	04-JUN-2013 12:00	04-JUN-2013 12:00	04-JUN-2013 12:00	----	----
				EP1304187-006	EP1304187-007	EP1304187-008	----	----
EP080: BTEXN - Continued								
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	----	----
^ Total Xylenes	1330-20-7	2	µg/L	<2	<2	<2	----	----
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	----	----
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.1	%	96.5	90.7	99.1	----	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.1	%	89.5	84.8	91.6	----	----
EP074S: VOC Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	92.9	97.5	103	----	----
Toluene-D8	2037-26-5	0.1	%	98.2	100	95.9	----	----
4-Bromofluorobenzene	460-00-4	0.1	%	87.9	91.0	91.3	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	25.9	27.9	37.7	----	----
2-Chlorophenol-D4	93951-73-6	0.1	%	76.1	83.5	94.1	----	----
2.4.6-Tribromophenol	118-79-6	0.1	%	82.0	90.7	98.2	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	79.8	89.3	103	----	----
Anthracene-d10	1719-06-8	0.1	%	92.9	90.8	101	----	----
4-Terphenyl-d14	1718-51-0	0.1	%	106	102	115	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	99.9	102	109	----	----
Toluene-D8	2037-26-5	0.1	%	96.1	98.2	96.6	----	----
4-Bromofluorobenzene	460-00-4	0.1	%	93.8	90.7	93.6	----	----

Surrogate Control Limits

Sub-Matrix: **WATER**

Compound	*CAS Number*	*Recovery Limits (%)* Low	High
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	38	129
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	35	135
EP074S: VOC Surrogates			
1.2-Dichloroethane-D4	17060-07-0	62.3	133.9
Toluene-D8	2037-26-5	74.5	124.3
4-Bromofluorobenzene	460-00-4	63.9	118.5
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	15.8	70
2-Chlorophenol-D4	93951-73-6	10	113
2.4.6-Tribromophenol	118-79-6	26	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	32	122
Anthracene-d10	1719-06-8	39	127
4-Terphenyl-d14	1718-51-0	37	137
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	60.5	141.2
Toluene-D8	2037-26-5	73.4	126
4-Bromofluorobenzene	460-00-4	59.6	125.3

Environmental Division

QUALITY CONTROL REPORT

Work Order	: **EP1304187**	Page	: 1 of 21
Client	: **MOBILE DEWATERING**	Laboratory	: Environmental Division Perth
Contact	: INFO	Contact	: Lauren Ockwell
Address	: PO BOX 239 MIDLAND WA, AUSTRALIA 6939	Address	: 10 Hod Way Malaga WA Australia 6090
E-mail	: info@environmentalservices.com.au	E-mail	: lauren.ockwell@alsenviro.com
Telephone	: +61 08 9250 4995	Telephone	: 08 9209 7606
Facsimile	: ----	Facsimile	: 08 9209 7600
Project	: E2012-031	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: WASTEROCK		
C-O-C number	: E2012-031-007	Date Samples Received	: 05-JUN-2013
Sampler	: Dale/Bronnie	Issue Date	: 12-JUN-2013
Order number	: ----		
		No. of samples received	: 8
Quote number	: EP/785/12	No. of samples analysed	: 8

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key :
Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Agnes Szilagyi	Senior Organic Chemist	Perth Organics
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Benjamin Nicholson	Metals Chemist	Perth Inorganics
Chas Tucker	Inorganic Chemist	Perth Inorganics
		Perth Inorganics
		Perth Inorganics
Hoa Nguyen	Senior Inorganic Chemist	Sydney Inorganics
Nancy Wang	Senior Semivolatile Instrument Chemist	Melbourne Organics
Scott James	Laboratory Manager	Perth Inorganics

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA005P: pH by PC Titrator (QC Lot: 2903340)									
EP1304185-001	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.15	7.00	2.1	0% - 20%
EP1304187-004	WRMW4-004	EA005-P: pH Value	----	0.01	pH Unit	5.64	5.35	5.3	0% - 20%
EA010P: Conductivity by PC Titrator (QC Lot: 2903341)									
EP1304185-001	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	106	104	1.6	0% - 20%
EP1304187-004	WRMW4-004	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	117	118	0.0	0% - 20%
EA015: Total Dissolved Solids (QC Lot: 2904685)									
EP1304185-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	152	146	3.7	0% - 50%
EP1304187-006	QC4	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	74	70	4.8	No Limit
EA025: Suspended Solids (QC Lot: 2904686)									
EP1304185-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	106	124	15.6	0% - 20%
EP1304187-008	QC7	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
EA045: Turbidity (QC Lot: 2902954)									
EP1304185-001	Anonymous	EA045: Turbidity	----	0.1	NTU	129	128	0.8	0% - 20%
EP1304187-008	QC7	EA045: Turbidity	----	0.1	NTU	<0.1	<0.1	0.0	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 2903339)									
EP1304185-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	12	12	0.0	0% - 50%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	12	12	0.0	0% - 50%
EP1304187-004	WRMW4-004	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	<1	0.0	No Limit
ED038A: Acidity (QC Lot: 2909581)									
EP1304185-001	Anonymous	ED038: Acidity as CaCO3	----	1	mg/L	6	8	28.6	No Limit
EP1304187-004	WRMW4-004	ED038: Acidity as CaCO3	----	1	mg/L	20	19	5.1	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 2903853)									
EP1304184-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	98	98	0.0	0% - 20%
EP1304187-004	WRMW4-004	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1	2	61.7	No Limit
ED045G: Chloride Discrete analyser (QC Lot: 2903852)									
EP1304184-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	78	80	2.6	0% - 20%
EP1304187-004	WRMW4-004	ED045G: Chloride	16887-00-6	1	mg/L	17	17	0.0	0% - 50%
EG020F: Dissolved Metals by ICP-MS (QC Lot: 2907457)									
EP1304185-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EG020F: Dissolved Metals by ICP-MS (QC Lot: 2907457) - continued									
EP1304185-001	Anonymous	EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.001	0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.001	0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.006	0.006	0.0	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	0.29	0.31	6.2	0% - 20%
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	0.14	0.14	0.0	No Limit
EP1304187-008	QC7	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 2905216)									
EP1304152-013	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EP1304177-002	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	0.003	0.003	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	0.001	0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	0.069	0.068	0.0	0% - 20%
		EG020A-T: Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-T: Aluminium	7429-90-5	0.01	mg/L	0.36	0.36	0.0	0% - 20%

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EG020T: Total Metals by ICP-MS (QC Lot: 2905216) - continued									
EP1304177-002	Anonymous	EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Iron	7439-89-6	0.05	mg/L	1.46	1.47	0.0	0% - 20%
EG020T: Total Metals by ICP-MS (QC Lot: 2905217)									
EP1304187-004	WRMW4-004	EG020B-T: Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	0.0	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 2905218)									
EP1304187-004	WRMW4-004	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.003	0.004	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	0.001	0.002	0.0	No Limit
		EG020A-T: Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.021	0.020	0.0	No Limit
		EG020A-T: Aluminium	7429-90-5	0.01	mg/L	0.48	0.42	12.0	0% - 20%
		EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Iron	7439-89-6	0.05	mg/L	0.07	0.07	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 2905241)									
EP1304112-001	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EP1304137-002	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 2905242)									
EP1304187-004	WRMW4-004	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG050F: Dissolved Hexavalent Chromium (QC Lot: 2904122)									
EP1304185-001	Anonymous	EG050G-F: Hexavalent Chromium	18540-29-9	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EP1304187-007	QC6	EG050G-F: Hexavalent Chromium	18540-29-9	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EG051G: Ferrous Iron by Discrete Analyser (QC Lot: 2903510)									
EP1304205-001	Anonymous	EG051G: Ferrous Iron	----	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EP1304187-007	QC6	EG051G: Ferrous Iron	----	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 2903709)									
EP1303820-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.13	0.12	10.6	0% - 50%
EP1304187-003	WRMW3-004	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.11	0.11	0.0	0% - 50%
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 2903850)									
EP1304184-001	Anonymous	EK057G: Nitrite as N	----	0.01	mg/L	0.04	0.04	0.0	No Limit
EP1304187-004	WRMW4-004	EK057G: Nitrite as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 2903708)									
EP1303820-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.96	0.96	0.0	0% - 20%
EP1304187-003	WRMW3-004	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.18	0.18	0.0	0% - 50%
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 2906659)									

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 2906659) - continued									
EP1304185-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.2	0.3	0.0	No Limit
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 2906660)									
EP1304185-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.11	0.10	0.0	0% - 50%
EP1304187-004	WRMW4-004	EK067G: Total Phosphorus as P	----	0.01	mg/L	----	<0.01	# Not Determined	No Limit
EK071G: Reactive Phosphorus as P by discrete analyser (QC Lot: 2903851)									
EP1304184-001	Anonymous	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	0.05	0.05	0.0	No Limit
EP1304187-004	WRMW4-004	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK085M: Sulfide as S2- (QC Lot: 2910766)									
EP1304185-001	Anonymous	EK085: Sulfide as S2-	18496-25-8	0.1	mg/L	<0.1	<0.1	0.0	No Limit
EP1304187-007	QC6	EK085: Sulfide as S2-	18496-25-8	0.1	mg/L	<0.1	<0.1	0.0	No Limit
EP026ST: Chemical Oxygen Demand (Sealed Tube) (QC Lot: 2910011)									
EP1304154-001	Anonymous	EP026ST: Chemical Oxygen Demand	----	5	mg/L	30	27	10.5	No Limit
EP1304187-007	QC6	EP026ST: Chemical Oxygen Demand	----	5	mg/L	<5	<5	0.0	No Limit
EP030: Biochemical Oxygen Demand (BOD) (QC Lot: 2903124)									
EP1304138-001	Anonymous	EP030: Biochemical Oxygen Demand	----	2	mg/L	7	2	102	No Limit
EP1304187-007	QC6	EP030: Biochemical Oxygen Demand	----	2	mg/L	<2	<2	0.0	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 2906752)									
EP1304187-004	WRMW4-004	EP068: alpha-BHC	319-84-6	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: beta-BHC	319-85-7	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: gamma-BHC	58-89-9	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: delta-BHC	319-86-8	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Heptachlor	76-44-8	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Aldrin	309-00-2	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Dieldrin	60-57-1	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: 4.4`-DDE	72-55-9	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Endrin	72-20-8	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: 4.4`-DDD	72-54-8	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Endrin ketone	53494-70-5	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: 4.4`-DDT	50-29-3	2.0	µg/L	<2.0	<2.0	0.0	No Limit
		EP068: Methoxychlor	72-43-5	2.0	µg/L	<2.0	<2.0	0.0	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP068B: Organophosphorus Pesticides (OP) (QC Lot: 2906752)									
EP1304187-004	WRMW4-004	EP068: Dichlorvos	62-73-7	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Dimethoate	60-51-5	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Diazinon	333-41-5	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Malathion	121-75-5	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Fenthion	55-38-9	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Fenamiphos	22224-92-6	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Prothiofos	34643-46-4	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Ethion	563-12-2	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Carbophenothion	786-19-6	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Monocrotophos	6923-22-4	2.0	µg/L	<2.0	<2.0	0.0	No Limit
		EP068: Parathion-methyl	298-00-0	2.0	µg/L	<2.0	<2.0	0.0	No Limit
		EP068: Parathion	56-38-2	2.0	µg/L	<2.0	<2.0	0.0	No Limit
EP074A: Monocyclic Aromatic Hydrocarbons (QC Lot: 2907160)									
EP1304187-001	WRMW1-004	EP074: Styrene	100-42-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: Isopropylbenzene	98-82-8	5	µg/L	<5	<5	0.0	No Limit
		EP074: n-Propylbenzene	103-65-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.3.5-Trimethylbenzene	108-67-8	5	µg/L	<5	<5	0.0	No Limit
		EP074: sec-Butylbenzene	135-98-8	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2.4-Trimethylbenzene	95-63-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: tert-Butylbenzene	98-06-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: p-Isopropyltoluene	99-87-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: n-Butylbenzene	104-51-8	5	µg/L	<5	<5	0.0	No Limit
EP074B: Oxygenated Compounds (QC Lot: 2907160)									
EP1304187-001	WRMW1-004	EP074: Vinyl Acetate	108-05-4	50	µg/L	<50	<50	0.0	No Limit
		EP074: 2-Butanone (MEK)	78-93-3	50	µg/L	<50	<50	0.0	No Limit
		EP074: 4-Methyl-2-pentanone (MIBK)	108-10-1	50	µg/L	<50	<50	0.0	No Limit
		EP074: 2-Hexanone (MBK)	591-78-6	50	µg/L	<50	<50	0.0	No Limit
EP074C: Sulfonated Compounds (QC Lot: 2907160)									
EP1304187-001	WRMW1-004	EP074: Carbon disulfide	75-15-0	5	µg/L	<5	<5	0.0	No Limit
EP074D: Fumigants (QC Lot: 2907160)									
EP1304187-001	WRMW1-004	EP074: 2.2-Dichloropropane	594-20-7	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dichloropropane	78-87-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: cis-1.3-Dichloropropylene	10061-01-5	5	µg/L	<5	<5	0.0	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP074D: Fumigants (QC Lot: 2907160) - continued									
EP1304187-001	WRMW1-004	EP074: trans-1.3-Dichloropropylene	10061-02-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dibromoethane (EDB)	106-93-4	5	µg/L	<5	<5	0.0	No Limit
EP074E: Halogenated Aliphatic Compounds (QC Lot: 2907160)									
EP1304187-001	WRMW1-004	EP074: 1.1-Dichloroethene	75-35-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: Iodomethane	74-88-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: trans-1.2-Dichloroethene	156-60-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1-Dichloroethane	75-34-3	5	µg/L	<5	<5	0.0	No Limit
		EP074: cis-1.2-Dichloroethene	156-59-2	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1.1-Trichloroethane	71-55-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1-Dichloropropylene	563-58-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: Carbon Tetrachloride	56-23-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dichloroethane	107-06-2	5	µg/L	<5	<5	0.0	No Limit
		EP074: Trichloroethene	79-01-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: Dibromomethane	74-95-3	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1.2-Trichloroethane	79-00-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.3-Dichloropropane	142-28-9	5	µg/L	<5	<5	0.0	No Limit
		EP074: Tetrachloroethene	127-18-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1.1.2-Tetrachloroethane	630-20-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: trans-1.4-Dichloro-2-butene	110-57-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: cis-1.4-Dichloro-2-butene	1476-11-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1.2.2-Tetrachloroethane	79-34-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2.3-Trichloropropane	96-18-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: Pentachloroethane	76-01-7	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dibromo-3-chloropropane	96-12-8	5	µg/L	<5	<5	0.0	No Limit
		EP074: Hexachlorobutadiene	87-68-3	5	µg/L	<5	<5	0.0	No Limit
		EP074: Dichlorodifluoromethane	75-71-8	50	µg/L	<50	<50	0.0	No Limit
		EP074: Chloromethane	74-87-3	50	µg/L	<50	<50	0.0	No Limit
		EP074: Vinyl chloride	75-01-4	50	µg/L	<50	<50	0.0	No Limit
		EP074: Bromomethane	74-83-9	50	µg/L	<50	<50	0.0	No Limit
		EP074: Chloroethane	75-00-3	50	µg/L	<50	<50	0.0	No Limit
		EP074: Trichlorofluoromethane	75-69-4	50	µg/L	<50	<50	0.0	No Limit
EP074F: Halogenated Aromatic Compounds (QC Lot: 2907160)									
EP1304187-001	WRMW1-004	EP074: Chlorobenzene	108-90-7	5	µg/L	<5	<5	0.0	No Limit
		EP074: Bromobenzene	108-86-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 2-Chlorotoluene	95-49-8	5	µg/L	<5	<5	0.0	No Limit
		EP074: 4-Chlorotoluene	106-43-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.3-Dichlorobenzene	541-73-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.4-Dichlorobenzene	106-46-7	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dichlorobenzene	95-50-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2.4-Trichlorobenzene	120-82-1	5	µg/L	<5	<5	0.0	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP074F: Halogenated Aromatic Compounds (QC Lot: 2907160) - continued									
EP1304187-001	WRMW1-004	EP074: 1.2.3-Trichlorobenzene	87-61-6	5	µg/L	<5	<5	0.0	No Limit
EP074G: Trihalomethanes (QC Lot: 2907160)									
EP1304187-001	WRMW1-004	EP074: Chloroform	67-66-3	5	µg/L	<5	<5	0.0	No Limit
		EP074: Bromodichloromethane	75-27-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: Dibromochloromethane	124-48-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: Bromoform	75-25-2	5	µg/L	<5	<5	0.0	No Limit
EP075(SIM)A: Phenolic Compounds (QC Lot: 2906751)									
EP1304187-004	WRMW4-004	EP075(SIM): Phenol	108-95-2	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2-Chlorophenol	95-57-8	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2-Methylphenol	95-48-7	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2-Nitrophenol	88-75-5	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2.4-Dimethylphenol	105-67-9	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2.4-Dichlorophenol	120-83-2	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2.6-Dichlorophenol	87-65-0	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 4-Chloro-3-Methylphenol	59-50-7	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 3- & 4-Methylphenol	1319-77-3	2.0	µg/L	<2.0	<2.0	0.0	No Limit
		EP075(SIM): Pentachlorophenol	87-86-5	2.0	µg/L	<2.0	<2.0	0.0	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 2906751)									
EP1304187-004	WRMW4-004	EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Benzo(b)fluoranthene	205-99-2	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 2906750)									
EP1304187-004	WRMW4-004	EP071: C15 - C28 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	µg/L	<50	<50	0.0	No Limit
		EP071: C29 - C36 Fraction	----	50	µg/L	<50	<50	0.0	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 2907161)									
EP1304187-001	WRMW1-004	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QC Lot: 2906750)									
EP1304187-004	WRMW4-004	EP071: >C10 - C16 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
		EP071: >C16 - C34 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QC Lot: 2907161)									
EP1304187-001	WRMW1-004	EP080: C6 - C10 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080: BTEXN (QC Lot: 2907161)									
EP1304187-001	WRMW1-004	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 2903340)								
EA005-P: pH Value	----	0.01	pH Unit	----	7.00 pH Unit	101	70	130
EA010P: Conductivity by PC Titrator (QCLot: 2903341)								
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	24800 µS/cm	100	90	110
EA015: Total Dissolved Solids (QCLot: 2904685)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	293 mg/L	93.8	70	130
EA025: Suspended Solids (QCLot: 2904686)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	95.0	70	130
EA045: Turbidity (QCLot: 2902954)								
EA045: Turbidity	----	0.1	NTU	<0.1	40 NTU	95.2	91	107
ED037P: Alkalinity by PC Titrator (QCLot: 2903339)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	200 mg/L	108	87	121
ED038A: Acidity (QCLot: 2909581)								
ED038: Acidity as CaCO3	----	1	mg/L	----	20 mg/L	106	85	119
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 2903853)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	91.4	88	121
ED045G: Chloride Discrete analyser (QCLot: 2903852)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	1000 mg/L	97.7	84	120
EG020F: Dissolved Metals by ICP-MS (QCLot: 2907457)								
EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.50 mg/L	90.6	77	113
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.100 mg/L	97.8	89	109
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1000 mg/L	99.0	89	109
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.100 mg/L	103	88	106
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.100 mg/L	101	87	107
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.100 mg/L	100	87	109
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.10 mg/L	94.9	93	117
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.100 mg/L	97.3	89	115
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.50 mg/L	108	83	109
EG020T: Total Metals by ICP-MS (QCLot: 2905216)								
EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	96.0	78	116

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High
EG020T: Total Metals by ICP-MS (QCLot: 2905216) - continued								
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	92.4	77	109
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	91.3	78	108
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	97.4	80	112
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	97.2	79	111
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	96.3	81	109
EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	104	80	112
EG020A-T: Molybdenum	7439-98-7	0.001	mg/L	<0.001	0.1 mg/L	104	86	118
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	100	80	112
EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	102	75	107
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	93.2	74	108
EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	102	75	115
EG020T: Total Metals by ICP-MS (QCLot: 2905217)								
EG020B-T: Silver	7440-22-4	0.001	mg/L	<0.001	0.01 mg/L	103	70	130
EG020T: Total Metals by ICP-MS (QCLot: 2905218)								
EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	99.8	78	116
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	91.9	77	109
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	94.7	78	108
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	95.2	80	112
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	97.4	79	111
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	95.7	81	109
EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	101	80	112
EG020A-T: Molybdenum	7439-98-7	0.001	mg/L	<0.001	0.1 mg/L	105	86	118
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	95.9	80	112
EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	104	75	107
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	94.4	74	108
EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	102	75	115
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2905241)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.0100 mg/L	102	82.3	118
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2905242)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.0100 mg/L	101	82.3	118
EG050F: Dissolved Hexavalent Chromium (QCLot: 2904122)								
EG050G-F: Hexavalent Chromium	18540-29-9	0.01	mg/L	<0.01	0.5 mg/L	97.9	91	115
EG051G: Ferrous Iron by Discrete Analyser (QCLot: 2903510)								
EG051G: Ferrous Iron	----	0.05	mg/L	<0.05	2.00 mg/L	101	89	113
EK055G: Ammonia as N by Discrete Analyser (QCLot: 2903709)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1 mg/L	99.6	87	115
EK057G: Nitrite as N by Discrete Analyser (QCLot: 2903850)								
EK057G: Nitrite as N	----	0.01	mg/L	<0.01	0.5 mg/L	95.6	86	112

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 2903708)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	99.7	92	112
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 2906659)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	10 mg/L	98.6	74	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 2906660)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	90.8	70	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 2903851)								
EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	0.5 mg/L	102	87	115
EK085M: Sulfide as S2- (QCLot: 2910766)								
EK085: Sulfide as S2-	18496-25-8	0.10	mg/L	<0.1	0.50 mg/L	92.0	82	116
EP026ST: Chemical Oxygen Demand (Sealed Tube) (QCLot: 2910011)								
EP026ST: Chemical Oxygen Demand	----	5	mg/L	<5	500 mg/L	96.9	88	114
EP030: Biochemical Oxygen Demand (BOD) (QCLot: 2903124)								
EP030: Biochemical Oxygen Demand	----	2	mg/L	<2	198 mg/L	85.8	84	114
EP068A: Organochlorine Pesticides (OC) (QCLot: 2906752)								
EP068: alpha-BHC	319-84-6	0.5	µg/L	<0.5	5 µg/L	95.6	59	123
EP068: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	5 µg/L	90.2	53	120
EP068: beta-BHC	319-85-7	0.5	µg/L	<0.5	5 µg/L	69.4	58	127
EP068: gamma-BHC	58-89-9	0.5	µg/L	<0.5	5 µg/L	123	59	129
EP068: delta-BHC	319-86-8	0.5	µg/L	<0.5	5 µg/L	104	58	127
EP068: Heptachlor	76-44-8	0.5	µg/L	<0.5	5 µg/L	101	55	119
EP068: Aldrin	309-00-2	0.5	µg/L	<0.5	5 µg/L	108	60	125
EP068: Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	5 µg/L	101	58	126
EP068: trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	5 µg/L	101	59	125
EP068: alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	5 µg/L	109	51	135
EP068: cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	5 µg/L	101	60	125
EP068: Dieldrin	60-57-1	0.5	µg/L	<0.5	5 µg/L	104	59	134
EP068: 4.4`-DDE	72-55-9	0.5	µg/L	<0.5	5 µg/L	102	61	127
EP068: Endrin	72-20-8	0.5	µg/L	<0.5	5 µg/L	74.6	62	130
EP068: beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	5 µg/L	110	63	132
EP068: 4.4`-DDD	72-54-8	0.5	µg/L	<0.5	5 µg/L	105	61	128
EP068: Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	5 µg/L	124	40	144
EP068: Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	5 µg/L	104	44	134
EP068: 4.4`-DDT	50-29-3	2.0	µg/L	<2.0	5 µg/L	101	38	118
EP068: Endrin ketone	53494-70-5	0.5	µg/L	<0.5	5 µg/L	121	46	132
EP068: Methoxychlor	72-43-5	2.0	µg/L	<2.0	5 µg/L	121	33	123
EP068B: Organophosphorus Pesticides (OP) (QCLot: 2906752)								
EP068: Dichlorvos	62-73-7	0.5	µg/L	<0.5	5 µg/L	92.2	37	109
EP068: Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	5 µg/L	98.5	36	118

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP068B: Organophosphorus Pesticides (OP) (QCLot: 2906752) - continued								
EP068: Monocrotophos	6923-22-4	2.0	µg/L	<2.0	5 µg/L	10.2	10	28.2
EP068: Dimethoate	60-51-5	0.5	µg/L	<0.5	5 µg/L	86.8	49	113
EP068: Diazinon	333-41-5	0.5	µg/L	<0.5	5 µg/L	105	61	125
EP068: Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	5 µg/L	96.6	63	120
EP068: Parathion-methyl	298-00-0	2.0	µg/L	<2.0	5 µg/L	106	47	118
EP068: Malathion	121-75-5	0.5	µg/L	<0.5	5 µg/L	99.6	45	129
EP068: Fenthion	55-38-9	0.5	µg/L	<0.5	5 µg/L	99.4	60	121
EP068: Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	5 µg/L	102	47	127
EP068: Parathion	56-38-2	2.0	µg/L	<2.0	5 µg/L	110	55	122
EP068: Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	5 µg/L	97.4	59	125
EP068: Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	5 µg/L	100	61	125
EP068: Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	5 µg/L	102	61	120
EP068: Fenamiphos	22224-92-6	0.5	µg/L	<0.5	5 µg/L	89.1	59	127
EP068: Prothiofos	34643-46-4	0.5	µg/L	<0.5	5 µg/L	100	49	121
EP068: Ethion	563-12-2	0.5	µg/L	<0.5	5 µg/L	98.9	45	123
EP068: Carbophenothion	786-19-6	0.5	µg/L	<0.5	5 µg/L	97.2	46	126
EP068: Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	5 µg/L	98.9	26.9	147
EP074A: Monocyclic Aromatic Hydrocarbons (QCLot: 2907160)								
EP074: Styrene	100-42-5	5	µg/L	<5	10 µg/L	96.3	74	124
EP074: Isopropylbenzene	98-82-8	5	µg/L	<5	10 µg/L	111	75	121
EP074: n-Propylbenzene	103-65-1	5	µg/L	<5	10 µg/L	104	72	122
EP074: 1.3.5-Trimethylbenzene	108-67-8	5	µg/L	<5	10 µg/L	107	73	121
EP074: sec-Butylbenzene	135-98-8	5	µg/L	<5	10 µg/L	105	72	122
EP074: 1.2.4-Trimethylbenzene	95-63-6	5	µg/L	<5	10 µg/L	107	74	122
EP074: tert-Butylbenzene	98-06-6	5	µg/L	<5	10 µg/L	108	73	121
EP074: p-Isopropyltoluene	99-87-6	5	µg/L	<5	10 µg/L	105	73	123
EP074: n-Butylbenzene	104-51-8	5	µg/L	<5	10 µg/L	104	70	126
EP074B: Oxygenated Compounds (QCLot: 2907160)								
EP074: Vinyl Acetate	108-05-4	50	µg/L	<50	100 µg/L	87.8	61	135
EP074: 2-Butanone (MEK)	78-93-3	50	µg/L	<50	100 µg/L	98.8	66	130
EP074: 4-Methyl-2-pentanone (MIBK)	108-10-1	50	µg/L	<50	100 µg/L	96.8	72	126
EP074: 2-Hexanone (MBK)	591-78-6	50	µg/L	<50	100 µg/L	# Not Determined	70	126
EP074C: Sulfonated Compounds (QCLot: 2907160)								
EP074: Carbon disulfide	75-15-0	5	µg/L	<5	10 µg/L	110	71	127
EP074D: Fumigants (QCLot: 2907160)								
EP074: 2.2-Dichloropropane	594-20-7	5	µg/L	<5	10 µg/L	109	71	129
EP074: 1.2-Dichloropropane	78-87-5	5	µg/L	<5	10 µg/L	109	74	124
EP074: cis-1.3-Dichloropropylene	10061-01-5	5	µg/L	<5	10 µg/L	97.2	73	127

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low	High
EP074D: Fumigants (QCLot: 2907160) - continued								
EP074: trans-1.3-Dichloropropylene	10061-02-6	5	µg/L	<5	10 µg/L	107	70	130
EP074: 1.2-Dibromoethane (EDB)	106-93-4	5	µg/L	<5	10 µg/L	106	74	124
EP074E: Halogenated Aliphatic Compounds (QCLot: 2907160)								
EP074: Dichlorodifluoromethane	75-71-8	50	µg/L	<50	100 µg/L	112	70	130
EP074: Chloromethane	74-87-3	50	µg/L	<50	100 µg/L	103	73	125
EP074: Vinyl chloride	75-01-4	50	µg/L	<50	100 µg/L	96.7	72	128
EP074: Bromomethane	74-83-9	50	µg/L	<50	100 µg/L	112	73	127
EP074: Chloroethane	75-00-3	50	µg/L	<50	100 µg/L	113	74	124
EP074: Trichlorofluoromethane	75-69-4	50	µg/L	<50	100 µg/L	124	72	130
EP074: 1.1-Dichloroethene	75-35-4	5	µg/L	<5	10 µg/L	112	73	129
EP074: Iodomethane	74-88-4	5	µg/L	<5	10 µg/L	66.6	42	142
EP074: trans-1.2-Dichloroethene	156-60-5	5	µg/L	<5	10 µg/L	116	72	126
EP074: 1.1-Dichloroethane	75-34-3	5	µg/L	<5	10 µg/L	103	73	125
EP074: cis-1.2-Dichloroethene	156-59-2	5	µg/L	<5	10 µg/L	103	76	122
EP074: 1.1.1-Trichloroethane	71-55-6	5	µg/L	<5	10 µg/L	120	76	124
EP074: 1.1-Dichloropropylene	563-58-6	5	µg/L	<5	10 µg/L	115	74	124
EP074: Carbon Tetrachloride	56-23-5	5	µg/L	<5	10 µg/L	115	73	129
EP074: 1.2-Dichloroethane	107-06-2	5	µg/L	<5	10 µg/L	117	76	126
EP074: Trichloroethene	79-01-6	5	µg/L	<5	10 µg/L	109	75	125
EP074: Dibromomethane	74-95-3	5	µg/L	<5	10 µg/L	120	75	127
EP074: 1.1.2-Trichloroethane	79-00-5	5	µg/L	<5	10 µg/L	107	74	122
EP074: 1.3-Dichloropropane	142-28-9	5	µg/L	<5	10 µg/L	101	72	128
EP074: Tetrachloroethene	127-18-4	5	µg/L	<5	10 µg/L	116	74	124
EP074: 1.1.1.2-Tetrachloroethane	630-20-6	5	µg/L	<5	----	----	----	----
EP074: trans-1.4-Dichloro-2-butene	110-57-6	5	µg/L	<5	10 µg/L	96.5	54	142
EP074: cis-1.4-Dichloro-2-butene	1476-11-5	5	µg/L	<5	10 µg/L	102	61	135
EP074: 1.1.2.2-Tetrachloroethane	79-34-5	5	µg/L	<5	10 µg/L	110	66	132
EP074: 1.2.3-Trichloropropane	96-18-4	5	µg/L	<5	10 µg/L	99.0	66	130
EP074: Pentachloroethane	76-01-7	5	µg/L	<5	10 µg/L	102	66	134
EP074: 1.2-Dibromo-3-chloropropane	96-12-8	5	µg/L	<5	10 µg/L	89.7	56	140
EP074: Hexachlorobutadiene	87-68-3	5	µg/L	<5	10 µg/L	107	66	134
EP074F: Halogenated Aromatic Compounds (QCLot: 2907160)								
EP074: Chlorobenzene	108-90-7	5	µg/L	<5	10 µg/L	98.1	78	120
EP074: Bromobenzene	108-86-1	5	µg/L	<5	10 µg/L	102	76	122
EP074: 2-Chlorotoluene	95-49-8	5	µg/L	<5	10 µg/L	101	75	121
EP074: 4-Chlorotoluene	106-43-4	5	µg/L	<5	10 µg/L	98.7	74	122
EP074: 1.3-Dichlorobenzene	541-73-1	5	µg/L	<5	10 µg/L	101	75	121
EP074: 1.4-Dichlorobenzene	106-46-7	5	µg/L	<5	10 µg/L	100	75	121
EP074: 1.2-Dichlorobenzene	95-50-1	5	µg/L	<5	10 µg/L	103	76	122

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP074F: Halogenated Aromatic Compounds (QCLot: 2907160) - continued								
EP074: 1.2.4-Trichlorobenzene	120-82-1	5	µg/L	<5	10 µg/L	91.0	68	132
EP074: 1.2.3-Trichlorobenzene	87-61-6	5	µg/L	<5	10 µg/L	96.2	72	128
EP074G: Trihalomethanes (QCLot: 2907160)								
EP074: Chloroform	67-66-3	5	µg/L	<5	10 µg/L	103	75	125
EP074: Bromodichloromethane	75-27-4	5	µg/L	<5	10 µg/L	106	73	129
EP074: Dibromochloromethane	124-48-1	5	µg/L	<5	10 µg/L	102	68	132
EP074: Bromoform	75-25-2	5	µg/L	<5	10 µg/L	98.0	67	133
EP075(SIM)A: Phenolic Compounds (QCLot: 2906751)								
EP075(SIM): Phenol	108-95-2	1	µg/L	<1.0	5 µg/L	39.5	10	60
EP075(SIM): 2-Chlorophenol	95-57-8	1	µg/L	<1.0	5 µg/L	86.3	23	117
EP075(SIM): 2-Methylphenol	95-48-7	1	µg/L	<1.0	5 µg/L	78.2	19.2	110
EP075(SIM): 3- & 4-Methylphenol	1319-77-3	2	µg/L	<2.0	10 µg/L	34.3	10	101
EP075(SIM): 2-Nitrophenol	88-75-5	1	µg/L	<1.0	5 µg/L	93.3	20.3	142
EP075(SIM): 2.4-Dimethylphenol	105-67-9	1	µg/L	<1.0	5 µg/L	86.2	25.3	116
EP075(SIM): 2.4-Dichlorophenol	120-83-2	1	µg/L	<1.0	5 µg/L	88.2	24.8	128
EP075(SIM): 2.6-Dichlorophenol	87-65-0	1	µg/L	<1.0	5 µg/L	87.0	33	128
EP075(SIM): 4-Chloro-3-Methylphenol	59-50-7	1	µg/L	<1.0	5 µg/L	84.6	33	124
EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	1	µg/L	<1.0	5 µg/L	84.5	23	126
EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	1	µg/L	<1.0	5 µg/L	88.2	32	134
EP075(SIM): Pentachlorophenol	87-86-5	2	µg/L	<2.0	5 µg/L	110	22.8	145
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2906751)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	5 µg/L	92.1	27.5	126
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	5 µg/L	67.2	35	127
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	5 µg/L	86.8	35	128
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	5 µg/L	73.7	36	132
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	93.5	42	132
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	101	42	133
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	109	41	137
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	5 µg/L	99.0	40	140
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	74.3	33	147
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	5 µg/L	75.1	37	145
EP075(SIM): Benzo(b)fluoranthene	205-99-2	1	µg/L	<1.0	5 µg/L	119	35	150
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	114	39	140
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	126	41	138
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	5 µg/L	72.3	35	139
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	71.8	36	141
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	5 µg/L	55.5	10	140
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2906750)								

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2906750) - continued								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	3610 µg/L	91.2	64	124
EP071: C15 - C28 Fraction	----	100	µg/L	<100	10340 µg/L	99.5	70	130
EP071: C29 - C36 Fraction	----	50	µg/L	<50	3790 µg/L	96.1	68	128
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2907161)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	320 µg/L	95.2	74.2	142
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QCLot: 2906750)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	5070 µg/L	96.4	70	130
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	11230 µg/L	109	70	130
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	1010 µg/L	90.2	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QCLot: 2907161)								
EP080: C6 - C10 Fraction	----	20	µg/L	<20	370 µg/L	95.9	74.2	142
EP080: BTEXN (QCLot: 2907161)								
EP080: Benzene	71-43-2	1	µg/L	<1	20 µg/L	94.7	72.6	122
EP080: Toluene	108-88-3	2	µg/L	<2	20 µg/L	93.5	71.1	123
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	20 µg/L	96.3	71.9	121
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	40 µg/L	95.1	72.3	122
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	20 µg/L	96.8	72.3	121
EP080: Naphthalene	91-20-3	5	µg/L	<5	20 µg/L	84.3	78.8	121

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	Recovery Limits (%) High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 2903853)							
EP1304184-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	92.8	70	130
ED045G: Chloride Discrete analyser (QCLot: 2903852)							
EP1304184-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	93.6	70	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 2907457)							
EP1304185-002	Anonymous	EG020A-F: Arsenic	7440-38-2	0.200 mg/L	104	70	130
		EG020A-F: Cadmium	7440-43-9	0.0500 mg/L	109	70	130
		EG020A-F: Chromium	7440-47-3	0.200 mg/L	97.8	70	130
		EG020A-F: Manganese	7439-96-5	0.200 mg/L	92.9	70	130
		EG020A-F: Nickel	7440-02-0	0.200 mg/L	94.2	70	130
		EG020A-F: Zinc	7440-66-6	0.200 mg/L	102	70	130

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	High
EG020T: Total Metals by ICP-MS (QCLot: 2905216)							
EP1304152-014	Anonymous	EG020A-T: Arsenic	7440-38-2	1.00 mg/L	91.3	70	130
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	94.5	70	130
		EG020A-T: Chromium	7440-47-3	1.00 mg/L	87.0	70	130
		EG020A-T: Copper	7440-50-8	1.00 mg/L	90.6	70	130
		EG020A-T: Lead	7439-92-1	1.00 mg/L	95.5	70	130
		EG020A-T: Manganese	7439-96-5	1.00 mg/L	95.5	70	130
		EG020A-T: Nickel	7440-02-0	1.00 mg/L	93.3	70	130
		EG020A-T: Zinc	7440-66-6	1.00 mg/L	92.3	70	130
EG020T: Total Metals by ICP-MS (QCLot: 2905218)							
EP1304187-005	WRMW5-004	EG020A-T: Arsenic	7440-38-2	1.00 mg/L	92.1	70	130
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	98.3	70	130
		EG020A-T: Chromium	7440-47-3	1.00 mg/L	82.0	70	130
		EG020A-T: Copper	7440-50-8	1.00 mg/L	89.7	70	130
		EG020A-T: Lead	7439-92-1	1.00 mg/L	98.6	70	130
		EG020A-T: Manganese	7439-96-5	1.00 mg/L	88.8	70	130
		EG020A-T: Nickel	7440-02-0	1.00 mg/L	90.2	70	130
		EG020A-T: Zinc	7440-66-6	1.00 mg/L	93.1	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2905241)							
EP1304112-002	Anonymous	EG035T: Mercury	7439-97-6	0.0100 mg/L	# 21.5	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2905242)							
EP1304187-005	WRMW5-004	EG035T: Mercury	7439-97-6	0.0100 mg/L	95.8	70	130
EG050F: Dissolved Hexavalent Chromium (QCLot: 2904122)							
EP1304185-001	Anonymous	EG050G-F: Hexavalent Chromium	18540-29-9	0.5 mg/L	74.6	70	130
EG051G: Ferrous Iron by Discrete Analyser (QCLot: 2903510)							
EP1304205-001	Anonymous	EG051G: Ferrous Iron	----	2.5 mg/L	103	70	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 2903709)							
EP1303820-001	Anonymous	EK055G: Ammonia as N	7664-41-7	1.00 mg/L	101	70	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 2903850)							
EP1304184-001	Anonymous	EK057G: Nitrite as N	----	0.5 mg/L	98.8	70	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 2903708)							
EP1303820-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	91.6	70	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 2906659)							
EP1304185-002	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	5.0 mg/L	94.6	70	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 2906660)							
EP1304185-002	Anonymous	EK067G: Total Phosphorus as P	----	1 mg/L	97.8	70	130

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	Recovery Limits (%) High
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 2903851)							
EP1304184-001	Anonymous	EK071G: Reactive Phosphorus as P	14265-44-2	0.5 mg/L	95.2	70	130
EP026ST: Chemical Oxygen Demand (Sealed Tube) (QCLot: 2910011)							
EP1304154-001	Anonymous	EP026ST: Chemical Oxygen Demand	----	333 mg/L	119	70	130
EP074E: Halogenated Aliphatic Compounds (QCLot: 2907160)							
EP1304187-002	WRMW2-004	EP074: 1.1-Dichloroethene	75-35-4	80 µg/L	82.3	73.7	126
		EP074: Trichloroethene	79-01-6	80 µg/L	93.8	79.1	120
EP074F: Halogenated Aromatic Compounds (QCLot: 2907160)							
EP1304187-002	WRMW2-004	EP074: Chlorobenzene	108-90-7	80 µg/L	84.4	81.4	115
EP075(SIM)A: Phenolic Compounds (QCLot: 2906751)							
EP1304187-004	WRMW4-004	EP075(SIM): Phenol	108-95-2	5 µg/L	31.5	10	66
		EP075(SIM): 2-Chlorophenol	95-57-8	5 µg/L	63.7	16.3	120
		EP075(SIM): 2-Nitrophenol	88-75-5	5 µg/L	79.3	18.4	144
		EP075(SIM): 4-Chloro-3-Methylphenol	59-50-7	5 µg/L	73.4	22.5	129
		EP075(SIM): Pentachlorophenol	87-86-5	5 µg/L	80.1	23.5	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2906751)							
EP1304187-004	WRMW4-004	EP075(SIM): Acenaphthene	83-32-9	5 µg/L	73.8	25.2	131
		EP075(SIM): Pyrene	129-00-0	5 µg/L	84.1	30.8	143
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2907161)							
EP1304187-002	WRMW2-004	EP080: C6 - C9 Fraction	----	1120 µg/L	80.1	77.0	137
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QCLot: 2907161)							
EP1304187-002	WRMW2-004	EP080: C6 - C10 Fraction	----	1320 µg/L	84.6	77.0	137
EP080: BTEXN (QCLot: 2907161)							
EP1304187-002	WRMW2-004	EP080: Benzene	71-43-2	80 µg/L	91.9	77.0	122
		EP080: Toluene	108-88-3	80 µg/L	86.7	73.5	126

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report

The quality control term Matrix Spike (MS) and Matrix Spike Duplicate (MSD) refers to intralaboratory split samples spiked with a representative set of target analytes. The purpose of these QC parameters are to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report: Spike Concentration	Spike Recovery (%) MS	Spike Recovery (%) MSD	Recovery Limits (%) Low	Recovery Limits (%) High	RPDs (%) Value	RPDs (%) Control Limit
EG051G: Ferrous Iron by Discrete Analyser (QCLot: 2903510)										
EP1304205-001	Anonymous	EG051G: Ferrous Iron	----	2.5 mg/L	103	----	70	130	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 2903708)										
EP1303820-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	91.6	----	70	130	----	----

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
				Concentration	MS	MSD	Low	High	Value	Control Limit
EK055G: Ammonia as N by Discrete Analyser (QCLot: 2903709)										
EP1303820-001	Anonymous	EK055G: Ammonia as N	7664-41-7	1.00 mg/L	101	----	70	130	----	----
EK057G: Nitrite as N by Discrete Analyser (QCLot: 2903850)										
EP1304184-001	Anonymous	EK057G: Nitrite as N	----	0.5 mg/L	98.8	----	70	130	----	----
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 2903851)										
EP1304184-001	Anonymous	EK071G: Reactive Phosphorus as P	14265-44-2	0.5 mg/L	95.2	----	70	130	----	----
ED045G: Chloride Discrete analyser (QCLot: 2903852)										
EP1304184-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	93.6	----	70	130	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 2903853)										
EP1304184-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	92.8	----	70	130	----	----
EG050F: Dissolved Hexavalent Chromium (QCLot: 2904122)										
EP1304185-001	Anonymous	EG050G-F: Hexavalent Chromium	18540-29-9	0.5 mg/L	74.6	----	70	130	----	----
EG020T: Total Metals by ICP-MS (QCLot: 2905216)										
EP1304152-014	Anonymous	EG020A-T: Arsenic	7440-38-2	1.00 mg/L	91.3	----	70	130	----	----
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	94.5	----	70	130	----	----
		EG020A-T: Chromium	7440-47-3	1.00 mg/L	87.0	----	70	130	----	----
		EG020A-T: Copper	7440-50-8	1.00 mg/L	90.6	----	70	130	----	----
		EG020A-T: Lead	7439-92-1	1.00 mg/L	95.5	----	70	130	----	----
		EG020A-T: Manganese	7439-96-5	1.00 mg/L	95.5	----	70	130	----	----
		EG020A-T: Nickel	7440-02-0	1.00 mg/L	93.3	----	70	130	----	----
		EG020A-T: Zinc	7440-66-6	1.00 mg/L	92.3	----	70	130	----	----
EG020T: Total Metals by ICP-MS (QCLot: 2905218)										
EP1304187-005	WRMW5-004	EG020A-T: Arsenic	7440-38-2	1.00 mg/L	92.1	----	70	130	----	----
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	98.3	----	70	130	----	----
		EG020A-T: Chromium	7440-47-3	1.00 mg/L	82.0	----	70	130	----	----
		EG020A-T: Copper	7440-50-8	1.00 mg/L	89.7	----	70	130	----	----
		EG020A-T: Lead	7439-92-1	1.00 mg/L	98.6	----	70	130	----	----
		EG020A-T: Manganese	7439-96-5	1.00 mg/L	88.8	----	70	130	----	----
		EG020A-T: Nickel	7440-02-0	1.00 mg/L	90.2	----	70	130	----	----
		EG020A-T: Zinc	7440-66-6	1.00 mg/L	93.1	----	70	130	----	----
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2905241)										
EP1304112-002	Anonymous	EG035T: Mercury	7439-97-6	0.0100 mg/L	# 21.5	----	70	130	----	----
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2905242)										
EP1304187-005	WRMW5-004	EG035T: Mercury	7439-97-6	0.0100 mg/L	95.8	----	70	130	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 2906659)										
EP1304185-002	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	5.0 mg/L	94.6	----	70	130	----	----
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 2906660)										
EP1304185-002	Anonymous	EK067G: Total Phosphorus as P	----	1 mg/L	97.8	----	70	130	----	----

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Spike Concentration	Spike Recovery (%) MS	Spike Recovery (%) MSD	Recovery Limits (%) Low	Recovery Limits (%) High	RPDs (%) Value	RPDs (%) Control Limit
EP075(SIM)A: Phenolic Compounds (QCLot: 2906751)										
EP1304187-004	WRMW4-004	EP075(SIM): Phenol	108-95-2	5 µg/L	31.5	----	10	66	----	----
		EP075(SIM): 2-Chlorophenol	95-57-8	5 µg/L	63.7	----	16.3	120	----	----
		EP075(SIM): 2-Nitrophenol	88-75-5	5 µg/L	79.3	----	18.4	144	----	----
		EP075(SIM): 4-Chloro-3-Methylphenol	59-50-7	5 µg/L	73.4	----	22.5	129	----	----
		EP075(SIM): Pentachlorophenol	87-86-5	5 µg/L	80.1	----	23.5	130	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2906751)										
EP1304187-004	WRMW4-004	EP075(SIM): Acenaphthene	83-32-9	5 µg/L	73.8	----	25.2	131	----	----
		EP075(SIM): Pyrene	129-00-0	5 µg/L	84.1	----	30.8	143	----	----
EP074E: Halogenated Aliphatic Compounds (QCLot: 2907160)										
EP1304187-002	WRMW2-004	EP074: 1.1-Dichloroethene	75-35-4	80 µg/L	82.3	----	73.7	126	----	----
		EP074: Trichloroethene	79-01-6	80 µg/L	93.8	----	79.1	120	----	----
EP074F: Halogenated Aromatic Compounds (QCLot: 2907160)										
EP1304187-002	WRMW2-004	EP074: Chlorobenzene	108-90-7	80 µg/L	84.4	----	81.4	115	----	----
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2907161)										
EP1304187-002	WRMW2-004	EP080: C6 - C9 Fraction	----	1120 µg/L	80.1	----	77.0	137	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QCLot: 2907161)										
EP1304187-002	WRMW2-004	EP080: C6 - C10 Fraction	----	1320 µg/L	84.6	----	77.0	137	----	----
EP080: BTEXN (QCLot: 2907161)										
EP1304187-002	WRMW2-004	EP080: Benzene	71-43-2	80 µg/L	91.9	----	77.0	122	----	----
		EP080: Toluene	108-88-3	80 µg/L	86.7	----	73.5	126	----	----
EG020F: Dissolved Metals by ICP-MS (QCLot: 2907457)										
EP1304185-002	Anonymous	EG020A-F: Arsenic	7440-38-2	0.200 mg/L	104	----	70	130	----	----
		EG020A-F: Cadmium	7440-43-9	0.0500 mg/L	109	----	70	130	----	----
		EG020A-F: Chromium	7440-47-3	0.200 mg/L	97.8	----	70	130	----	----
		EG020A-F: Manganese	7439-96-5	0.200 mg/L	92.9	----	70	130	----	----
		EG020A-F: Nickel	7440-02-0	0.200 mg/L	94.2	----	70	130	----	----
		EG020A-F: Zinc	7440-66-6	0.200 mg/L	102	----	70	130	----	----
EP026ST: Chemical Oxygen Demand (Sealed Tube) (QCLot: 2910011)										
EP1304154-001	Anonymous	EP026ST: Chemical Oxygen Demand	----	333 mg/L	119	----	70	130	----	----

Environmental Division

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **EP1304187**	Page	: 1 of 15
Client	: MOBILE DEWATERING	Laboratory	: Environmental Division Perth
Contact	: INFO	Contact	: Lauren Ockwell
Address	: PO BOX 239 MIDLAND WA, AUSTRALIA 6939	Address	: 10 Hod Way Malaga WA Australia 6090
E-mail	: info@environmentalservices.com.au	E-mail	: lauren.ockwell@alsenviro.com
Telephone	: +61 08 9250 4995	Telephone	: 08 9209 7606
Facsimile	: ----	Facsimile	: 08 9209 7600
Project	: E2012-031	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: WASTEROCK		
C-O-C number	: E2012-031-007	Date Samples Received	: 05-JUN-2013
Sampler	: Dale/Bronnie	Issue Date	: 12-JUN-2013
Order number	: ----		
		No. of samples received	: 8
Quote number	: EP/785/12	No. of samples analysed	: 8

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non -volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

Matrix: **WATER**

Evaluation: ✘ = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P)								
WRMW1-004, WRMW3-004, WRMW5-004, QC6,	WRMW2-004, WRMW4-004, QC4, QC7	**04-JUN-2013**	---	04-JUN-2013	----	**05-JUN-2013**	04-JUN-2013	✘
EA010P: Conductivity by PC Titrator								
Clear Plastic Bottle - Natural (EA010-P)								
WRMW1-004, WRMW3-004, WRMW5-004, QC6,	WRMW2-004, WRMW4-004, QC4, QC7	**04-JUN-2013**	---	02-JUL-2013	----	**05-JUN-2013**	02-JUL-2013	✓
EA015: Total Dissolved Solids								
Clear Plastic Bottle - Natural (EA015H)								
WRMW1-004, WRMW3-004, WRMW5-004, QC6,	WRMW2-004, WRMW4-004, QC4, QC7	**04-JUN-2013**	---	11-JUN-2013	----	**06-JUN-2013**	11-JUN-2013	✓
EA025: Suspended Solids								
Clear Plastic Bottle - Natural (EA025H)								
WRMW1-004, WRMW3-004, WRMW5-004, QC6,	WRMW2-004, WRMW4-004, QC4, QC7	**04-JUN-2013**	---	11-JUN-2013	----	**06-JUN-2013**	11-JUN-2013	✓
EA045: Turbidity								
Clear Plastic Bottle - Natural (EA045)								
WRMW1-004, WRMW3-004, WRMW5-004, QC6,	WRMW2-004, WRMW4-004, QC4, QC7	**04-JUN-2013**	----	----	----	**05-JUN-2013**	05-JUN-2013	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Evaluation	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Evaluation
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P)								
WRMW1-004,	WRMW2-004,	**04-JUN-2013**	---	18-JUN-2013	----	**05-JUN-2013**	18-JUN-2013	✓
WRMW3-004,	WRMW4-004,							
WRMW5-004,	QC4,							
QC6,	QC7							
ED038A: Acidity								
Clear Plastic Bottle - Natural (ED038)								
WRMW1-004,	WRMW2-004,	**04-JUN-2013**	----	----	----	**10-JUN-2013**	18-JUN-2013	✓
WRMW3-004,	WRMW4-004,							
WRMW5-004,	QC4,							
QC6,	QC7							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G)								
WRMW1-004,	WRMW2-004,	**04-JUN-2013**	---	01-JUL-2013	----	**05-JUN-2013**	01-JUL-2013	✓
WRMW3-004,	WRMW4-004,							
WRMW5-004,	QC4,							
QC6,	QC7							
ED045G: Chloride Discrete analyser								
Clear Plastic Bottle - Natural (ED045G)								
WRMW1-004,	WRMW2-004,	**04-JUN-2013**	---	01-JUL-2013	----	**05-JUN-2013**	01-JUL-2013	✓
WRMW3-004,	WRMW4-004,							
WRMW5-004,	QC4,							
QC6,	QC7							
EG020F: Dissolved Metals by ICP-MS								
Clear Plastic Bottle - Filtered; Lab-acidified (EG020A-F)								
WRMW1-004,	WRMW2-004,	**04-JUN-2013**	---	01-DEC-2013	----	**10-JUN-2013**	01-DEC-2013	✓
WRMW3-004,	WRMW4-004,							
WRMW5-004,	QC4,							
QC6,	QC7							
EG020T: Total Metals by ICP-MS								
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG020A-T)								
WRMW1-004,	WRMW2-004,	**04-JUN-2013**	**07-JUN-2013**	01-DEC-2013	✓	**07-JUN-2013**	01-DEC-2013	✓
WRMW3-004,	WRMW4-004,							
WRMW5-004,	QC4,							
QC6,	QC7							
EG020T: Total Metals by ICP-MS								
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG020B-T)								
WRMW1-004,	WRMW2-004,	**04-JUN-2013**	**07-JUN-2013**	01-DEC-2013	✓	**07-JUN-2013**	01-DEC-2013	✓
WRMW3-004,	WRMW4-004,							
WRMW5-004,	QC4,							
QC6,	QC7							

Matrix: **WATER**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method / *Container / Client Sample ID(s)*	*Sample Date*	*Extraction / Preparation* *Date extracted*	*Due for extraction*	*Evaluation*	*Analysis* *Date analysed*	*Due for analysis*	*Evaluation*
EG035T: Total Recoverable Mercury by FIMS							
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG035T) WRMW1-004, WRMW2-004, WRMW3-004, WRMW4-004, WRMW5-004, QC4, QC6, QC7	**04-JUN-2013**	----	----	----	**07-JUN-2013**	02-JUL-2013	✓
EG050F: Dissolved Hexavalent Chromium							
Clear Plastic Bottle - NaOH (EG050G-F) WRMW1-004, WRMW2-004, WRMW3-004, WRMW4-004, WRMW5-004, QC4	**04-JUN-2013**	----	----	----	**05-JUN-2013**	01-JUL-2013	✓
Clear Plastic Bottle - Natural (EG050G-F) QC6, QC7	**04-JUN-2013**	----	----	----	**05-JUN-2013**	04-JUN-2013	✗
EG051G: Ferrous Iron by Discrete Analyser							
Clear Plastic Bottle - HCl - Filtered (EG051G) WRMW1-004, WRMW2-004, WRMW3-004, WRMW4-004, WRMW5-004, QC4, QC6, QC7	**04-JUN-2013**	----	----	----	**05-JUN-2013**	11-JUN-2013	✓
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G) WRMW1-004, WRMW2-004, WRMW3-004, WRMW4-004, WRMW5-004, QC4, QC6, QC7	**04-JUN-2013**	---	02-JUL-2013	----	**05-JUN-2013**	02-JUL-2013	✓
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G) WRMW1-004, WRMW2-004, WRMW3-004, WRMW4-004, WRMW5-004, QC4, QC6, QC7	**04-JUN-2013**	---	05-JUN-2013	----	**05-JUN-2013**	05-JUN-2013	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G) WRMW1-004, WRMW2-004, WRMW3-004, WRMW4-004, WRMW5-004, QC4, QC6, QC7	**04-JUN-2013**	---	02-JUL-2013	----	**05-JUN-2013**	02-JUL-2013	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK061G)								
WRMW1-004,	WRMW2-004,	**04-JUN-2013**	**10-JUN-2013**	02-JUL-2013	✓	**10-JUN-2013**	02-JUL-2013	✓
WRMW3-004,	WRMW4-004,							
WRMW5-004,	QC4,							
QC6,	QC7							
EK067G: Total Phosphorus as P by Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK067G)								
WRMW1-004,	WRMW2-004,	**04-JUN-2013**	**10-JUN-2013**	02-JUL-2013	✓	**10-JUN-2013**	02-JUL-2013	✓
WRMW3-004,	WRMW4-004,							
WRMW5-004,	QC4,							
QC6,	QC7							
EK071G: Reactive Phosphorus as P by discrete analyser								
Clear Plastic Bottle - Natural (EK071G)								
WRMW1-004,	WRMW2-004,	**04-JUN-2013**	---	05-JUN-2013	----	**05-JUN-2013**	05-JUN-2013	✓
WRMW3-004,	WRMW4-004,							
WRMW5-004,	QC4,							
QC6,	QC7							
EK085M: Sulfide as S2-								
Clear Plastic Bottle - Zinc Acetate/NaOH (EK085)								
WRMW1-004,	WRMW2-004,	**04-JUN-2013**	----	----	----	**11-JUN-2013**	11-JUN-2013	✓
WRMW3-004,	WRMW4-004,							
WRMW5-004,	QC4,							
QC6,	QC7							
EP026ST: Chemical Oxygen Demand (Sealed Tube)								
Clear Plastic Bottle - Sulfuric Acid (EP026ST)								
WRMW1-004,	WRMW2-004,	**04-JUN-2013**	----	----	----	**11-JUN-2013**	02-JUL-2013	✓
WRMW3-004,	WRMW4-004,							
WRMW5-004,	QC4,							
QC6,	QC7							
EP030: Biochemical Oxygen Demand (BOD)								
Clear Plastic Bottle - Natural (EP030)								
WRMW1-004,	WRMW2-004,	**04-JUN-2013**	----	----	----	**05-JUN-2013**	06-JUN-2013	✓
WRMW3-004,	WRMW4-004,							
WRMW5-004,	QC4,							
QC6,	QC7							
EP068A: Organochlorine Pesticides (OC)								
Amber Glass Bottle - Unpreserved (EP068)								
WRMW1-004,	WRMW2-004,	**04-JUN-2013**	**07-JUN-2013**	11-JUN-2013	✓	**08-JUN-2013**	17-JUL-2013	✓
WRMW3-004,	WRMW4-004,							
WRMW5-004,	QC4,							
QC6,	QC7							

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP068B: Organophosphorus Pesticides (OP)								
Amber Glass Bottle - Unpreserved (EP068)								
WRMW1-004, WRMW3-004, WRMW5-004, QC6,	WRMW2-004, WRMW4-004, QC4, QC7	**04-JUN-2013**	**07-JUN-2013**	11-JUN-2013	✓	**08-JUN-2013**	17-JUL-2013	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft								
Amber Glass Bottle - Unpreserved (EP071)								
WRMW1-004, WRMW3-004, WRMW5-004, QC6,	WRMW2-004, WRMW4-004, QC4, QC7	**04-JUN-2013**	**07-JUN-2013**	11-JUN-2013	✓	**08-JUN-2013**	17-JUL-2013	✓
EP074D: Fumigants								
Amber VOC Vial - Sulfuric Acid (EP074)								
WRMW1-004, WRMW3-004, WRMW5-004, QC6,	WRMW2-004, WRMW4-004, QC4, QC7	**04-JUN-2013**	**07-JUN-2013**	18-JUN-2013	✓	**10-JUN-2013**	18-JUN-2013	✓
EP074E: Halogenated Aliphatic Compounds								
Amber VOC Vial - Sulfuric Acid (EP074)								
WRMW1-004, WRMW3-004, WRMW5-004, QC6,	WRMW2-004, WRMW4-004, QC4, QC7	**04-JUN-2013**	**07-JUN-2013**	18-JUN-2013	✓	**10-JUN-2013**	18-JUN-2013	✓
EP074F: Halogenated Aromatic Compounds								
Amber VOC Vial - Sulfuric Acid (EP074)								
WRMW1-004, WRMW3-004, WRMW5-004, QC6,	WRMW2-004, WRMW4-004, QC4, QC7	**04-JUN-2013**	**07-JUN-2013**	18-JUN-2013	✓	**10-JUN-2013**	18-JUN-2013	✓
EP074A: Monocyclic Aromatic Hydrocarbons								
Amber VOC Vial - Sulfuric Acid (EP074)								
WRMW1-004, WRMW3-004, WRMW5-004, QC6,	WRMW2-004, WRMW4-004, QC4, QC7	**04-JUN-2013**	**07-JUN-2013**	18-JUN-2013	✓	**10-JUN-2013**	18-JUN-2013	✓
EP074B: Oxygenated Compounds								
Amber VOC Vial - Sulfuric Acid (EP074)								
WRMW1-004, WRMW3-004, WRMW5-004, QC6,	WRMW2-004, WRMW4-004, QC4, QC7	**04-JUN-2013**	**07-JUN-2013**	18-JUN-2013	✓	**10-JUN-2013**	18-JUN-2013	✓

Work Order : EP1304187
Client : MOBILE DEWATERING
Project : E2012-031

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation
EP074C: Sulfonated Compounds							
Amber VOC Vial - Sulfuric Acid (EP074) WRMW1-004, WRMW2-004, WRMW3-004, WRMW4-004, WRMW5-004, QC4, QC6, QC7	**04-JUN-2013**	**07-JUN-2013**	18-JUN-2013	✓	**10-JUN-2013**	18-JUN-2013	✓
EP074G: Trihalomethanes							
Amber VOC Vial - Sulfuric Acid (EP074) WRMW1-004, WRMW2-004, WRMW3-004, WRMW4-004, WRMW5-004, QC4, QC6, QC7	**04-JUN-2013**	**07-JUN-2013**	18-JUN-2013	✓	**10-JUN-2013**	18-JUN-2013	✓
EP075(SIM)A: Phenolic Compounds							
Amber Glass Bottle - Unpreserved (EP075(SIM)) WRMW1-004, WRMW2-004, WRMW3-004, WRMW4-004, WRMW5-004, QC4, QC6, QC7	**04-JUN-2013**	**07-JUN-2013**	11-JUN-2013	✓	**08-JUN-2013**	17-JUL-2013	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP075(SIM)) WRMW1-004, WRMW2-004, WRMW3-004, WRMW4-004, WRMW5-004, QC4, QC6, QC7	**04-JUN-2013**	**07-JUN-2013**	11-JUN-2013	✓	**08-JUN-2013**	17-JUL-2013	✓
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080) WRMW1-004, WRMW2-004, WRMW3-004, WRMW4-004, WRMW5-004, QC4, QC6, QC7	**04-JUN-2013**	**07-JUN-2013**	18-JUN-2013	✓	**10-JUN-2013**	18-JUN-2013	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber VOC Vial - Sulfuric Acid (EP080) WRMW1-004, WRMW2-004, WRMW3-004, WRMW4-004, WRMW5-004, QC4, QC6, QC7	**04-JUN-2013**	**07-JUN-2013**	18-JUN-2013	✓	**10-JUN-2013**	18-JUN-2013	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Acidity as Calcium Carbonate	ED038	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Alkalinity by PC Titrator	ED037-P	2	19	**10.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ammonia as N by Discrete analyser	EK055G	2	17	**11.8**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Biochemical Oxygen Demand (BOD)	EP030	2	12	**16.7**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chemical Oxygen Demand (Sealed Tube)	EP026ST	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	2	18	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ferrous Iron by Discrete Analyser	EG051G	2	13	**15.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Hexavalent Chromium by Discrete Analyser - Dissolved	EG050G-F	2	15	**13.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	2	19	**10.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	1	8	**12.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
pH by PC Titrator	EA005-P	2	19	**10.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P-By Discrete Analyser	EK071G	2	16	**12.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Sulfide as S2-	EK085	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids (High Level)	EA015H	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	16	**6.3**	**10.0**	✗	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	3	28	**10.7**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	3	27	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite B	EG020B-T	1	10	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	2	16	**12.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	10	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Turbidity	EA045	2	14	**14.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Volatile Organic Compounds	EP074	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Acidity as Calcium Carbonate	ED038	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Alkalinity by PC Titrator	ED037-P	2	19	**10.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ammonia as N by Discrete analyser	EK055G	1	17	**5.9**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Biochemical Oxygen Demand (BOD)	EP030	1	12	**8.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chemical Oxygen Demand (Sealed Tube)	EP026ST	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	**Actual**	**Expected**	*Evaluation*	
Laboratory Control Samples (LCS) - Continued							
Conductivity by PC Titrator	EA010-P	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ferrous Iron by Discrete Analyser	EG051G	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Hexavalent Chromium by Discrete Analyser - Dissolved	EG050G-F	1	15	**6.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	1	8	**12.5**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
pH by PC Titrator	EA005-P	2	19	**10.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	16	**6.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Sulfide as S2-	EK085	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids (High Level)	EA015H	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	16	**12.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	2	28	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	2	27	**7.4**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite B	EG020B-T	1	10	**10.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	2	16	**12.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	10	**10.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Turbidity	EA045	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Volatile Organic Compounds	EP074	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ammonia as N by Discrete analyser	EK055G	1	17	**5.9**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Biochemical Oxygen Demand (BOD)	EP030	1	12	**8.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chemical Oxygen Demand (Sealed Tube)	EP026ST	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ferrous Iron by Discrete Analyser	EG051G	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Hexavalent Chromium by Discrete Analyser - Dissolved	EG050G-F	1	15	**6.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	1	8	**12.5**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	16	**6.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Sulfide as S2-	EK085	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
Suspended Solids (High Level)	EA025H	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids (High Level)	EA015H	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	16	**6.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	2	28	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	2	27	**7.4**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite B	EG020B-T	1	10	**10.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	1	16	**6.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	10	**10.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Turbidity	EA045	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Volatile Organic Compounds	EP074	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	17	**5.9**	**5.0**	✓	ALS QCS3 requirement
Chemical Oxygen Demand (Sealed Tube)	EP026ST	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Ferrous Iron by Discrete Analyser	EG051G	1	13	**7.7**	**5.0**	✓	ALS QCS3 requirement
Hexavalent Chromium by Discrete Analyser - Dissolved	EG050G-F	1	15	**6.7**	**5.0**	✓	ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	1	19	**5.3**	**5.0**	✓	ALS QCS3 requirement
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	9	**11.1**	**5.0**	✓	ALS QCS3 requirement
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	16	**6.3**	**5.0**	✓	ALS QCS3 requirement
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	16	**6.3**	**5.0**	✓	ALS QCS3 requirement
Total Mercury by FIMS	EG035T	2	28	**7.1**	**5.0**	✓	ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	2	27	**7.4**	**5.0**	✓	ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	1	16	**6.3**	**5.0**	✓	ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	9	**11.1**	**5.0**	✓	ALS QCS3 requirement
Volatile Organic Compounds	EP074	1	9	**11.1**	**5.0**	✓	ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
pH by PC Titrator	EA005-P	WATER	APHA 21st ed. 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Conductivity by PC Titrator	EA010-P	WATER	APHA 21st ed., 2510 B This procedure determines conductivity by automated ISE. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Dissolved Solids (High Level)	EA015H	WATER	In-House, APHA 21st ed., 2540C A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Suspended Solids (High Level)	EA025H	WATER	In-House, APHA 21st ed., 2540D A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Turbidity	EA045	WATER	APHA 21st ed., 2130 B. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Alkalinity by PC Titrator	ED037-P	WATER	APHA 21st ed., 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Acidity as Calcium Carbonate	ED038	WATER	APHA 21st ed., 2310 B Acidity is determined by titration with a standardised alkali to an end-point pH of 8.3. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	APHA 21st ed., 4500-SO4 Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Chloride by Discrete Analyser	ED045G	WATER	APHA 21st ed., 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA 21st edition seal method 2 017-1-L april 2003
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): Samples are 0.45 um filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.

Analytical Methods	Method	Matrix	Method Descriptions
Total Metals by ICP-MS - Suite B	EG020B-T	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Mercury by FIMS	EG035T	WATER	AS 3550, APHA 21st ed. 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the unfiltered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Hexavalent Chromium by Discrete Analyser - Dissolved	EG050G-F	WATER	APHA 21st ed., 3500 Cr-A & B. Samples are 0.45 um filtered prior to analysis. Hexavalent chromium is determined directly on water sample by Discrete Analyser as received by pH adjustment and colour development using dephenylcarbazide. Each run of samples is measured against a five-point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ferrous Iron by Discrete Analyser	EG051G	WATER	APHA 21st ed., 3500 Fe-B. A colorimetric determination based on the reaction between phenanthroline and ferrous iron at pH 3.2-3.3 to form an orange-red complex that is measured against a five-point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ammonia as N by Discrete analyser	EK055G	WATER	APHA 21st ed., 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrite as N by Discrete Analyser	EK057G	WATER	APHA 21st ed., 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrate as N by Discrete Analyser	EK058G	WATER	APHA 21st ed., 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	APHA 21st ed., 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	APHA 21st ed., 4500-Norg D. 25mL water samples are digested using a traditional Kjeldahl digestion followed by determination by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	APHA 21st ed., 4500-Norg / 4500-NO3-. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	APHA 21st ed., 4500-P B&F This procedure involves sulphuric acid digestion of a 100mL sample to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Reactive Phosphorus as P-By Discrete Analyser	EK071G	WATER	APHA 21st ed., 4500-P F Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Analytical Methods	Method	Matrix	Method Descriptions
Sulfide as S2-	EK085	WATER	APHA 21st ed., 4500-S2- D Sulfide species present in water samples are immediately precipitated when collected in pretreated caustic/zinc acetate preserved sample containers. After the supernatant is discarded, the resultant precipitate is then coloured using methylene blue indicator and measured using UV-VIS detection at 664nm. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Chemical Oxygen Demand (Sealed Tube)	EP026ST	WATER	(APHA 21st ed., 5220C, ALS QWI-EN/EP026) Samples are digested with a known excess of an acidic potassium dichromate solution using silver sulfate as a catalyst. The chromium is reduced from the Cr (VI) oxidation state to the Cr (III) state by the oxygen present in the organic material. The unreacted Cr (VI) can then be titrated with ferrous ammonium sulfate to determine the amount of Cr (VI) consumed. The oxidisable organic matter can be calculated in terms of oxygen equivalents.
Biochemical Oxygen Demand (BOD)	EP030	WATER	APHA 21st ed., 5210 B The 5-Day BOD test provides an empirical measure of the oxygen consumption capacity of a given water. A portion of the sample is diluted into oxygenated, nutrient rich water, and a seed added to begin biological decay. The initial dissolved oxygen content is measured, then the bottle is sealed and incubated for five days. The remaining dissolved oxygen is measured, and from the difference, the demand for oxygen, by biological decay, is determined. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Pesticides by GCMS	EP068	WATER	USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
TPH - Semivolatile Fraction	EP071	WATER	USEPA SW 846 - 8015A The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Volatile Organic Compounds	EP074	WATER	USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
TPH Volatiles/BTEX	EP080	WATER	USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Preparation Methods	Method	Matrix	Method Descriptions
Digestion for Total Recoverable Metals	EN25	WATER	USEPA SW846-3005 Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Separatory Funnel Extraction of Liquids	ORG14	WATER	USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2). ALS default excludes sediment which may be resident in the container.

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Duplicate (DUP) RPDs							
EK067G: Total Phosphorus as P by Discrete Analyser	EP1304187-004	WRMW4-004	**Total Phosphorus as P**	----	Not Determined		**Analyte not determined in allocated original sample.**
Laboratory Control Spike (LCS) Recoveries							
EP074B: Oxygenated Compounds	3455032-002	----	**2-Hexanone (MBK)**	591-78-6	Not Determined	----	**Standard recovery not determined, result less than LOR**
Matrix Spike (MS) Recoveries							
EG035T: Total Recoverable Mercury by FIMS	EP1304112-002	Anonymous	**Mercury**	7439-97-6	21.5 %	70-130%	**Recovery less than lower data quality objective**

- **For all matrices, no Method Blank value outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

Matrix: **WATER**

Method		Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		*Date extracted*	*Due for extraction*	***Days overdue***	*Date analysed*	*Due for analysis*	***Days overdue***
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
WRMW1-004,	WRMW2-004,	----	----	----	05-JUN-2013	04-JUN-2013	**1**
WRMW3-004,	WRMW4-004,						
WRMW5-004,	QC4,						
QC6,	QC7						
EG050F: Dissolved Hexavalent Chromium							
Clear Plastic Bottle - Natural							
QC6,	QC7	----	----	----	05-JUN-2013	04-JUN-2013	**1**

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

Matrix: **WATER**

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Total Kjeldahl Nitrogen as N By Discrete Analyser	1	16	6.3	10.0	NEPM 1999 Schedule B(3) and ALS QCS3 requirement